

Northeast School Corporation

Industrial Tech Renovations

Schmidt Project No. 2016-100. ITR

Project Manual



SCHMIDT
ASSOCIATES

Better Foresight • Better Insight • Better On-Site

415 Massachusetts Avenue | Indianapolis, IN 46204
317.263.6226 | 1.888.263.6224 | www.schmidt-arch.com

March 27, 2020

Project Manual

for

**Northeast School Corporation -
Industrial Tech Renovations**

Schmidt Project No. 2016-100. ITR

Prepared For:

Northeast School Corporation
620 N Washington Street
Shelburn, IN 47879
(812) 383-5761/fax (812) 383-4591

Prepared By:

Schmidt Associates
415 Massachusetts Avenue
Indianapolis, IN 46204-1501
(317) 263-6226/fax(317) 263-6224



March 27, 2020

TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 001113 - ADVERTISEMENT FOR BIDS (PUBLIC)
SECTION 002113 - INSTRUCTIONS TO BIDDERS
SECTION 003100 - AVAILABLE PROJECT INFORMATION
SECTION 004113 - SUPPLEMENTAL BID FORM (PUBLIC)
SECTION 004335 - SUBCONTRACTORS AND PRODUCTS (UNIFIED CONTRACT)
SECTION 004553 - ASBESTOS AFFIDAVIT
SECTION 006000 - PROJECT FORMS
SECTION 007200 - GENERAL CONDITIONS OF THE CONTRACT

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 011000 - SUMMARY
SECTION 012100 - ALLOWANCES
SECTION 012300 - ALTERNATES
SECTION 012500 - SUBSTITUTION PROCEDURES
SECTION 012600 - CONTRACT MODIFICATION PROCEDURES
SECTION 012900 - PAYMENT PROCEDURES
SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION
SECTION 013123.99 - WEB-BASED PROJECT MANAGEMENT
SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION
SECTION 013300 - SUBMITTAL PROCEDURES
SECTION 014000 - QUALITY REQUIREMENTS
SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS
SECTION 016000 - PRODUCT REQUIREMENTS
SECTION 017300 - EXECUTION
SECTION 017700 - CLOSEOUT PROCEDURES
SECTION 017823 - OPERATION AND MAINTENANCE DATA
SECTION 017839 - PROJECT RECORD DOCUMENTS
SECTION 017900 - DEMONSTRATION AND TRAINING

DIVISION 02 - EXISTING CONDITIONS

SECTION 024119 - SELECTIVE DEMOLITION

DIVISION 03 - CONCRETE

SECTION 033000 - CAST-IN-PLACE CONCRETE

DIVISION 04 - MASONRY

SECTION 042200 - CONCRETE UNIT MASONRY

DIVISION 05 - METALS

NOT APPLICABLE

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY
SECTION 061600 - SHEATHING

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 070150.19 - PREPARATION FOR RE-ROOFING
SECTION 072100 - THERMAL INSULATION
SECTION 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING
SECTION 077100 - ROOF SPECIALTIES
SECTION 077200 - ROOF ACCESSORIES
SECTION 079200 - JOINT SEALANTS

DIVISION 08 - OPENINGS

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES
SECTION 081416 - FLUSH WOOD DOORS
SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
SECTION 085113 - ALUMINUM WINDOWS
SECTION 087100 - DOOR HARDWARE
SECTION 088000 - GLAZING
SECTION 089000 - LOUVERS AND VENTS

DIVISION 09 - FINISHES

SECTION 092216 - NON-STRUCTURAL METAL FRAMING
SECTION 092900 - GYPSUM BOARD
SECTION 093000 - TILING
SECTION 095113 - ACOUSTICAL PANEL CEILINGS
SECTION 096513 - RESILIENT BASE AND ACCESSORIES
SECTION 096519 - RESILIENT TILE FLOORING
SECTION 096723.13 - RESINOUS FLOORING - LEVEL 1
SECTION 099123.99 - INTERIOR PAINTING
SECTION 099600.99 - HIGH PERFORMANCE COATINGS

DIVISION 10 - SPECIALTIES

SECTION 101100 - VISUAL DISPLAY UNITS

DIVISION 11 - EQUIPMENT

NOT APPLICABLE

DIVISION 12 - FURNISHINGS

SECTION 122413 - ROLLER WINDOW SHADES
SECTION 123200 - MANUFACTURED WOOD CASEWORK

DIVISION 13 - SPECIAL CONSTRUCTION

NOT APPLICABLE

DIVISION 14 - CONVEYING EQUIPMENT

NOT APPLICABLE

DIVISION 21 - FIRE SUPPRESSION

NOT APPLICABLE

DIVISION 22 - PLUMBING

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING
SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING
SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
SECTION 220719 - PLUMBING PIPING INSULATION
SECTION 221116 - DOMESTIC WATER PIPING (BUILDING)
SECTION 221316 - SANITARY WASTE AND VENT PIPING (BUILDING)
SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES
SECTION 224100 - RESIDENTIAL PLUMBING FIXTURES
SECTION 224233 - WASH FOUNTAINS

DIVISION 23 - HEATING, VENTILATING, AND AIR-CONDITIONING(HVAC)

SECTION 230500 - COMMON WORK RESULTS FOR HVAC
SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING
SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC
SECTION 230713 - DUCT INSULATION
SECTION 230719 - HVAC PIPING INSULATION
SECTION 232113 - HYDRONIC PIPING
SECTION 233113 - METAL DUCTS
SECTION 233300 - AIR DUCT ACCESSORIES
SECTION 233423 - HVAC POWER VENTILATORS
SECTION 233713.99 - DIFFUSERS, REGISTERS, AND GRILLES
SECTION 233723 - HVAC GRAVITY VENTILATORS
SECTION 238223.98 - VERTICAL UNIT VENTILATORS

DIVISION 26 - ELECTRICAL

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL
SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING
SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS
SECTION 260923 - LIGHTING CONTROL DEVICES
SECTION 262416 - PANELBOARDS
SECTION 262726 - WIRING DEVICES
SECTION 262813 - FUSES
SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS
SECTION 262913 - ENCLOSED CONTROLLERS
SECTION 265119 - LED INTERIOR LIGHTING
SECTION 265213 - EMERGENCY AND EXIT LIGHTING

DIVISION 27 - COMMUNICATIONS

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS
SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

SECTION 284621 - ADDRESSABLE FIRE-ALARM SYSTEMS

DIVISION 31 - EARTHWORK

NOT APPLICABLE

DIVISION 32 - EXTERIOR IMPROVEMENTS

NOT APPLICABLE

DIVISION 33 - UTILITIES

NOT APPLICABLE

DOCUMENT 001113 - ADVERTISEMENT FOR BIDS (PUBLIC)

PART 1 - GENERAL

1.1 NOTICE TO BIDDERS

- A. Notice is hereby given that the Northeast School Corporation, Sullivan County, Indiana (the "Owner") is requesting interested parties to submit sealed Bids for the construction work described in the Procurement Documents with respect to the following facility:
1. North Central High School, 910 E. County Road 975 N, Farmersburg, IN 47850
- B. Bids will be received until:
1. April 21, 2020 at 2pm (local time) at Northeast School Corporation Administration Building, 620 N. Washington Street, Shelburn, IN 47879.
 2. Bids received after that time will be returned unopened. Bids will be publicly opened and read aloud via Skype. Call in information will be distributed to Contractors that submit bids.
- C. Work shall be performed under one Unified Contract.
- D. Bids shall be submitted on forms provided in this Project Manual.
- E. Bids shall be executed in accordance with Indiana Board of Accounts Form No. 96 (Current Revision) - "Contractor's Bid for Public Works" (available at: <http://www.in.gov/sboa/files/Form96.pdf>), with a financial statement complying with Section III of Form No. 96, Supplemental Bid Form (Document 004113), a satisfactory Bid Bond, or certified check pursuant to I.C. 36-1-12-4.5, payable to:
1. Northeast School Corporation
- F. Bid Bond or Certified Check (the Bid Security) shall be in the amount of not less than five percent (5%) of the total price made payable to the Owner and delivered in a sealed envelope showing the Bidder's name and address.
- G. Bid shall be delivered in a sealed envelope plainly labeled to indicate the following:
1. Addressed to:
 - a. Northeast School Corporation
 - b. Industrial Tech Lab Renovations
 2. The name and return address of the Bidder.
- H. Should a successful Bidder withdraw the Bid, or fail to execute a satisfactory Contract, the

Owner may then declare the Bid deposit forfeited as liquidated damages.

- I. Construction shall be in full accord with Drawings and Specifications. Procurement Documents are obtainable from the printing company listed below for a deposit of \$100/set payable to the Owner, which will be refunded when documents are returned in good condition, within seven (7) days after the bid opening. There is a limit of three (3) sets per Bidder, one (1) set per subbidder and supplier, under the refundable policy. Additional sets may be purchased at non-refundable printing costs. A non-refundable fee will be added for postage when necessary. Electronic media of the Drawings and Specifications in PDF format is available to plan-holders (only) from the same printing company for a non-refundable fee of \$50.
 1. Repro Graphix
 - a. 437 N. Illinois Street, Indianapolis, IN 46204
 - b. Phone: 317-637-3377 / FAX: 317-637-3415
 - c. <http://www.reprographix.com>
- J. Procurement Documents may be examined by prospective Bidders at the following locations:
 1. McGraw-Hill Construction Dodge
 - a. 8900 Keystone Crossing, Suite 540, Indianapolis, Indiana 46240
 - b. Phone: (317) 817-9110 / Fax: (317) 571-8201
 2. ConstructConnect
 - a. 3825 Edwards Road, Suite 800, Cincinnati, OH 45209
 - b. Phone: 800-364-2059
 - c. <https://www.constructconnect.com>
 3. BX Indiana / Construction League
 - a. 1200 South Madison Avenue, Suite LL20, Indianapolis, Indiana 46225
 - b. Phone: (317) 423-7080 / Fax: (317) 423-7094
- K. The Owner reserves the right to accept or reject any Bid, to waive any informalities or errors in bidding for a period of sixty (60) days after the Bid opening and to waive any inconsistencies or errors in any of the Procurement Documents.
- L. Bidder receiving the award shall furnish an approved one hundred percent (100%) Performance Bond and a one hundred percent (100%) Labor and Materials Payment Bond which cover faithful performance of the Contract and the payment of all obligations arising thereunder. Said bonds shall remain in full force and effect for twelve (12) months from the date of acceptance of the Work.
- M. The Contract to which the Owner will be a party will contain a provision prohibiting the other party to the Contract, and their subcontractors, from engaging in employment practice that constitutes a discrimination against a person because of the person's race, color, sex, religion,

national origin or ancestry. The Contractor shall provide an affidavit with each billing, assuring the Owner that this provision has not been violated.

- N. Where trade names, brand names, or manufacturers' names are used in this Project Manual, it is for the purpose of establishing kind and quality and not for the purpose of limiting competition. Bidders may offer items or materials equal in quality and having the same durability and efficiency if the Bidder first receives written approval from the Architect/Engineer prior to the date/time of the Bid opening and complying with requirements indicated in Document 002113, "Instructions To Bidders". The Bidder shall identify such substitutions by name, kind, and type with the Bid.
- O. A Pre-Bid meeting and tour is scheduled for:
1. Date: April 7, 2020
 2. Time: 1pm (local time)
 3. Place: The Pre-bid will be conducted via Skype. Interested contractors must email Lisa Gomperts at lgomperts@schmidt-arch.com to receive the call in information.

END OF DOCUMENT 001113

DOCUMENT 002113 - INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL

1.1 INSTRUCTIONS TO BIDDERS

- A. The terms for Bidding shall be as stipulated in the Instructions to Bidders, AIA Document A701-1997, 5th Edition.
- B. References to Separate Prime Contractors within this Document shall be construed as referring to the Contractor.
- C. The supplements to modify the Instructions to Bidders, AIA Document A701 (current version) have been incorporated directly into the document provided in this Project Manual. Where a portion of the Instruction to Bidders is modified or any paragraph, subparagraph or clause thereof is modified or deleted by these Supplementary Instructions to Bidders, the unaltered portions of the Instructions to Bidders shall remain in effect. Additions are indicated as bold and underlined, deletions are indicated as struck-through.

END OF DOCUMENT 002113



AIA[®] Document A701[™] – 1997

Instructions to Bidders

for the following PROJECT:

(Name and location or ~~address~~)address):

North Central High School

910 E. County Road 975 N, Farmersburg, IN 47850

THE OWNER:

(Name, legal status and ~~address~~)address):

Northeast School Corporation

620 N. Washington Street

Shelburn, IN 47879

THE ARCHITECT:

(Name, legal status and ~~address~~)address):

Schmidt Associates

415 Massachusetts Ave.

Indianapolis, IN 46204

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

~~TABLE OF ARTICLES~~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 |

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, as amended,~~ 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.

§ 2.1.3.1 No claims for extra compensation will be granted which are the result of any Bidder's failure to examine the conditions which exist at the Project site nor for conditions of difficulties which arise in the execution of the Work which may have been avoided by such prior examination.

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

§ 2.2 The purpose and intent of the Contract Documents is to achieve a fully completed Project. Each Bidder shall be responsible for including costs necessary to provide labor and materials for the portion of the Work bid upon and shall include all incidentals whether or not specifically called for in the Contract Documents.

§ 2.3 No claims for extra compensation shall be granted which are the result of a Bidder's error or oversight (on the Bidder's part) or the failure to thoroughly examine and/or become familiar with the Contract Documents.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 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.

§ 3.1.1.1 If a Sub-bidder desires full or partial sets of Documents in excess of those quantities obtainable for a deposit as listed in the Advertisement or Invitation to Bid, or if a Bidder desires full or partial sets in excess of those obtainable for a deposit (as listed in the Advertisement or Invitation to Bid), they may be purchased. These charges are not refundable.

§ 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 Architect by email at least ~~seven~~ten calendar days prior to the date for receipt of Bids.

§ 3.2.2.1 The email to contact the Architect is bid 2016-100.ITR@saix.schmidt-arch.com.

§ 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 Architect by email from a Bidder 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 decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.2.1 Architect will consider substitution requests received from Bidders only. Substitution requests received from an entity (sub-bidder, vendor, supplier, manufacturer) other than a Bidder will not be considered. Substitution requests shall be submitted on form provided in Contract Documents. Contact Architect regarding consideration on future projects.

§ 3.3.2.2 The email to contact the Architect is bid2016-100.ITR@saix.schmidt-arch.com.

§ 3.3.3 If the Architect 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 (4) days before 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 unless deemed in the best interest of the Project.~~

§ 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.

§ 3.4.5 Only written Addendum items shall be considered legally binding. Verbal interpretations, made as a courtesy, are not legally or contractually binding.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

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

§ 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. Bid Security shall be a Certified Check only for out-of-state Bidders, a Bid Bond or a Certified Check or a Certified Bank Draft or a Cashier's Check for Indiana Bidders, in the amount noted in the "Advertisement or Invitation to Bid."

§ 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.

§ 5.2.1 The failure of a Bidder to submit the requested information with the Bid may be grounds for rejection of the Bid.

§ 5.2.2 The Owner also reserves the right to reject the Bid of a Bidder who has previously failed to perform properly or to complete Work of a similar nature on time, who is not in a position to perform the Work of the Contract, or who has habitually and without just cause neglected the payment of bills or otherwise disregarded obligations to subcontractors, suppliers, material fabricators and/or employees.

§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest ~~qualified~~ responsible and responsive 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.

§ 5.3.3 Each Bidder is encouraged to attend the Pre-Bid Meeting as scheduled in the Advertisement or Invitation to Bid.

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 Architect, 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. Each Bidder shall submit with the Bid a copy of Indiana State Board of Accounts Form 96 (Current Revision), Contractor's Bid for Public Work, properly completed.

§ 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 through the Architect in writing: apparent low three (3) Bidders shall submit the following to the Architect/engineer as indicated in Division 00 Document "Subcontractors and Products" of this Project Manual:

- .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.
- .4 Performance Bond and Labor, Material Payment Bond, and Certificate of Insurance shall be turned in to the Owner within three (3) days after notice to proceed in order to expedite the project.

§ 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 will notify the Bidder in writing if either the Owner or Architect, 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 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~~ 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~~ The cost of the Bidder's performance and payment bonds 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 prior to or at the time~~ 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~~ 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.~~ Bond for 100% of the Contract amount, and shall be kept in compliance with Indiana law.

§ 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.

ARTICLE 9 SUPPLEMENTARY INSTRUCTIONS

§ 9.1 TAX EXEMPTION

§ 9.1.1 Refer to AIA A201, General Conditions of the Contract for Construction, Article 3.6 TAXES.

§ 9.3 CRIMINAL HISTORY CHECK

§ 9.3.1 Refer to Section 011000 "Summary" for Background Check requirements.

§ 9.4 ACKNOWLEDGEMENTS

§ 9.4.1 Contractor and all Subcontractors are responsible to comply with Indiana Code as it pertains to public works projects. The following are notable requirements set forth in IC 5-16-13, in effect as of July 1, 2015, but are not inclusive of all requirements. See Document AIA A201, Article 13 and check appropriate box in Bid Form.

DOCUMENT 003100 - AVAILABLE PROJECT INFORMATION

PART 1 - GENERAL

1.1 EXISTING CONDITIONS

- A. Bidders should visit the site and inform themselves of all existing conditions under which work is to be performed, structure of the ground, obstacles that may be encountered, location, and availability of utilities and facilities, and other relevant matters concerning the work to be done.
- B. The Asbestos Report, prepared for the Owner, is not a part of the Contract Documents and is on file at the Owner's office for review as necessary. The Architect does not accept responsibility for the information contained in the report.

1.2 CRIMINAL HISTORY BACKGROUND INFORMATION

- A. See attached Exhibit 1 regarding the requirements of Indiana Code Section 20-5-2-7(b)(4)(c) for background checks.

END OF DOCUMENT 003100

EXHIBIT 1

EXPANDED CRIMINAL HISTORY CHECK INFORMATION

[I.C. 20-26-2-1.5; I.C. 20-26-5-10]

EXPANDED CRIMINAL HISTORY CHECK (EHC) means one of the two following items:

- 1) Search of records maintained by all Indiana counties where the applicant has lived;
Search of all counties out-of-state where the applicant has lived; AND
Check of all 50 states' sex offender registry or check of national sex offender registry.

OR

- 2) Search of national criminal history background check (FBI); AND
Check of all 50 states' sex offender registry or check of national sex offender registry.

NEW EMPLOYEES

New law requires the school corporation policy on criminal history information to require an EHC to be done on ALL applicants for employment [both certificated and noncertificated positions] whose job will likely cause the person to have direct ongoing contact with children before employment or within three months after the applicant is hired.

- The applicant is responsible for all costs associated with acquiring the EHC.
- The applicant cannot be required by the school corporation to get an EHC more than once in a five-year period.

The Indiana State Police can still provide services to get the information needed to comply with the new law. It will do a national criminal history check which includes all states. This criminal history check includes only felony arrests and/or dispositions (i.e. conviction, acquittal, etc.) The cost is \$32.25 for an employee check and \$28.25 for a volunteer check.

This can be done online at the Indiana State Police website through the INnkless link. This check does require the applicant to be fingerprinted but the website gives the sites which will do the fingerprinting. You sign the applicant up for a site, the applicant goes there and the site personnel send in the fingerprints for the criminal history check. The check is sent back to the State Police and will be checked to see if the applicant qualifies for employment. If the applicant does not qualify for employment, the State Police will tell you that the applicant does not qualify for employment. But it will not tell you the crime the applicant was convicted of; that will be the responsibility of the school corporation to ask those questions. There are 21 crimes for which a person may be disqualified. These crimes are listed in I.C. 20-26-5-11, a copy of which is attached.

The sex offender registry for all states and the national registry can be accessed online at www.insor.org, and then hit on the Links tab on the left-hand side of the website. This takes you a list of the links to the national sex offender registry and each state sex offender registry.

VOLUNTEERS; CONTRACTED SERVICES

The policy may require an ECHC to be done on volunteers, employees of an entity who contracts with the school corporation, and any person who has a contract to provide services to a school corporation wherein the services provided by any of the above-mentioned individuals would cause the individual to have direct, ongoing contact with children. So, your current policy and/or practices on getting criminal history checks with respect to these individuals are still good.

The limited criminal history checks may still be done on these individuals or the school corporation may also do ECHCs on these individuals per policy. It is best to have the individual get the limited criminal history check as it contains more information than if the employer gets this check. The cost for the individual to get this check is \$10.00.

FOR YOUR INFORMATION

The Indiana Department of Education and the Indiana State Police are working on information and forms for schools to use in registering for the INkless database and for registering employees who have been convicted of a crime listed in I.C. 20-28-5-8. I.C. 20-28-5-8 now requires the superintendent to report any final action taken against an employee who has engaged in any of the crimes listed in I.C. 20-28-5-8(c). Subsection (e) of this statute requires DOE to develop and maintain a database on the employees who have been reported to the department under this law. This statute is also included with these materials.

This information and the forms should be sent out to all school corporations from the department by Friday, June 12, 2009.

There are also other companies that may be used to do the ECHCs for your applicants. This author is aware of two such companies – Safe Hiring Solutions and First Advantage.

SAMPLE POLICY

An updated version of a criminal history check policy is included at the end of these materials.

RELEVANT INDIANA CRIMINAL HISTORY STATUTES

I.C. 20-26-2-1.5 [NEW SECTION --EFFECTIVE JULY 1, 2009]:

"Expanded criminal history check" means a criminal history background check of an individual that includes:

(1) a:

(A) search of the records maintained by all counties in Indiana in which the individual who is the subject of the background check resided;

(B) search of the records maintained by all counties or similar governmental units in another state, if the individual who is the subject of the background check resided in another state; and

(C) check of:

(i) sex offender registries in all fifty (50) states; or

(ii) the national sex offender registry maintained by the United States Department of Justice; or

(2) a:

(A) national criminal history background check (as defined in I.C. 10-13-3-12); and

(B) check of:

(i) sex offender registries in all fifty (50) states; or

(ii) the national sex offender registry maintained by the United States Department of Justice.

I.C. 20-26-5-10 [AMENDED -- EFFECTIVE JULY 1, 2009]:

(a) A school corporation, including a charter school and an accredited nonpublic school, shall adopt a policy concerning criminal history information for individuals who:

(1) apply for:

(A) employment with the school corporation; or

(B) employment with an entity with which the school corporation contracts for services;

(2) seek to enter into a contract to provide services to the school corporation; or

(3) are employed by an entity that seeks to enter into a contract to provide services to the school corporation;

if the individuals are likely to have direct, ongoing contact with children within the scope of the individuals' employment.

(b) A school corporation, including a charter school and an accredited nonpublic school, shall administer a policy adopted under this section uniformly for all individuals to whom the policy applies. A policy adopted under this section must require that the school corporation, charter school, or accredited nonpublic school conduct an expanded criminal history check concerning each applicant for noncertificated employment or certificated employment before or not later than three (3) months after the applicant's employment by the school corporation, charter school, or accredited nonpublic school.

Each individual hired for noncertificated employment or certificated employment may be required to provide a written consent for the school corporation, charter school, or accredited

nonpublic school to request **an expanded criminal history** check concerning the individual before or not later than three (3) months after the individual's employment by the school corporation. The school corporation, **charter school, or accredited nonpublic school** may require the individual to provide a set of fingerprints and pay any fees required for **the expanded criminal history** check.

Each applicant for noncertificated employment or certificated employment may be required at the time the individual applies to answer questions concerning the individual's **expanded criminal history check**. The failure to answer honestly questions asked under this **subsection** is grounds for termination of the employee's employment.

The applicant is responsible for all costs associated with obtaining the **expanded criminal history check**. **An applicant may not be required by a school corporation, charter school, or accredited nonpublic school to obtain an expanded criminal history check more than one (1) time during a five (5) year period.**

(c) Information obtained under this section must be used in accordance with **law**.

I.C. 20-28-5-8 [AMENDED --EFFECTIVE JULY 1, 2009]:

(a) This section applies when a prosecuting attorney knows that a licensed employee of a public school or a nonpublic school has been convicted of an offense listed in subsection (c). The prosecuting attorney shall immediately give written notice of the conviction to the following:

(1) The state superintendent.

(2) Except as provided in subdivision (3), the superintendent of the school corporation that employs the licensed employee or the equivalent authority if a nonpublic school employs the licensed employee.

(3) The presiding officer of the governing body of the school corporation that employs the licensed employee, if the convicted licensed employee is the superintendent of the school corporation.

(b) The superintendent of a school corporation, presiding officer of the governing body, or equivalent authority for a nonpublic school shall immediately notify the state superintendent when the individual knows that a current or former licensed employee of the public school or nonpublic school has been convicted of an offense listed in subsection (c), **or when the governing body or equivalent authority for a nonpublic school takes any final action in relation to an employee who engaged in any offense listed in subsection (c).**

(c) The department, after holding a hearing on the matter, shall permanently revoke the license of a person who is known by the department to have been convicted of any of the following felonies:

(1) Kidnapping (I.C. 35-42-3-2), if the victim is less than eighteen (18) years of age.

(2) Criminal confinement (I.C. 35-42-3-3), if the victim is less than eighteen (18) years of age.

(3) Rape (I.C. 35-42-4-1), if the victim is less than eighteen (18) years of age.

(4) Criminal deviate conduct (I.C. 35-42-4-2), if the victim is less than eighteen (18) years of age.

(5) Child molesting (I.C. 35-42-4-3).

(6) Child exploitation (I.C. 35-42-4-4(b)).

(7) Vicarious sexual gratification (I.C. 35-42-4-5).

- (8) Child solicitation (I.C. 35-42-4-6).
- (9) Child seduction (I.C. 35-42-4-7).
- (10) Sexual misconduct with a minor (I.C. 35-42-4-9).
- (11) Incest (I.C. 35-46-1-3), if the victim is less than eighteen (18) years of age.
- (12) Dealing in or manufacturing cocaine or a narcotic drug (I.C. 35-48-4-1).
- (13) Dealing in methamphetamine (I.C. 35-48-4-1.1).
- (14) Dealing in a schedule I, II, or III controlled substance (I.C. 35-48-4-2).
- (15) Dealing in a schedule IV controlled substance (I.C. 35-48-4-3).
- (16) Dealing in a schedule V controlled substance (I.C. 35-48-4-4).
- (17) Dealing in a counterfeit substance (I.C. 35-48-4-5).
- (18) Dealing in marijuana, hash oil, or hashish (I.C. 35-48-4-10(b)).
- (19) Possession of child pornography (I.C. 35-42-4-4(c)).**
- (d) A license may be suspended by the state superintendent as specified in I.C. 20-28-7-7.
- (e) The department shall develop a data base of information on school corporation employees who have been reported to the department under this section.**

IC 20-26-5-11

Use of information; notice of conviction of certain offenses

- (a) This section applies to:
 - (1) a school corporation; and
 - (2) an entity:
 - (A) with which the school corporation contracts for services; and
 - (B) that has employees who are likely to have direct, ongoing contact with children within the scope of the employees' employment.
- (b) A school corporation or entity may use information obtained under section 10 of this chapter concerning an individual's conviction for one (1) of the following offenses as grounds to not employ or contract with the individual:
 - (1) Murder (IC 35-42-1-1).**
 - (2) Causing suicide (IC 35-42-1-2).**
 - (3) Assisting suicide (IC 35-42-1-2.5).**
 - (4) Voluntary manslaughter (IC 35-42-1-3).**
 - (5) Reckless homicide (IC 35-42-1-5).**
 - (6) Battery (IC 35-42-2-1) unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.**
 - (7) Aggravated battery (IC 35-42-2-1.5).**
 - (8) Kidnapping (IC 35-42-3-2).**
 - (9) Criminal confinement (IC 35-42-3-3).**
 - (10) A sex offense under I.C. 35-42-4.**
 - (11) Carjacking (IC 35-42-5-2).**
 - (12) Arson (IC 35-43-1-1), unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.**
 - (13) Incest (IC 35-46-1-3).**
 - (14) Neglect of a dependent as a Class B felony (IC 35-46-1-4(b)(2)), unless ten (10) years have elapsed from the date the individual was discharged from probation,**

imprisonment, or parole, whichever is later.

(15) Child selling (IC 35-46-1-4(d)).

(16) Contributing to the delinquency of a minor (IC 35-46-1-8), unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.

(17) An offense involving a weapon under I.C. 35-47 or I.C. 35-47.5, unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.

(18) An offense relating to controlled substances under I.C. 35-48-4, unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.

(19) An offense relating to material or a performance that is harmful to minors or obscene under I.C. 35-49-3, unless ten (10) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.

(20) An offense relating to operating a motor vehicle while intoxicated under I.C. 9-30-5, unless five (5) years have elapsed from the date the individual was discharged from probation, imprisonment, or parole, whichever is later.

(21) An offense that is substantially equivalent to any of the offenses listed in this subsection in which the judgment of conviction was entered under the law of any other jurisdiction.

(c) An individual employed by a school corporation or an entity described in subsection (a) shall notify the governing body of the school corporation, if during the course of the individual's employment, the individual is convicted in Indiana or another jurisdiction of an offense described in subsection (b).

CRIMINAL HISTORY INFORMATION

[The language in italics is optional language that may be adopted at the discretion of the local school board.]

[The language that is not in italics is required language.]

To help ensure a safe environment and as required by state law, the _____ School Corporation will obtain for each individual hired for employment that is likely to have direct, ongoing contact with children as a result of the individual's position an expanded criminal history check. The expanded criminal history check will be obtained by the Corporation prior to the individual's employment and no later than three (3) months after the individual's employment begins. The individual will be responsible for the cost to the School Corporation for obtaining the expanded criminal history check.

Each individual hired may will be questioned about the individual's expanded criminal history check. Failure to answer honestly any questions related to the expanded criminal history check may be cause for termination of the applicant.

Any volunteer who may have direct, ongoing contact with children when performing services for the school, must provide to the Corporation a limited criminal history check [an expanded criminal history check] prior to beginning volunteer work for the Corporation. The volunteer will be responsible for all costs associated with obtaining the limited criminal history check [an expanded criminal history check]. However, the School Corporation will pay the costs by way of reimbursement for volunteers who are selected for service.

Any entity which has a contract to provide services to the Corporation and whose employees have direct, ongoing contact with children when performing those services for the school, must provide to the Corporation limited criminal histories [expanded criminal history checks] for such employees. The entity and/or the entity's employees are responsible for all costs associated with obtaining the limited criminal histories [expanded criminal history checks]. An individual who is working for such an entity may also be required to provide the individual's limited criminal history [expanded criminal history check] to the school corporation upon its request to do so or to provide consent to the school corporation for it to request a limited criminal history[an expanded criminal history check] of the individual.

Any information obtained from any type of criminal history check is confidential and shall not be released or disseminated.

All school employees and individuals or entities who have contracts for services with the Corporation are required by state law to report convictions of certain crimes enumerated in state law to the Corporation. The superintendent or designee is responsible for implementing regulations to notify the employees, including volunteers, and the entities for contracted services of this duty. *In addition to the crimes listed in the state law, the notice shall also include the convictions of the "attempted" crimes listed in the law.*

LEGAL REFERENCE: I.C. 20-26-5-10
I.C. 20-26-5-11

DOCUMENT 004113 – SUPPLEMENTAL BID FORM

PRESENTED TO

To: Northeast School Corporation
 Re: Industrial Tech Lab Renovation - North Central High School
910 E Co Rd 975 N, Farmersburg, IN 47850

PRESENTED BY

From (Bidder): _____
 Contact: _____
 Address: _____
 Telephone: _____
 E-mail: _____
 Date: _____

The undersigned, having visited the Project site and having become familiar with conditions thereof and having examined and become fully cognizant of Drawings and Project Manual and all Addenda issued thereto, hereby agrees to furnish all labor, materials, equipment, fixtures and incidentals required for construction of the Project in conformance with the intent of the Construction Documents.

Pursuant to these requirements, the undersigned submits the following Base Bid and Alternate Bids, which include all applicable taxes, overhead and profit for General Contract Work.

BID

| | Amount (Lump Sum in Words) | Amount (Number) |
|----------|----------------------------|-----------------|
| Base Bid | Dollars | \$ |

ALTERNATE BIDS

| Alternate | Add/Deduct | Amount (Lump Sum in Words) | Amount (Number) |
|------------------------------------|---|----------------------------|-----------------|
| Alternate No. 1 - Wall Cabinets | <input type="checkbox"/> Add <input type="checkbox"/> Deduct | Dollars | \$ |
| Alternate No. 2 - Cord Reels | <input type="checkbox"/> Add <input type="checkbox"/> Deduct | Dollars | \$ |
| Alternate No. 3 - Roller Shades | <input type="checkbox"/> Add <input type="checkbox"/> Deduct | Dollars | \$ |

TIME OF COMPLETION

By initialing here, the Bidder acknowledges and accepts the Time of Completion requirements as set forth in Division 01 Section "Summary."

ACKNOWLEDGEMENTS

- ☐ Check this box to acknowledge Public Bidding requirements of Document AIA A201, Article 13.
☐ Check this box to acknowledge Allowance(s) included in Base Bid as specified in Section 012100.

SUPPLEMENTAL DOCUMENTS

- ☐ Form 96 – Contractor’s Bid for Public Work (Current Revision) (Indiana State Board of Accounts Form with Questionnaire)
- ☐ Bidder’s Financial Statement
- ☐ Bid Security
- ☐ Subcontractors and Products List (Document 004333 or 004335 of this Manual)

ADDENDA

Receipt of Addenda issued to the Drawings and Project Manual is hereby acknowledged:

Addenda Nos: _____

INDIVIDUAL/SOLE PROPRIETORS COMPLETE BELOW

Day of _____ 20____

Individual

Bidder: _____

Subscribed and sworn to before me by

Day of _____ 20____

My commission expires: _____

FIRMS/PARTNERSHIPS COMPLETE BELOW

Day of _____ 20____

Name of Firm: _____

By: _____

Subscribed and sworn to before me by

Day of _____ 20____

My commission expires: _____

CORPORATIONS COMPLETE BELOW

Day of _____ 20____

Name of

Corporation: _____

President: _____

(Seal)

Secretary: _____

Subscribed and sworn to before me by _____

Day of _____ 20____

My commission expires: _____

END OF DOCUMENT 004113

DOCUMENT 004335 - SUBCONTRACTORS AND PRODUCTS (UNIFIED CONTRACT)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Bidder shall furnish one copy of Major Subcontractors List with the Bid. Failure to submit this list will give the Owner the right to reject the Bid in its entirety.
 - 1. Major Subcontractors List shall be submitted on form provided in this document and shall be completely executed. "As Specified" or "With Equipment" type of terminology will not be accepted.
 - 2. Under "Subcontractor" column, insert the name of the firm that the Bidder proposes to have perform the respective Work. If Work will be done by Bidder and no subcontract will be awarded, state "By Own Forces."
 - 3. Major Subcontractors List is intended to inform Owner of Bidder's plan to accomplish the Work.
- B. Bidder shall furnish two copies of the Complete Subcontractors and Products List to the Architect's/Engineer's Office 24 hours following the Bid opening, as required by this Document. Failure to submit this list will give the Owner the right to reject the Bid in its entirety.
 - 1. Complete Subcontractor and Products List is intended to assure use of materials and vendors acceptably equivalent to those specified and is not a substitution sheet or complete listing of all required materials or services.
 - 2. Whenever products, materials, and a list of acceptable manufacturers have been indicated in the Bid Documents, the Bidder shall name one of the listed products, materials, and acceptable manufacturers. Refer to Instructions to Bidders for provisions and requirements for substitutions.
 - 3. Architect/Engineer and Owner have the right to choose the subcontractor, material, or equipment for particular item where the Bidder either fails to list the same or lists more than one name for the item in question.
 - 4. Submission does not constitute acceptance for use of listed manufacturers and products. Materials and subcontractors are subject to provisions of General Conditions and "Standards of Product Acceptability" and shall be formally reviewed and judged acceptable by Architect/Engineer.
- C. For inclusion with Contract, General Contractor shall submit a completed list of all subcontractors and all suppliers, fully executed. This list shall be all-inclusive and shall be considered a Contract Document.
 - 1. It is intended that this complete Subcontractors and Products List shall show manufacturer or supplier of all specified items of Work that will be subcontracted and to whom.

2. Architect/Engineer and Owner reserve the right to reject submission of materials, Work, or subcontract that do not, in their opinion, meet the requirements of Drawings, Specifications or Project conditions even though such materials, Work, or subcontract were listed and described by Bidder prior to the execution of the Contract.
3. After submission of this complete Subcontractors and Products List by the Bidder and after approval by Architect/Engineer and Owner, it shall become a part of the Owner/Contractor Agreement and shall not be changed, unless written approval of said change is authorized by the Architect/ Engineer and Owner.

1.2 MAJOR SUBCONTRACTORS LIST

| Division or Specification Section | Description | Subcontractor or Supplier |
|--------------------------------------|---|---------------------------|
| Division 02 | Existing Conditions | _____ |
| Division 03 | Concrete | _____ |
| Division 04 | Masonry | _____ |
| Division 05 | Metals | _____ |
| Division 06 | Woods, Plastics, and Composites | _____ |
| Division 07 | Thermal and Moisture Protection | _____ |
| Division 08 | Openings | _____ |
| Division 09 | Finishes | _____ |
| Division 10 | Specialties | _____ |
| Division 11 | Equipment | _____ |
| Division 12 | Furnishings | _____ |
| Division 13 | Special Construction | _____ |
| Division 14 | Conveying Equipment | _____ |
| Division 21 | Fire Suppression | _____ |
| Division 22 | Plumbing | _____ |
| Division 23 | Heating, Ventilating, and Air Conditioning | _____ |

| Division or Specification Section | Description | Subcontractor or Supplier |
|--------------------------------------|-----------------------------------|---------------------------|
| Division 26 | Electrical | _____ |
| Division 27 | Communications | _____ |
| Division 28 | Electronic Safety and Security | _____ |
| Division 31 | Earthwork | _____ |
| Division 32 | Exterior Improvements | _____ |
| Division 33 | Utilities | _____ |

COMPLETE SUBCONTRACTORS AND PRODUCTS LIST - GENERAL CONSTRUCTION

***THIS LIST SHALL BE SUBMITTED TO THE ARCHITECT'S/ENGINEER'S OFFICE 24 HOURS
FOLLOWING BID OPENING.***

| Specification | Prime Subcontractor and/or Supplier | Product and/or Manufacturer |
|---|---|--------------------------------|
| 024119 - SELECTIVE DEMOLITION | _____ | _____ |
| 033000 - CAST-IN-PLACE CONCRETE | _____ | _____ |
| 042200 - CONCRETE UNIT MASONRY | _____ | _____ |
| 061053 - MISCELLANEOUS ROUGH CARPENTRY | _____ | _____ |
| 079200 - JOINT SEALANTS | _____ | _____ |
| 081113 - HOLLOW METAL DOORS AND FRAMES | _____ | _____ |
| 081416 - FLUSH WOOD DOORS | _____ | _____ |
| 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS | _____ | _____ |
| 085113 - ALUMINUM WINDOWS | _____ | _____ |
| 088000 - GLAZING | _____ | _____ |
| 089000 - LOUVERS AND VENTS | _____ | _____ |
| 092216 - NON-STRUCTURAL METAL FRAMING | _____ | _____ |
| 092900 - GYPSUM BOARD | _____ | _____ |
| 093000 - TILING | _____ | _____ |
| 095113 - ACOUSTICAL PANEL CEILINGS | _____ | _____ |
| 096513 - RESILIENT BASE AND ACCESSORIES | _____ | _____ |
| 096519 - RESILIENT TILE FLOORING | _____ | _____ |

SUBCONTRACTORS AND PRODUCTS
(UNIFIED CONTRACT)

004335 - 3

| Specification | Prime Subcontractor and/or Supplier | Product and/or Manufacturer |
|--|---|--------------------------------|
| 096723.13 - RESINOUS FLOORING - LEVEL 1 | | |
| 099123.99 - INTERIOR PAINTING | | |
| 099600.99 - HIGH PERFORMANCE COATINGS | | |
| 101100 - VISUAL DISPLAY UNITS | | |
| 122413 - ROLLER WINDOW SHADES | | |
| 123200 - MANUFACTURED WOOD CASEWORK | | |
| 220518 - ESCUTCHEONS FOR PLUMBING PIPING | | |
| 220523.12 - BALL VALVES FOR PLUMBING PIPING | | |
| 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT | | |
| 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT | | |
| 220719 - PLUMBING PIPING INSULATION | | |
| 221116 - DOMESTIC WATER PIPING (BUILDING) | | |
| 221316 - SANITARY WASTE AND VENT PIPING (BUILDING) | | |
| 221319 - SANITARY WASTE PIPING SPECIALTIES | | |
| 224100 - RESIDENTIAL PLUMBING FIXTURES | | |
| 224233 - WASH FOUNTAINS | | |
| 230500 - COMMON WORK RESULTS FOR HVAC | | |
| 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT | | |
| 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING | | |
| 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT | | |
| 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT | | |
| 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC | | |
| 230713 - DUCT INSULATION | | |
| 230719 - HVAC PIPING INSULATION | | |
| 232113 - HYDRONIC PIPING | | |
| 233113 - METAL DUCTS | | |
| 233300 - AIR DUCT ACCESSORIES | | |
| 233423 - HVAC POWER VENTILATORS | | |
| 233713.99 - DIFFUSERS, REGISTERS, AND GRILLES | | |
| SUBCONTRACTORS AND PRODUCTS (UNIFIED CONTRACT) | | 004335 - 4 |

| Specification | Prime Subcontractor and/or Supplier | Product and/or Manufacturer |
|--|---|--------------------------------|
| 233723 - HVAC GRAVITY VENTILATORS | | |
| 238223.98 - VERTICAL UNIT VENTILATORS | | |
| 260500 - COMMON WORK RESULTS FOR ELECTRICAL | | |
| 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES | | |
| 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS | | |
| 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS | | |
| 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS | | |
| 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING | | |
| 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS | | |
| 260923 - LIGHTING CONTROL DEVICES | | |
| 262416 - PANELBOARDS | | |
| 262726 - WIRING DEVICES | | |
| 262813 - FUSES | | |
| 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS | | |
| 265119 - LED INTERIOR LIGHTING | | |
| 265213 - EMERGENCY AND EXIT LIGHTING | | |
| 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS | | |
| 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING | | |
| 284621 - ADDRESSABLE FIRE-ALARM SYSTEMS | | |

Name of submitter: _____

Name of firm: _____

END OF DOCUMENT 004335

DOCUMENT 004553 - ASBESTOS AFFIDAVIT

PART 1 - GENERAL

1.1 ASBESTOS HANDLING

- A. The Scope of Work of this Project is not expected to include testing for and/or the removal of asbestos. The Contractor shall identify any locations/items which involve asbestos, indicate any interface points with asbestos-containing materials, and shall notify the Owner for testing.
- B. The Owner will obtain a certified testing agency to conduct the tests.
- C. If asbestos is present, the Owner will obtain an abatement contractor to perform abatement. The cost of this work will not be part of this Contract. However, reinsulation work required related to the tie-ins shall be a part of this Contract.
- D. All requirements of the Asbestos Hazard Emergency Response Act (AHERA) shall be met. These include the following requirements:
 - 1. Accredited persons shall be used to design and conduct response actions (i.e., removal, encapsulation, enclosure, or repair, other than small-scale, short duration asbestos projects). A list of approved courses to accredit contractors is found on page 41900 of the October 30, 1987 Federal Register.
 - 2. Successful completion of response actions shall be verified by air monitoring per Subparagraph 763.90 of the AHERA regulations.
 - 3. Transportation and disposal of ACBM shall be in accordance with Appendix D of the AHERA regulations.

1.2 ASBESTOS AFFIDAVIT

- A. As a part of the Project closeout documentation, the General Contractor, each of the subcontractors and each of the material suppliers shall provide a signed affidavit stating that no materials containing asbestos have been used or installed on this Project.

END OF DOCUMENT 004553

DOCUMENT 006000 - PROJECT FORMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Purpose of this Document is to identify some of the forms to be used in conjunction with the administration of Project.
- B. BIDDING FORMS: Following forms shall be properly completed, signed/executed, and submitted with Bid. Failure to properly complete and furnish one of forms can be cause for rejection of Bid.
 - 1. Form 96 - Contractor's Bid for Public Work (Current Revision).
 - a. IMPORTANT - FORM 96 SHALL BE ENTIRELY COMPLETED FOR BID TO BE CONSIDERED RESPONSIVE. Response to each item is required, even if response to that Item is "Not Applicable."
 - 2. Supplemental Bid Form: See Division 00 Document.
 - 3. Subcontractors and Products: See Division 00 Document.
- C. CONTRACT FORMS: Following forms shall be submitted by Contract Awardee and approved by Architect/Engineer and Construction Manager before acceptance and execution of Agreement by Owner.
 - 1. Subcontractor and Products List (shall be reviewed for approval by Architect/Engineer): See Division 00 Document, "Subcontractors and Products".
 - 2. Form of Bonds:
 - a. Performance Bond, AIA A312-2010.
 - b. Payment Bond, AIA A312-2010.
 - 3. Sample of AIA Document A101 (Current Version) for Bidder's information only.
 - a. This sample is not required to be submitted by Contract Awardee as stated above. Awardee will be provided an original document to sign.
- D. ADMINISTRATIVE FORMS
 - 1. Substitution Request (During the Bidding Phase)
 - 2. Substitution Request (During Construction)
- E. OTHER FORMS
 - 1. e-Verify Affidavit

END OF DOCUMENT 006000



CONTRACTOR'S BID FOR PUBLIC WORK - FORM 96

State Form 52414 (R2 / 2-13) / Form 96 (Revised 2013)

Prescribed by State Board of Accounts

PART I

(To be completed for all bids. Please type or print)

Date (month, day, year): _____

1. Governmental Unit (Owner): _____

2. County : _____

3. Bidder (Firm): _____

Address: _____

City/State/ZIPcode: _____

4. Telephone Number: _____

5. Agent of Bidder (if applicable): _____

Pursuant to notices given, the undersigned offers to furnish labor and/or material necessary to complete the public works project of _____

(Governmental Unit) in accordance with plans and specifications prepared by _____

_____ and dated _____ for the sum of

_____ \$ _____

The undersigned further agrees to furnish a bond or certified check with this bid for an amount specified in the notice of the letting. If alternative bids apply, the undersigned submits a proposal for each in accordance with the notice. Any addendums attached will be specifically referenced at the applicable page.

If additional units of material included in the contract are needed, the cost of units must be the same as that shown in the original contract if accepted by the governmental unit. If the bid is to be awarded on a unit basis, the itemization of the units shall be shown on a separate attachment.

The contractor and his subcontractors, if any, shall not discriminate against or intimidate any employee, or applicant for employment, to be employed in the performance of this contract, with respect to any matter directly or indirectly related to employment because of race, religion, color, sex, national origin or ancestry. Breach of this covenant may be regarded as a material breach of the contract.

CERTIFICATION OF USE OF UNITED STATES STEEL PRODUCTS

(If applicable)

I, the undersigned bidder or agent as a contractor on a public works project, understand my statutory obligation to use steel products made in the United States (I.C. 5-16-8-2). I hereby certify that I and all subcontractors employed by me for this project will use U.S. steel products on this project if awarded. I understand that violations hereunder may result in forfeiture of contractual payments.

ACCEPTANCE

The above bid is accepted this _____ day of _____, _____, subject to the following conditions: _____

Contracting Authority Members:

| | |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

PART II

(For projects of \$150,000 or more – IC 36-1-12-4)

Governmental Unit: _____

Bidder (Firm) _____

Date (month, day, year): _____

These statements to be submitted under oath by each bidder with and as a part of his bid.
Attach additional pages for each section as needed.

SECTION I EXPERIENCE QUESTIONNAIRE

1. What public works projects has your organization completed for the period of one (1) year prior to the date of the current bid?

| Contract Amount | Class of Work | Completion Date | Name and Address of Owner |
|-----------------|---------------|-----------------|---------------------------|
| | | | |
| | | | |
| | | | |
| | | | |

2. What public works projects are now in process of construction by your organization?

| Contract Amount | Class of Work | Expected Completion Date | Name and Address of Owner |
|-----------------|---------------|--------------------------|---------------------------|
| | | | |
| | | | |
| | | | |
| | | | |

3. Have you ever failed to complete any work awarded to you? _____ If so, where and why?

4. List references from private firms for which you have performed work.

SECTION II PLAN AND EQUIPMENT QUESTIONNAIRE

1. Explain your plan or layout for performing proposed work. *(Examples could include a narrative of when you could begin work, complete the project, number of workers, etc. and any other information which you believe would enable the governmental unit to consider your bid.)*

2. Please list the names and addresses of all subcontractors *(i.e. persons or firms outside your own firm who have performed part of the work)* that you have used on public works projects during the past five (5) years along with a brief description of the work done by each subcontractor.

3. If you intend to sublet any portion of the work, state the name and address of each subcontractor, equipment to be used by the subcontractor, and whether you will require a bond. However, if you are unable to currently provide a listing, please understand a listing must be provided prior to contract approval. Until the completion of the proposed project, you are under a continuing obligation to immediately notify the governmental unit in the event that you subsequently determine that you will use a subcontractor on the proposed project.

4. What equipment do you have available to use for the proposed project? Any equipment to be used by subcontractors may also be required to be listed by the governmental unit.

5. Have you entered into contracts or received offers for all materials which substantiate the prices used in preparing your proposal? If not, please explain the rationale used which would corroborate the prices listed.

SECTION III CONTRACTOR'S FINANCIAL STATEMENT

Attachment of bidder's financial statement is mandatory. Any bid submitted without said financial statement as required by statute shall thereby be rendered invalid. The financial statement provided hereunder to the governing body awarding the contract must be specific enough in detail so that said governing body can make a proper determination of the bidder's capability for completing the project if awarded.

SECTION IV CONTRACTOR'S NON – COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to include anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee, gift, commission or thing of value on account of such sale.

SECTION V OATH AND AFFIRMATION

I HEREBY AFFIRM UNDER THE PENALTIES FOR PERJURY THAT THE FACTS AND INFORMATION CONTAINED IN THE FOREGOING BID FOR PUBLIC WORKS ARE TRUE AND CORRECT.

Dated at _____ this _____ day of _____, _____

(Name of Organization)

By _____

(Title of Person Signing)

ACKNOWLEDGEMENT

STATE OF _____)
COUNTY OF _____) ss

Before me, a Notary Public, personally appeared the above-named _____ and
swore that the statements contained in the foregoing document are true and correct.

Subscribed and sworn to before me this _____ day of _____, _____.

Notary Public

My Commission Expires: _____

County of Residence: _____

BID OF

(Contractor)

(Address)

**FOR
PUBLIC WORKS PROJECTS
OF**

Filed _____, _____

Action taken _____

DRAFT AIA[®] Document A312[™] – 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

CONSTRUCTION CONTRACT

Date:

Amount: \$

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

Signature:

Name and

Title:

SURETY

Company: (Corporate Seal)

Signature:

Name and

Title:

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:**OWNER'S REPRESENTATIVE:**

(Architect, Engineer or other party:)

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

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

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



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

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the

Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, 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 furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 **Balance of the Contract Price.** The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 **Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 **Contractor Default.** Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:



(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company: _____ (Corporate Seal)

Signature: _____

Name and Title: _____

Address: _____

SURETY

Company: _____ (Corporate Seal)

Signature: _____

Name and Title: _____

Address: _____

DRAFT AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

CONSTRUCTION CONTRACT

Date:

Amount: \$

Description:

(Name and location)

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

SURETY

Company: (Corporate Seal)

Signature:

Name and

Title:

(Any additional signatures appear on the last page of this Payment Bond.)

Signature:

Name and

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:**OWNER'S REPRESENTATIVE:**

(Architect, Engineer or other party:)

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

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

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



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

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, 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 furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 **Claim.** A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 **Claimant.** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 **Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 **Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 **Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

<< >>

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company: _____
(Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

SURETY

Company: _____
(Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

DRAFT AIA® Document A101™ – 2017

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

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

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

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

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

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

Schmidt Associates
415 Massachusetts Avenue
Indianapolis, IN 46204

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:

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

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

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

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

TABLE OF ARTICLES

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

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

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

ARTICLE 2 THE WORK OF THIS CONTRACT

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

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

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

(Check one of the following boxes.)

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

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

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

§ 3.3 Substantial Completion

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

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

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

[] By the following date:

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

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

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

ARTICLE 4 CONTRACT SUM

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

§ 4.2 Alternates

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

| Item | Price |
|------|-------|
| | |

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

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

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

| Item | Price |
|------|-------|
| | |

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

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

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

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

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

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

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

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

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

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

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

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

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

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

§ 5.1.7 Retainage

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

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

«As indicated in the AIA Document A201. »

§ 5.1.7.1.1 The following items are not subject to retainage:

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

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

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

«The Owner shall retain amounts from each progress payment as indicated in the AIA Document A201. »

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

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

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

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

§ 5.2 Final Payment

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

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

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

§ 5.3 Interest

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

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

%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

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

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

§ 6.2 Binding Dispute Resolution

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

(Check the appropriate box.)

☐ Arbitration pursuant to Section 15.4 of AIA Document A201–2017

☒ Litigation in a court of competent jurisdiction

[] Other (*Specify*)

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

ARTICLE 7 TERMINATION OR SUSPENSION

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

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

ARTICLE 8 MISCELLANEOUS PROVISIONS

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

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

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

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

§ 8.5 Insurance and Bonds

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

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

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

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

§ 8.7 Other provisions:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction
- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, G201-2013 Project Digital Data Protocol Form, and G202-2013 Project BIM Protocol Form, if completed by the parties and dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

- .5 Drawings: As bound in the Drawings Set dated [insert date of Drawings].
- .6 Specifications: Divisions 01-33 as indicated in the Table of Contents of the Project Manual dated [insert date of Project Manual].
- .7 Addenda, if any:

| Number | Date | Pages |
|--------|------|-------|
| | | |

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

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

☐ Supplementary and other Conditions of the Contract:

| Document | Title | Date | Pages |
|----------|-------|------|-------|
| | | | |

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

1. Reference Division 00 Documents of the Project Manual dated [insert date of Project Manual]:
 - a. Form 96 "Contractor's Bid for Public Work"
 - b. 004113 Supplemental Bid Form
 - c. Subcontractor and Products
 - d. Performance Bond and Payment Bond (AIA A312)
 - e. e-Verify Affidavit
 - f. General Conditions of the Contract

This Agreement entered into as of the day and year first written above and is executed in at least three original copies, of which one is to be delivered to the Contractor, one to the Architect for use in the administration of the Agreement, and one to be retained by the Owner.

OWNER *(Signature)*

(Printed name and title)

CONTRACTOR *(Signature)*

(Printed name and title)

FOR
BY
DATE



AIA® Document A101™ – 2017 Exhibit A

Insurance and Bonds

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

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

THE OWNER:
(Name, legal status and address)

THE CONTRACTOR:
(Name, legal status and address)

TABLE OF ARTICLES

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

ARTICLE A.1 GENERAL

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

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

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

§ A.2.2 Liability Insurance

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

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.

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

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. This insurance shall include the interests of mortgagees as loss payees. Such property insurance shall not cover any tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring and other similar items commonly referred to as construction equipment, which may be on the site and the capital value of which is not included in the Work. The Contractor, at its own expense, shall make its own arrangement for any insurance it may require on such construction equipment, and shall require all Subcontractors to do the same.

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

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

Causes of Loss

Sub-Limit

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

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

Coverage

Sub-Limit

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

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

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

§ A.2.3.3 Insurance for Existing Structures

If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure

against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.

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

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

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

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

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

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

☐ **§ A.2.5.2 Other Insurance**
(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage

Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

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

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

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, the Architect, and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04. Coverage afforded the additional insureds shall not exclude claims asserted by the Contractor's employees. If the additional insureds have other insurance that is applicable to the loss, such other insurance will be on an excess or contingent basis and the amount of the Contractor's insurance company's liability under the insurance policy will not be reduced by the existence of such other insurance.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor and its Subcontractors (unless the Owner approves in writing different coverages for a specific Subcontractor) shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located and having an A.M. Best financial strength rating not lower than 'A.'. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

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

The duration for maintaining the required insurance is two (2) years after the Substantial Completion Date

Init.

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than one million dollars (\$ 1,000,000) each occurrence, two million dollars (\$ 2,000,000) general aggregate, and two million dollars (\$ 2,000,000) aggregate for products-completed operations hazard, providing coverage for claims including

- .1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;
- .2 personal injury and advertising injury;
- .3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property and including the X, C, and U coverages as applicable (coverage shall include and not delete the exception to the "Your Work" exclusion which applies if the damages work or the work out of which the damage arises was performed by a subcontractor);
- .4 bodily injury or property damage arising out of completed operations; and
- .5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

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

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

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than one million (\$ 1,000,000) per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

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

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than five hundred thousand (\$ 500,000) each accident, five hundred thousand (\$ 500,000) each employee, and five hundred thousand (\$ 500,000) policy limit.

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

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work (including but not limited to any design-build or design-assist services), the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than (\$ 1,000,000) per claim and (\$ 2,000,000) in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than two million dollars (\$ 2,000,000) per claim and five million dollars (\$ 5,000,000) in the aggregate.

§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than two million dollars (\$ 2,000,000) per claim and five million dollars (\$ 5,000,000) in the aggregate.

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

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

§ A.3.3 Contractor's Other Insurance Coverage

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

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

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

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

- [] **§ A.3.3.2.1** Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
- (Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)*

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

- [] **§ A.3.3.2.3 Asbestos Abatement Liability Insurance**, with policy limits of not less than (\$) per claim and (\$) in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.
- [] **§ A.3.3.2.4** Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.
- [] **§ A.3.3.2.5** Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.
- [X] **§ A.3.3.2.6 Other Insurance**
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage

Contractor shall secure, pay for and maintain whatever fire or extended coverage insurance it may deem necessary to protect itself against loss of owned or rented capital equipment and tools, including any tools owned by mechanics, and any tools, equipment, scaffoldings, staging, towers and forms owned or rented by Contractor. The requirement to secure and maintain such insurance is solely for the benefit of Contractor. Failure of Contractor to secure such insurance or to maintain adequate levels of coverage shall not obligate Owner, Architect or their agents and employees for any losses of owned or rented equipment. If Contractor secures such insurance, the insurance policy shall include a waiver of subrogation clause as follows: 'It is agreed that in no event shall this insurance company have any right of recovery against Owner or Architect.'

Limits

§ A.3.3.3 Upon the Owner's request, Contractor shall provide a copy of the insurance policy or policies required by Section A.3.2. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.3.3.4 Contractor shall obtain an endorsement to its Commercial General Liability policy waiving the carrier's rights to recover payments made pursuant to the policy from the additional insureds.

§ A.3.4 Performance Bond and Payment Bond

§ A.3.4.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder.

§ A.3.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ A.3.4.3 The Contractor shall furnish a Performance Bond and Labor and Material Payment Bond to the Owner. The Contractor shall use as a surety for the Performance Bond and Labor and Material Payment Bond one of the acceptable companies listed in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reimbursing Companies", Department Circular 570, latest revision, Department of the Treasury. The Contractor shall use a surety company that can underwrite the entire amount of the Performance Bond and Labor and Material Payment Bond. Underwriting limitations for the acceptable companies are also contained in Circular 570. Said Performance Bond and Labor and Material Payment Bond shall be in amount at least equal to 100% of the Contract Price as security for: (1) the faithful performance of all provisions of the Contract and satisfactory completion of the work included thereunder; (2) the payment of all persons performing labor and furnishing materials in connection with the Contract; (3) the covering of all guarantees and warranties included herein; and (4) In addition to 1, 2, and 3 above, this Bond shall guarantee the Owner that all workmanship and materials performed and furnished as part of this Contract are in accordance with the Contract Documents and that the Contractor shall correct all defects due to faulty workmanship or materials.

§ A.3.4.4 The Performance Bond and Labor and Material Payment Bond shall be AIA Document A312 entitled 'Performance Bond' and Payment Bond', shall be executed by an acceptable surety company licensed to do business in the State of Indiana, and must state that it is for the benefit of the Subcontractors, laborers, material suppliers and those performing services as part of the Work.

(Table deleted)

§ A.3.4.5 The Performance Bond and Labor and Material Payment Bond must specify that: (1) a modification, omission, or addition to the terms and conditions of the Contract, Drawings, or Specifications; (2) a defect in the Contract; or (3) a defect in the proceedings preliminary to the letting and awarding of the Contract; does not discharge the surety.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

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



SUBSTITUTION REQUEST

(During the Bidding/Negotiating Stage)

Project: _____ Substitution Request Number: _____

From: _____
To: _____ Date: _____

A/E Project Number: _____
Re: _____ Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone: _____
Trade Name: _____ Model No.: _____

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

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

The Undersigned certifies:

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

Submitted by: _____
Signed by: _____
Firm: _____
Address: _____

Telephone: _____

A/E's REVIEW AND ACTION

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

Signed by: _____

Date: _____

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____



SUBSTITUTION REQUEST

(After the Bidding/Negotiating Stage)

Project: _____ Substitution Request Number: _____

From: _____
To: _____ Date: _____

A/E Project Number: _____
Re: _____ Contract For: _____

Specification Title: _____ Description: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone: _____
Trade Name: _____ Model No.: _____
Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 1-4 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

☐ Point-by-point comparative data attached — REQUIRED BY A/E

Reason for not providing specified item: _____

Similar Installation:

Project: _____ Architect: _____
Address: _____ Owner: _____
_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes: explain _____

Savings to Owner for accepting substitution: _____ (\$ _____).

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SUBSTITUTION REQUEST

(After the Bidding/Negotiating Stage - Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

A/E's REVIEW AND ACTION

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

Signed by: _____

Date: _____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

E-VERIFY PROVISIONS FOR CONTRACTS

E-Verify Compliance: Pursuant to I.C. 22-5-1.7, Contractor shall enroll in and verify the work eligibility status of all newly hired employees of Contractor through the E-Verify Program (Program). Contractor is not required to verify the work eligibility status of all newly hired employees through the Program if the Program no longer exists. Also pursuant to I.C. 22-5-1.7, Contractor must execute an affidavit affirming the Contractor does not knowingly employ an unauthorized alien and confirming the Contractor's enrollment in the Program, unless the Program no longer exists, shall be filed with the _____, hereafter referred to as _____ prior to the execution of this contract. This contract shall not be deemed fully executed until such affidavit is delivered to _____.

Contractor and its subcontractors shall not knowingly employ or contract with an unauthorized alien or retain an employee or contract with a person that contractor or its subcontractors subsequently learns is an unauthorized alien. If Contractor violates this provision _____ shall require Contractor to remedy the violation not later than thirty (30) days after _____ notifies Contractor. If Contractor fails to remedy the violation within the thirty (30) day period, _____ shall terminate the contract for breach of contract. If _____ terminates the contract, Contractor shall be liable to _____ for actual damages in addition to any other contractual remedies. There is a rebuttable presumption that Contractor did not knowingly employ an unauthorized alien if Contractor verified the work eligibility status of the employee through the Program.

Prior to performing any work, Contractor shall require each subcontractor to certify to Contractor that the subcontractor does not knowingly employ or contract with an unauthorized alien and has enrolled in the Program. Contractor shall maintain on file a certification from each subcontractor throughout the duration of this contract or project which is the subject of this contract. If Contractor determines that a subcontractor is in violation of this provision, Contractor may terminate its contract with the subcontractor for such violation.

AFFIDAVIT

The undersigned being duly sworn upon his/her oath, now says that I,

_____, _____,
(Name) (Position)

do hereby state that _____ does not knowingly
(Business Entity)

employ unauthorized aliens and participates in the E-Verify Program when it hires new employees to confirm their work eligibility.

I swear or affirm, under the penalties for perjury, that the foregoing statements are true.

Signature of affiant (include title and name of business entity)

DOCUMENT 007200 - GENERAL CONDITIONS OF THE CONTRACT

PART 1 - GENERAL

1.1 SUMMARY

- A. The terms for construction shall be as stipulated in the "General Conditions of the Contract for Construction," AIA Document A201 (Current Version).
- B. References to Separate Prime Contractors within this Document shall be construed as referring to the Contractor.
- C. The supplements have been incorporated directly into the "General Conditions of the Contract for Construction," AIA Document A201 (Current Version) and shall modify, delete and/or add to the General Conditions. Where any part or portion of the General Conditions is amended or supplemented (indicated in bold and underline), the remaining or revised provisions of the General Conditions shall remain in effect. Deletions are indicated as struck-through.

END OF DOCUMENT 007200



AIA[®] Document A201[™] – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

North Central High School
910 E. County Road 975 N, Farmersburg, IN 47850

THE OWNER:

(Name, legal status and address)

Northeast School Corporation
406 North Vine Street
Hymers, IN 47855

THE ARCHITECT:

(Name, legal status and address)

Schmidt Associates
415 Massachusetts Avenue
Indianapolis, IN 46204

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

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

TABLE OF ARTICLES

| | |
|----|--|
| 1 | GENERAL PROVISIONS |
| 2 | OWNER |
| 3 | CONTRACTOR |
| 4 | ARCHITECT |
| 5 | SUBCONTRACTORS |
| 6 | CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS |
| 7 | CHANGES IN THE WORK |
| 8 | TIME |
| 9 | PAYMENTS AND COMPLETION |
| 10 | PROTECTION OF PERSONS AND PROPERTY |
| 11 | INSURANCE AND BONDS |
| 12 | UNCOVERING AND CORRECTION OF WORK |
| 13 | MISCELLANEOUS PROVISIONS |

Init.

AIA Document A201[™] – 2017. Copyright © 1911, 1915, 1918, 1925, 1937, 1951, 1958, 1961, 1963, 1966, 1970, 1976, 1987, 1997, 2007 and 2017 by The American Institute of Architects. All rights reserved. **WARNING: This AIA[®] Document is protected by U.S. Copyright Law and International Treaties. Unauthorized reproduction or distribution of this AIA[®] Document, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.** This document was produced by AIA software at 10:24:20 ET on 03/27/2020 under Order No. 2721677931 which expires on 07/31/2020, and is not for resale.

User Notes:

(2054187336)

14 **TERMINATION OR SUSPENSION OF THE CONTRACT**

15 **CLAIMS AND DISPUTES**



Init.

/

INDEX

(Topics and numbers in bold are Section headings.)

Acceptance of Nonconforming Work

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, **12.3**

Access to Work

3.16, 6.2.1, **12.1**

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5,
10.2.8, 13.3.2, 14.1, 15.1.2, 15.2

Addenda

1.1.1

Additional Costs, Claims for

3.7.4, 3.7.5, 10.3.2, 15.1.5

Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, **13.4**

Additional Time, Claims for

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**

Administration of the Contract

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

Allowances

3.8

Applications for Payment

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10

Approvals

2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9,

3.12.10.1, 4.2.7, 9.3.2, 13.4.1

Arbitration

8.3.1, 15.3.2, **15.4**

ARCHITECT

4

Architect, Definition of

4.1.1

Architect, Extent of Authority

2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 7.4, 9.2,
9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1,
13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 15.2.1

Architect, Limitations of Authority and Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3,
4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2,
9.5.4, 9.6.4, 15.1.4, 15.2

Architect's Additional Services and Expenses

2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.5, 3.1.3, 3.5, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3,
7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1,
13.4.2, 15.2

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,
3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16,
3.18, 4.1.2, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5,
9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3, 12, 13.3.2, 13.4, 15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.6.8, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

Award of Subcontracts and Other Contracts for Portions of the Work

5.2

Basic Definitions

1.1

Bidding Requirements

1.1.1

Binding Dispute Resolution

8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5,
15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1

Bonds, Lien

7.3.4.4, 9.6.8, 9.10.2, 9.10.3

Bonds, Performance, and Payment

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**

Building Information Models Use and Reliance

1.8

Building Permit

3.7.1

Capitalization

1.3

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

Certificates for Payment

4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.4

Certificates of Inspection, Testing or Approval
13.4.4

Certificates of Insurance
9.10.2

Change Orders

1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2

Change Orders, Definition of
7.2.1

CHANGES IN THE WORK

2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5

Claims, Definition of
15.1.1

Claims, Notice of
1.6.2, 15.1.3

CLAIMS AND DISPUTES

3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4
Claims and Timely Assertion of Claims
15.4.1

Claims for Additional Cost

3.2.4, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**

Claims for Additional Time

3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**

Concealed or Unknown Conditions, Claims for **3.7.4**

Claims for Damages

3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7

Claims Subject to Arbitration
15.4.1

Cleaning Up

3.15, 6.3

Commencement of the Work, Conditions Relating to
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.2, **15.1.5**

Commencement of the Work, Definition of
8.1.2

Communications

3.9.1, **4.2.4**

Completion, Conditions Relating to

3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 14.1.2, 15.1.2

COMPLETION, PAYMENTS AND **9**

Completion, Substantial

3.10.1, 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 15.1.2

Compliance with Laws

2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3

Concealed or Unknown Conditions

3.7.4, 4.2.8, 8.3.1, 10.3

Conditions of the Contract

1.1.1, 6.1.1, 6.1.4

Consent, Written

3.4.2, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 15.4.4.2

Consolidation or Joinder

15.4.4

CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

1.1.4, **6**

Construction Change Directive, Definition of
7.3.1

Construction Change Directives

1.1.1, 3.4.2, 3.11, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1

Construction Schedules, Contractor's

3.10, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2

Contingent Assignment of Subcontracts
5.4, 14.2.2.2

Continuing Contract Performance
15.1.4

Contract, Definition of

1.1.2

CONTRACT, TERMINATION OR SUSPENSION OF THE

5.4.1.1, 5.4.2, 11.5, **14**

Contract Administration

3.1.3, 4, 9.4, 9.5

Contract Award and Execution, Conditions Relating to

3.7.1, 3.10, 5.2, 6.1

Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3

Contract Documents, Definition of
1.1.1

Contract Sum

2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5**, **15.2.5**

Contract Sum, Definition of
9.1

Contract Time

1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5

Contract Time, Definition of
8.1.1

CONTRACTOR

3

Contractor, Definition of

3.1, **6.1.2**

Contractor's Construction and Submittal Schedules

3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2

Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2,
10.3, 11.3, 14.1, 14.2.1.1

Contractor's Liability Insurance

11.1

Contractor's Relationship with Separate Contractors
and Owner's Forces

3.12.5, 3.14.2, 4.2.4, 6, 11.3, 12.2.4

Contractor's Relationship with Subcontractors

1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7,
9.10.2, 11.2, 11.3, 11.4

Contractor's Relationship with the Architect

1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2,
3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.2, 5.2, 6.2.2,
7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3,
11.3, 12, 13.4, 15.1.3, 15.2.1

Contractor's Representations

3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2

Contractor's Responsibility for Those Performing the
Work

3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8

Contractor's Review of Contract Documents

3.2

Contractor's Right to Stop the Work

2.2.2, 9.7

Contractor's Right to Terminate the Contract

14.1

Contractor's Submittals

3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2,
9.8.3, 9.9.1, 9.10.2, 9.10.3

Contractor's Superintendent

3.9, 10.2.6

Contractor's Supervision and Construction
Procedures

1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3,
7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4

Coordination and Correlation

1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1

Copies Furnished of Drawings and Specifications

1.5, 2.3.6, 3.11

Copyrights

1.5, **3.17**

Correction of Work

2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3,
15.1.3.1, 15.1.3.2, 15.2.1

Correlation and Intent of the Contract Documents

1.2

Cost, Definition of

7.3.4

Costs

2.5, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3,
7.3.3.3, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2,
12.1.2, 12.2.1, 12.2.4, 13.4, 14

Cutting and Patching

3.14, 6.2.5

Damage to Construction of Owner or Separate
Contractors

3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 12.2.4

Damage to the Work

3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 12.2.4

Damages, Claims for

3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.3.2,
11.3, 14.2.4, 15.1.7

Damages for Delay

6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2

Date of Commencement of the Work, Definition of

8.1.2

Date of Substantial Completion, Definition of

8.1.3

Day, Definition of

8.1.4

Decisions of the Architect

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 6.3, 7.3.4,
7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2,
14.2.2, 14.2.4, 15.1, 15.2

Decisions to Withhold Certification

9.4.1, **9.5**, 9.7, 14.1.1.3

Defective or Nonconforming Work, Acceptance,
Rejection and Correction of

2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 9.6.6, 9.8.2, 9.9.3,
9.10.4, 12.2.1

Definitions

1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 5.1,
6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1

Delays and Extensions of Time

3.2, **3.7.4**, 5.2.3, 7.2.1, 7.3.1, **7.4**, **8.3**, 9.5.1, **9.7**,
10.3.2, **10.4**, 14.3.2, **15.1.6**, 15.2.5

Digital Data Use and Transmission

1.7

Disputes

6.3, 7.3.9, 15.1, 15.2

Documents and Samples at the Site

3.11

Drawings, Definition of

1.1.5

Drawings and Specifications, Use and Ownership of

3.11

Effective Date of Insurance

8.2.2

Emergencies

10.4, 14.1.1.2, **15.1.5**

Employees, Contractor's

3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2,
10.3.3, 11.3, 14.1, 14.2.1.1

Equipment, Labor, or Materials

1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1,
4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3,
9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2

Execution and Progress of the Work

1.1.3, 1.2.1, 1.2.2, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1,
3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1,
9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4

Extensions of Time
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.6, **15.2.5**

Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2

Faulty Work
(See Defective or Nonconforming Work)

Final Completion and Final Payment
4.2.1, 4.2.9, 9.8.2, **9.10**, 12.3, 14.2.4, 14.4.3

Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4

GENERAL PROVISIONS

1

Governing Law

13.1
Guarantees (See Warranty)

Hazardous Materials and Substances
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1

Indemnification
3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3

Information and Services Required of the Owner
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4

Initial Decision

15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5

Injury or Damage to Person or Property
10.2.8, 10.4
Inspections
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.4
Instructions to Bidders
1.1.1
Instructions to the Contractor
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.4.2

Instruments of Service, Definition of
1.1.7
Insurance
6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, **11**
Insurance, Notice of Cancellation or Expiration
11.1.4, 11.2.3

Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 14.4.2

Insurance, Owner's Liability
11.2

Insurance, Property
10.2.5, 11.2, 11.4, 11.5

Insurance, Stored Materials
9.3.2

INSURANCE AND BONDS

11
Insurance Companies, Consent to Partial Occupancy
9.9.1
Insured loss, Adjustment and Settlement of
11.5
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13

Interest
13.5

Interpretation
1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12
Judgment on Final Award
15.4.2

Labor and Materials, Equipment
1.1.3, 1.1.6, **3.4**, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
Labor Disputes
8.3.1
Laws and Regulations
1.5, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 15.1.2, 15.4.1.1
Limitations of Liability
3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6, 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3, 11.3, 12.2.5, 13.3.1
Limitations of Time
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15, 15.1.2, 15.1.3, 15.1.5

Materials, Hazardous
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2
Means, Methods, Techniques, Sequences and Procedures of Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic's Lien
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8

Mediation
8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1, 15.4.1.1

Minor Changes in the Work
1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1, **7.4**

MISCELLANEOUS PROVISIONS

13

Modifications, Definition of

1.1.1

Modifications to the Contract

1.1.1, 1.1.2, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2

Mutual Responsibility

6.2

Nonconforming Work, Acceptance of

9.6.6, 9.9.3, **12.3**

Nonconforming Work, Rejection and Correction of
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2

Notice

1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2, 2.2.3, 2.2.4, 2.5, 3.2.4, 3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4, 8.2.2, 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1, 13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5, 15.1.6, 15.4.1

Notice of Cancellation or Expiration of Insurance

11.1.4, 11.2.3

Notice of Claims

1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6, 15.2.8, 15.3.2, 15.4.1

Notice of Testing and Inspections

13.4.1, 13.4.2

Observations, Contractor's

3.2, 3.7.4

Occupancy

2.3.1, 9.6.6, 9.8

Orders, Written

1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1

OWNER

2

Owner, Definition of

2.1.1

Owner, Evidence of Financial Arrangements

2.2, 13.2.2, 14.1.1.4

Owner, Information and Services Required of the

2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4

Owner's Authority

1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7

Owner's Insurance

11.2

Owner's Relationship with Subcontractors

1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2

Owner's Right to Carry Out the Work

2.5, 14.2.2

Owner's Right to Clean Up

6.3

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

6.1

Owner's Right to Stop the Work

2.4

Owner's Right to Suspend the Work

14.3

Owner's Right to Terminate the Contract

14.2, 14.4

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

1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3

Partial Occupancy or Use

9.6.6, **9.9**

Patching, Cutting and

3.14, 6.2.5

Patents

3.17

Payment, Applications for

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3

Payment, Certificates for

4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4

Payment, Failure of

9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2

Payment, Final

4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3

Payment Bond, Performance Bond and

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

Payments, Progress

9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

PAYMENTS AND COMPLETION

9

Payments to Subcontractors

5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2

PCB

10.3.1

Performance Bond and Payment Bond

7.3.4.4, 9.6.7, 9.10.3, **11.1.2**

Permits, Fees, Notices and Compliance with Laws

2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2

PERSONS AND PROPERTY, PROTECTION OF

10

Polychlorinated Biphenyl

10.3.1

Product Data, Definition of

3.12.2

Product Data and Samples, Shop Drawings

3.11, **3.12**, 4.2.7

Progress and Completion

4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.4

Progress Payments

9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

Project, Definition of

1.1.4

Project Representatives

4.2.10

Property Insurance

10.2.5, **11.2**

Proposal Requirements

1.1.1

PROTECTION OF PERSONS AND PROPERTY **10**

Regulations and Laws

1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1,
10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4

Rejection of Work

4.2.6, 12.2.1

Releases and Waivers of Liens

9.3.1, 9.10.2

Representations

3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1

Representatives

2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1

Responsibility for Those Performing the Work

3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10

Retainage

9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3

Review of Contract Documents and Field

Conditions by Contractor

3.2, 3.12.7, 6.1.3

Review of Contractor's Submittals by Owner and
Architect

3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2

Review of Shop Drawings, Product Data and Samples
by Contractor

3.12

Rights and Remedies

1.1.2, 2.4, 2.5, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1,
6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.1, 12.2.2,
12.2.4, **13.3**, 14, 15.4

Royalties, Patents and Copyrights

3.17

Rules and Notices for Arbitration

15.4.1

Safety of Persons and Property

10.2, 10.4

Safety Precautions and Programs

3.3.1, 4.2.2, 4.2.7, 5.3, **10.1**, 10.2, 10.4

Samples, Definition of

3.12.3

Samples, Shop Drawings, Product Data and

3.11, **3.12**, 4.2.7

Samples at the Site, Documents and

3.11

Schedule of Values

9.2, 9.3.1

Schedules, Construction

3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2

Separate Contracts and Contractors

1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2

Separate Contractors, Definition of

6.1.1

Shop Drawings, Definition of

3.12.1

Shop Drawings, Product Data and Samples

3.11, **3.12**, 4.2.7

Site, Use of

3.13, 6.1.1, 6.2.1

Site Inspections

3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.9.2, 9.4.2, 9.10.1, 13.4

Site Visits, Architect's

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.4

Special Inspections and Testing

4.2.6, 12.2.1, 13.4

Specifications, Definition of

1.1.6

Specifications

1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14

Statute of Limitations

15.1.2, 15.4.1.1

Stopping the Work

2.2.2, 2.4, 9.7, 10.3, 14.1

Stored Materials

6.2.1, 9.3.2, 10.2.1.2, 10.2.4

Subcontractor, Definition of

5.1.1

SUBCONTRACTORS

5

Subcontractors, Work by

1.2.2, 3.3.2, 3.12.1, 3.18, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2,
9.6.7

Subcontractual Relations

5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1

Submittals

3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.4, 9.2, 9.3, 9.8,
9.9.1, 9.10.2, 9.10.3

Submittal Schedule

3.10.2, 3.12.5, 4.2.7

Subrogation, Waivers of

6.1.1, **11.3**

Substances, Hazardous

10.3

Substantial Completion

4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2,
15.1.2

Substantial Completion, Definition of

9.8.1

Substitution of Subcontractors

5.2.3, 5.2.4

Substitution of Architect

2.3.3

Substitutions of Materials

3.4.2, 3.5, 7.3.8

Sub-subcontractor, Definition of

5.1.2

Subsurface Conditions

3.7.4

Successors and Assigns

13.2

Superintendent

3.9, 10.2.6

Supervision and Construction Procedures

1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3,

7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4

Suppliers

1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6,
9.10.5, 14.2.1

Surety

5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2,
15.2.7

Surety, Consent of

9.8.5, 9.10.2, 9.10.3

Surveys

1.1.7, 2.3.4

Suspension by the Owner for Convenience

14.3

Suspension of the Work

3.7.5, 5.4.2, 14.3

Suspension or Termination of the Contract

5.4.1.1, 14

Taxes

3.6, 3.8.2.1, 7.3.4.4

Termination by the Contractor

14.1, 15.1.7

Termination by the Owner for Cause

5.4.1.1, **14.2**, 15.1.7

Termination by the Owner for Convenience

14.4

Termination of the Architect

2.3.3

Termination of the Contractor Employment

14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT

14

Tests and Inspections

3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3,
9.9.2, 9.10.1, 10.3.2, 12.2.1, **13.4**

TIME

8

Time, Delays and Extensions of

3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7,
10.3.2, 10.4, 14.3.2, 15.1.6, 15.2.5

Time Limits

2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2,
5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1,
9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 12.2, 13.4, 14, 15.1.2,
15.1.3, 15.4

Time Limits on Claims

3.7.4, 10.2.8, 15.1.2, 15.1.3

Title to Work

9.3.2, 9.3.3

UNCOVERING AND CORRECTION OF WORK

Uncovering of Work

12.1

Unforeseen Conditions, Concealed or Unknown

3.7.4, 8.3.1, 10.3

Unit Prices

7.3.3.2, 9.1.2

Use of Documents

1.1.1, 1.5, 2.3.6, 3.12.6, 5.3

Use of Site

3.13, 6.1.1, 6.2.1

Values, Schedule of

9.2, 9.3.1

Waiver of Claims by the Architect

13.3.2

Waiver of Claims by the Contractor

9.10.5, 13.3.2, **15.1.7**

Waiver of Claims by the Owner

9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**

Waiver of Consequential Damages

14.2.4, 15.1.7

Waiver of Liens

9.3, 9.10.2, 9.10.4

Waivers of Subrogation

6.1.1, **11.3**

Warranty

3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2,
15.1.2

Weather Delays

8.3, 15.1.6.2

Work, Definition of

1.1.3

Written Consent

1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.10.3,
13.2, 13.3.2, 15.4.4.2

Written Interpretations

4.2.11, 4.2.12

Written Orders

1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

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

§ 1.1.9 The Project Manual

The Project Manual is that portion of the Contract Documents consisting of Contract Requirements, Conditions of the Contract, general requirements for construction, and sample forms.

§ 1.1.10 Approved Equal

"Approved Equal" refers to any materials, systems or installations which, in the opinion of the Architect and Owner, are equal in quality, durability, functional performance, strength, appearance, etc., to the specified or scheduled material, systems or installation and will meet the intent and performance requirements of the Contract Documents, and are approved by the Architect prior to bidding in accordance with the Instructions to Bidders.

§ 1.1.11 Furnished By Owner

"Furnished by Owner" refers to equipment delivered FOB to Project site by the Owner. Contractor shall receive, rig, unload, store, uncrate, protect, set in place and connect equipment complete ready for operation. All labor and materials necessary for final connection shall be provided by the Contractor.

§ 1.1.12 Surety

"Surety" shall mean a person, firm or corporation that has executed, as surety, the Contractor's Performance and labor and material payment bonds securing the performance and payment of the Work within the Contract.

§ 1.1.13 Definitions and Industry Standards

§ 1.1.13.1 Definitions.

§ 1.1.13.1.1 General: Basic Contract definitions are included in the Conditions of the Contract.

§ 1.1.13.1.2 "Reviewed": When used to convey Architect's action on Contractor's submittals, applications, and requests, "reviewed" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

§ 1.1.13.1.3 "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

§ 1.1.13.1.4 "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."

§ 1.1.13.1.5 "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.

§ 1.1.13.1.6 "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

§ 1.1.13.1.7 "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.

§ 1.1.13.1.8 "Provide": Furnish and install, complete and ready for the intended use.

§ 1.1.13.1.9 "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.

§ 1.1.13.2 Standards.

§ 1.1.13.2.1 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.

§ 1.1.13.2.2 Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

§ 1.1.13.2.3 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. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results. In the case of an inconsistency between Drawings and Specifications and within either Document not clarified by Addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or

unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

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

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

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

§ 1.6 Notice

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

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

§ 1.7 Digital Data Use and Transmission

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

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol ~~Form~~, Form or similar documents, shall be at the

using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

§ 2.1.2 ~~The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.~~ Pursuant to Indiana Law, no mechanic's lien may be recorded against the Project or the Owner..

§ 2.2 Evidence of the Owner's Financial Arrangements

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

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

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

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

§ 2.3 Information and Services Required of the Owner

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

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

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

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to reasonably rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under in the Owner's control possession and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services. To the extent the Owner provides Contractor with investigations, reports or other information about the site or the Project, it is furnished solely for the convenience of Contractor and shall not relieve Contractor from its responsibility under the Contract Documents.

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

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

§ 2.5 An obligation of Owner, if any, arising out of the Contract, to save and hold harmless any person or entity shall be limited in substance by statutes designed to protect and limit the exposure and liability of Owner as an instrumentality of the State of Indiana, including without limitation, the provisions under the Indiana Torts Claim Act and its aggregate liability limits for punitive damages and for acts or omissions of others.

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.1.4 Within ten (10) days after the Contractor executes the Agreement or such shorter time as required by the bidding documents, but not later than the start of Work on the Project, the Contractor shall deliver to the Owner certified as true and accurate with no material changes as of the time of delivery: (i) a copy of Contractor's license; (ii) a copy of the Contractor's sales tax registration certificate; (iii) all required payment and performance bonds; (iv) a copy of all applicable certifications or qualifications required by the Contract Documents or applicable law or regulation; (v) a list of the Contractor's project staff; (vi) all required certificates of insurance, including a Certification of Compliance for worker's compensation insurance; and (vii) all other information required by the Contract Documents.

§ 3.1.5 The relationship between the Owner and the Contractor is that of independent contractor. The Contract Documents shall not be construed to make the Contractor the agent, servant or employee of the Owner or to create any joint venture, partnership or other association between the Owner and the Contractor other than that of independent contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents, and shall at once report to the Architect errors, inconsistencies or omissions discovered. The Contractor shall not be liable to the Owner or Architect for damage resulting from errors, inconsistencies or omissions in the Contract Documents unless the Contractor recognized such error, inconsistency or omission and knowingly failed to report it to the Architect. If Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require. shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Architect at once. The Contractor shall be responsible for all costs including compensation for the Architect resulting from or arising out of the Contractor's failure to take proper field measurements or to verify existing field conditions.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those

obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.2.5 The Contractor shall not scale dimensions from Drawings unless expressly directed to do so by the Architect.

§ 3.2.6 Where there is a conflict or inconsistency in or between the Drawings and Specifications, the Contractor shall provide the better quality of Work and the larger quantity required.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, jobsite safety, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or ~~procedures~~. procedures; provided, however, in no event shall Contractor proceed in any manner that would violate applicable laws or regulations including but not limited to OSHA and IOSHA regulations.

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

§ 3.3.2.1 E-Verify Certification. Pursuant to Indiana Code 22-5-1.7, Contractor providing services to Owner certifies that it has enrolled in and is verifying the work eligibility status of all newly hired employees through the E-Verify program for the duration of this and future contracts for services with Owner, unless and until the E-Verify program no longer exists. Contractor affirms that it does not knowingly employ or retain in its employ unauthorized aliens, which includes persons whose immigration status makes them ineligible to work for Contractor. Contractor requires all of its Subcontractors, before performing services under this Contract, in any amount, to provide to Contractor a Certification that, at the time of Certification, (a) Subcontractor does not knowingly employ or contract with unauthorized aliens, meaning persons whose immigration status makes them ineligible to work for Subcontractor, and (b) Subcontractor has enrolled in and is participating in the E-Verify program. Contractor certifies that it will keep on file these Subcontractor Certifications referenced for the duration of contract with Subcontractor to provide services under this or future contract with Owner. This provision does not apply to subcontractors who are self-employed and do not employ employees or to contractor who is not providing services to Owner.

§ 3.3.2.2 Contractor Not Suspended or Debarred: By signing this Agreement, Contractor certifies that Contractor, its principals or sub-recipients are not suspended or debarred by Federal Government, nor is known suspension or debarment procedure pending. Contractor agrees to notify the Owner in writing of suspension or debarment, or potential suspension or debarment proceeding. Failure to report suspension or debarment, or potential suspension or debarment will be sufficient cause to terminate this Agreement and report such termination to Federal authorities. Contractor representative certifies that he/she has authorization to make such certification and to bind Contractor to all representations herein.

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

§ 3.4 Labor and Materials

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

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive. By making requests for substitutions, the Contractor: (i) represents that the Contractor has personally investigated the proposed substitute product or system and determined that it is equal or superior in all respects to that specified; (ii) represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified; (iii) certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and (iv) will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

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

§ 3.4.4 In the event that any contractor, supplier, or other entity for which the Contractor is responsible asserts a verified statement, bond claim, or other payment claim against the Owner and/or the Project, the Contractor shall promptly resolve such claim and shall defend, indemnify and hold harmless the Owner and the Project from all losses, damages or costs incurred in connection therewith, except to the extent the claim arises as a result of the Owner's failure to timely make payments to the Contractor under the terms of the Contract. Should the Contractor fail to promptly resolve any such claim, the Contractor shall also be responsible for reasonable attorneys' fees and expenses incurred by the Owner, to the extent necessary to protect the Owner's interests with respect to such claim.

§ 3.5 Warranty

§ 3.5.1 ~~The~~ In addition to any warranties implied by law or any special warranties with respect to particular equipment or systems, the Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and ~~new unless the Contract Documents require or permit otherwise. new.~~ The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, ~~except for those inherent in the quality of the Work the Contract Documents require or permit.~~ ~~defects.~~ Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

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

§ 3.5.3 Where guarantees are required, Contractor shall secure warranties from subcontractors, manufacturers and/or suppliers addressed to and in favor of the Owner and deliver copies of the same to the Architect upon completion of the Work. Delivery of said guarantees shall not relieve Contractor from any obligations assumed under any other provisions of the Contract.

§ 3.6 Taxes

~~The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.~~ **§ 3.6.1** The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.6.2 The Contractor shall include in the proposal the cost of any and all federal taxes applying to the operation of performing the Contract.

§ 3.6.3 Only as permitted under Indiana law, materials supplied for permanent installation in this Project are exempt from State of Indiana sales taxes. The Owner will provide the Contractor with the Owner's tax exemption certificate number.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall (i) promptly provide notice in writing to the Owner and the Architect before conditions are disturbed and in no event later than 44 ~~days after first observance of the conditions~~ five (5) days after first observance of the conditions, and (ii) keep an accurate and detailed record which will indicate the actual cost of the work done under the alleged differing site condition and failure to keep such a record shall be a bar to any recovery by reason of such alleged differing site condition. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

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

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. The Contractor shall identify each allowance item as a separate line item on the schedule of values. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated ~~allowance amounts shall be included in the Contract Sum but~~

- ~~not in the allowances.~~ Allowance amounts shall be stated in Division 01 section "Allowances" in accordance with the type of Allowance specified; and
3. whenever costs are anticipated by the Contractor to be more than or less than allowances, no adjustment to the Contract Sum shall be adjusted accordingly made without the Owner's prior written authorization by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

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

§ 3.9 Superintendent and Other Key Personnel

§ 3.9.1 The Contractor shall employ a competent project manager, superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. The Contractor's project manager shall be the person who has responsibility for the prosecution of the Work and who has the authority to act on behalf of the Contractor in all matters for the coordination, direction and technical administration of the Work.

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

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

§ 3.9.4 The Contractor shall provide a competent and adequate staff, including but not limited to the project manager and superintendent for the timely and proper administration of the Work. If the Owner determines that the continued participation of any member of the Contractor's staff is not in the best interest of the Project, the Owner may require the Contractor to replace the unsatisfactory staff member. In addition, the Contractor shall not change key members of its staff including but not limited to its project manager and superintendent without the prior written consent of the Owner which consent shall not be unreasonably withheld, so long as such key person remains satisfactory to and employed by the Contractor.

§ 3.10 Contractor's Construction and Submittal Schedules

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

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

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect. Contractor shall diligently monitor the progress of the Work, and update the construction schedule on a prompt and periodic basis to reasonably reflect the actual progress of the Work. In no event shall the Architect's or Owner's approval of the Contractor's construction schedule be deemed to modify the Contract Time.

§ 3.10.4 Contractor shall notify Owner in writing within seven (7) days of any update to the construction schedule that reflects a delay or imminent delay to the Substantial Completion Date. Notwithstanding the foregoing, Owner and Contractor hereby acknowledge and agree that the only means of modifying the Contract Time is by a duly executed written Change Order, signed by the Owner and Contractor pursuant to the provisions of the Contract Documents.

§ 3.10.5 If the Owner determines that the Work has failed to progress or reach the level of completion required by the Contract Documents, and such failure is the fault of the Contractor or a Subcontractor, the Owner may, but is not obligated to, order the Contractor to take necessary corrective measures to expedite the progress of the Work, including, without limitation, (1) additional shifts or overtime; (2) additional manpower, equipment and facilities; and (3) similar measures (referred to collectively as "extraordinary measures"). If so ordered by the Owner, such extraordinary measures shall continue until the Work achieves the level of completion required by the Contract Documents. The Owner's right to require extraordinary measures is solely for the purposes of ensuring the Contractor's compliance with the construction schedule and shall not entitle the Contractor to an increase in the Contract Sum.

§ 3.11 Documents and Samples at the Site

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

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

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

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

§ 3.12.10.3 The Owner shall be deemed the owner of all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by or on behalf of the Contractor pursuant to Section 3.12.10 ("Contractor's Design Documents") and shall possess all common law, statutory and other reserved rights, including copyrights. Submission or distribution of Contractor's Design Documents to meet official regulatory requirements or for similar purposes in connection with the Project is not to be construed as publication in derogation of the reserved rights of the Owner. Neither Contractor, Contractor's design professional, nor any Subcontractor shall have any right or copyright in and to any Contractor's Design Documents or any part of the design of the Work which may have been created or contributed to by the Contractor, Contractor's design professional, or such Subcontractor. If Contractor, Contractor's design professional, or a Subcontractor participates in the design of any part of the Work, such participation shall conclusively be deemed to be Work for Hire, and all other work product created by or for the account of Contractor or any Subcontractor shall be the exclusive property of Owner. The Contractor shall incorporate the requirements of this Section 3.12.10 into its contracts with its design professional and Subcontractors where applicable.

§ 3.13 Use of Site

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

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

§ 3.13.2 Only materials and equipment that are to be used directly in the Work and in the immediate future shall be brought to and stored on the Project site by the Contractor. Equipment no longer required for the Work shall be promptly removed from the Project. Contractor shall be solely responsible for the protection of materials, tools, and equipment stored at the Project site from weather, theft, damage, and all other adversity.

§ 3.13.3 The Contractor shall keep the Project site, all roads, sidewalks, parking areas, and thoroughfares on and adjacent to the Project free from obstructions which might present a hazard, nuisance, or interference with vehicular or pedestrian traffic. When construction operations necessitate the closing of traffic lanes or sidewalks, the Contractor shall be responsible for arranging such closing in advance with the authorities having jurisdiction, the Owner and any adjacent property owners. The Contractor shall provide adequate barricades, signs, flagmen, traffic control personnel, and other devices for traffic guides and public safety. The Work shall be performed to the fullest extent reasonably possible in such a manner that areas adjacent to the site of the Work shall be free from all debris, building materials, and equipment likely to cause hazardous conditions.

§ 3.13.4 The Contractor shall not permit any of its or its Subcontractors' employees to use any existing facilities at the Project site, including without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner or the Owner's authorized representative. Without limitation by any other provision of the Contract Documents, the Contractor shall comply with any and all rules and regulations promulgated by the Owner in connection with the use and occupancy of the Project site, as may be amended from time to time.

§ 3.13.5 The Contractor recognizes that the school buildings shall remain in operation during performance of the Work. Accordingly, the Contractor shall cooperate with the Owner in scheduling and performing the Work to avoid unnecessary or unreasonable conflict, delay in or interference with the classes being held at the school buildings and the Owner's other ongoing operations at or adjacent to the Project. It is critical that such classroom instruction and Owner's other operations not suffer any significant interference, including, without limitation, any interruption in utilities or unreasonable noise, dust, odor, vibration or hazardous condition. The Contractor shall perform the Work and limit its use of the Project site in such manner as to minimize any interference with Owner's classroom instructions, occupancy and operations in the school buildings consistent with the Contract Documents and applicable building rules and regulations. Without limiting the generality of the foregoing, at no additional cost to Owner, the Contractor shall provide and apply continuous internal and external dust control, as required, to prevent the spread of dust and to avoid the creation of a nuisance at the Project site or in the surrounding areas as a result of construction activities. All ingress/egress from the Project site shall be maintained in a dry condition, and any mud tracked onto areas of the Project or any building or property of third persons shall be immediately removed and the affected area cleaned. The Contractor, the Owner and its representatives, and the Architect shall regularly meet and communicate in order to coordinate the performance of the Work activity with the Owner's classroom instruction and other ongoing operations at the Project. The Owner shall have the right in writing to direct a postponement or rescheduling of any date or time for the performance of any part of the Work that may interfere with the ongoing operation of the Owner's premises. The Contractor shall, upon the Owner's written request, reschedule any portion of the Work affecting operation of the premises to hours when the premises are not in operation or as may be requested by the Owner. The Contractor may seek an extension of time as permitted by the Contract Documents for any such postponement or rescheduling of any performance of the Work and an equitable adjustment in the Contract Sum but only if (1) the performance of the Work was properly scheduled and coordinated by the Contractor in compliance with the requirements of the Contract Documents, (2) such rescheduling or postponement is required for the sole convenience of the Owner, and (3) the Contractor complies with the claim and notice requirements of Article 15.

§ 3.13.6 The Contractor shall be responsible for the Project remaining secure at all times. All of the workers of Contractor and its subcontractors, whatever tier, at the Project site shall be clearly identified by company badges, t-shirts or other acceptable identification.

§ 3.14 Cutting and Patching

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

occasioned by existing Work removal or by ill-timed and damaged new Work) shall mean the restoration of a surface or item to its original condition to match the existing unless otherwise indicated, noted, detailed, or specified. Cutting and patching shall be done by the proper trades or crafts necessary for the material involved, but the cost of the same shall be borne by the Contractor requiring the cutting and patching. When patching involves painting, special coating, vinyl fabric or other applied finish, the entire surface affected (i.e., wall or ceiling) shall be refinished as a part of this requirement unless complete refinishing of the entire space is scheduled or specified elsewhere.

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

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

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

§ 3.18.3 The duties and obligations of Section 3.18 shall survive completion or termination of the Contract.

ARTICLE 4 ARCHITECT

§ 4.1 General

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

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

§ 4.2 Administration of the Contract

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

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

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

§ 4.2.4 Communications

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

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

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

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

or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

Not Used.

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

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

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

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

§ 4.2.15 Contractor shall be responsible for and shall promptly reimburse the Owner for any and all additional Architect costs incurred by the Owner that are caused in whole or in part by the Contractor including but not limited to the following: (1) the Architect having to review the Contractor's submittal out of sequence from the initial Project submittal schedule agreed to by the Architect; (2) the Architect responding to the Contractor's request for information that are not prepared in accordance with the Contract Documents or where such information is readily available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings or prior Project correspondence or documentation; (3) the Architect providing construction phase services 60 days after substantial completion of the Work or the Substantial Completion Date, whichever date is earlier; (4) the Architect providing more than two reviews of each shop drawing, product data item, sample or other similar submittal of the Contractor; (5) the Architect providing more than two inspections of any portion of the Work to determine whether the Work is substantially complete; and (6) the Architect providing more than two inspections of any portion of the Work to determine final completion of the Work. The invoices submitted by the Architect for such additional services, when approved by the Owner, shall be used as the basis for adjusting the Contract Sum by a deductive Change Order.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number

and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

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

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

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

§ 5.4.4 Unless and until an assignment of the Subcontract to the Owner is effective as provided in this Section, nothing contained herein shall create any obligation on the part of the Owner to make any payments to any Subcontractor, and no payment by the Owner to any Subcontractor shall create any obligation to make any further payments to any Subcontractor.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 Mutual Responsibility

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

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

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.2.2 A fully executed Change Order or a Construction Change Directive signed by the Contractor shall constitute a final settlement of all known matters relating to or arising out of the change in the Work that is subject of the Change Order or Construction Change Directive, including but in no way limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and Contract Time.

§ 7.2.3 A No course of conduct or dealing between the parties and no expressed or implied acceptance of alterations or additions to the Work shall be the basis of any claim for an increase in the Contract Sum or for a change in the Contract Time in the absence of a Change Order or Construction Change Directive.

§ 7.3 Construction Change Directives

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

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

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit ~~evaluation; evaluation as stipulated in 7.3.12;~~
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;

- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount, accordance with 7.3.11. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

- .1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
- .2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
- .5 Costs of supervision and field office personnel directly attributable to the change, for the Contractor's Project Managers and Superintendents assigned to the Project, including any costs associated with the evaluation and administration of the change, are part of the overhead allowance enumerated in 7.3.11.

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

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

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

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

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

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

§ 7.3.11 The allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:

- .1 for the Contractor, for Work performed by the Contractor's own forces, 5 percent of the cost.

- .2 for the Contractor, for Work performed by the Contractor's subcontractor, 5 percent of the amount due the subcontractor.
- .3 for each subcontractor or sub-subcontractor involved, for Work performed by that subcontractor's or sub-subcontractor's own forces, 5 percent of the cost.
- .4 for each subcontractor, for Work performed by the subcontractors, 5 percent of the amount due the sub-subcontractor.
- .5 cost to which overhead and profit is to be applied shall be determined in accordance with subparagraph 7.3.7.

§ 7.3.12 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and subcontracts. Labor and materials shall be itemized in the manner prescribed in 7.3.4 and 7.3.11. Where major cost items are subcontracts, they shall be itemized also. In no case will a change involving more than \$1,000.00 be approved without such itemization.

§ 7.4 Minor Changes in the Work

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

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

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

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

§ 8.2.4 Completion shall be understood to be Substantial Completion for the Owner's beneficial occupancy, with only minor "punch list" items yet to be completed and items such as balancing of heating system, exterior paving or landscaping etc., which cannot be completed due to climatic conditions.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by ~~labor disputes~~, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's ~~control~~ ~~control~~ and which are not due to any fault, neglect, act or omission on the part of the Contractor or its Subcontractors or suppliers; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor

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

§ 8.3.1.1 The Contractor shall not be allowed to claim weather delay days for the number of days which the U.S. Weather Bureau reports as the average number of days per month of inclement weather for the nearest reporting station to Terre Haute, IN (latest available information.) The Contractor shall take this number of days and the Project Schedule into account when preparing its bid proposal. Historical data for all areas may be obtained from:

U.S. Department of Commerce
National Climatic Center
Federal Building
Asheville, NC 28801
Phone (704) 259-0682
<http://www.ncdc.noaa.gov/>

§ 8.3.1.2 Inclement weather shall be defined as rain, snow, sleet, hail or other forms of precipitation that prohibit/halt/or otherwise inhibit the ability of the Contractor to make meaningful progress. If the Work has progressed to the point that inclement weather does not affect the progress of the Contractor, no delay can be claimed. No delay is allowed for the effect of inclement weather. The Contractor shall make provisions to overcome the effect of inclement weather (i.e. mud, snow, etc.).

§ 8.3.1.3 The Contractor shall include in its bid a sufficient amount of money to cover the required manpower, equipment, protection, etc. to complete its Work in accordance with the Project Guideline Schedule, accounting for inclement weather. It is the Contractor's obligation to provide a copy of the "National Climatic Center" report with any weather delay filed. This includes the current information as well as the monthly averages available at the time of bidding.

§ 8.3.1.4 Neither the Contractor nor any subcontractor shall be due any additional compensation for an extension of time granted the Contractor, or granted to another Prime Contractor for a weather delay extension. The Contractor may receive additional days only.

~~§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15. Unless the Contractor shall, within seven (7) days from the commencement of any possible excusable delay or within seven (7) days from the time delay, notify the Owner and the Architect in writing of all facts then available to the Contractor relative to the nature and extent of the delay, and its anticipated effect, if any upon the time for Substantial Completion of the Work as hereinbefore described, and shall also request that a determination be made as to whether or not the delay is an excusable delay so as to extend the number of calendar days for completion of the Work, the act or occurrence in question shall not thereafter be an excusable delay for any purpose except upon the written consent of the Architect.~~

~~§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents. The Architect will promptly acknowledge the Contractor's request for extension of time, but the Architect need not make a determination concerning the same until the nature and extent of the delay and its related impact upon the Contract time for completion are determined.~~

§ 8.3.4 The Contractor shall furnish sufficient labor forces, materials, equipment, enclosures, and anything else reasonably required for the Work and protection thereof and shall work such hours including additional shifts, overtime, and weekends as may be necessary to insure the prosecution of the Work in order to meet the Substantial Completion Date and in accordance with the current approved construction schedule. Should the Contractor fall behind the current approved construction schedule or is in jeopardy of missing the Substantial Completion Date to the extent due to Contractor's fault, the Contractor shall take all such steps as may be reasonably necessary to improve his progress in order to meet the Substantial Completion Date and current approved construction schedule including but not limited to increasing the number of laborers, shifts, working overtime, and/or working weekends, all without an increase in the Contract Sum.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

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

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents. Applications for Payment shall be submitted to the Architect each month on original AIA Forms G702 and G703. The final application shall also be accompanied by the Approval of Surety. Copies of the standard forms are on file and may be examined at the office of the Owner. Copies of all required permits shall accompany the first application for payment. All applications shall be notarized and signed ("wet signatures").

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

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

§ 9.3.1.3 Until the Work is 50% complete, the Owner will retain 10% of the amount due the Contractor on account of progress payments. At the time the Work is 50% completed and, at the request of the Contractor, the Architect (with consent of Surety) may recommend the reduction of retainage on any remaining partial payments to 0% provided that the manner of completion of the Work and its timely progress are satisfactory to the Architect and the Owner.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site. Payments for materials or equipment stored off the site shall not be approved.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to

the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work. Partial payments will be made by the Owner only with the following notarized certification attached: the Contractor will hereby certify that all items are paid for which previous certificates were issued and payment received and further waives all rights of lien for the total amount previously paid, and further represents that no person or party has any right to a lien on account of Work performed or material furnished.

§ 9.3.4 At the discretion of the Contractor, funds retained by the Owner, as specified in the Agreement, shall be held by the Owner or placed in an escrow account with a bank, savings and loan institution or the State of Indiana, as the escrow agent. The escrow agent shall be selected by mutual agreement between the Owner and the Contractor under a written agreement. The Owner shall not be required to pay interest on the amount of retainage. The escrow agreement must contain the following provisions: (a) the escrow agent shall invest all escrowed principal in obligations selected by the escrow agent; (b) the escrow agent shall hold the escrowed principal and income until receipt of notice from the Owner and the Contractor, specifying the part of the escrowed principal to be released from the escrow and the person to whom that portion is to be released; (c) after receipt of the notice, the escrow agent shall remit the designated part of escrowed principal and the same proportion of then escrowed income to the person specified in the notice; (d) the escrow agent shall be compensated for the agent's services; and (e) the Owner and Contractor may agree on a reasonable fee comparable with fees being charged for the handling of escrow accounts of similar size and duration and the fee shall be paid from the escrowed income.

§ 9.4 Certificates for Payment

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

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

§ 9.5 Decisions to Withhold Certification

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

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;

- .3 failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a Separate Contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.
- .8 failure to submit the Construction Schedule in accordance with Division 01 Section "Construction Progress Documentation" of this Manual or failure to submit periodic schedule reports prior to each application for payment.

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

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld. The Owner shall not be deemed to be in default of the Contract by reason of withholding payment while any of the grounds set forth in Section 9.5.1 remain uncured.

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

§ 9.6 Progress Payments

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

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

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

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

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

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

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

§ 9.6.9 As required by Ind. Code § 36-1-12-20(c), the cost for trench safety systems, if any, shall be paid for as a separate pay item or in the pay of the principal work with which safety systems are associated.

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

§ 9.8.1.1 Project Closeout includes those activities leading to Substantial Completion and Final Completion of the Work. Project Closeout activities and requirements are specified in Division 01 Section "Closeout Procedures" of this Manual. To administer and conduct Project Closeout, the Contractor shall indicate a designated value as specified in Division 01 Section "Payment Procedures," of this Manual.

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

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

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

§ 9.8.4.1 If, upon the Architect's completion of the initial inspection and the second inspection, as described in paragraph 9.8.3, there remains incomplete or unsatisfactory Work, the Contractor will be back-charged for time to satisfactorily complete the Work accrued by the Owner and Architect, including the Architect's consultants. Charges will be at each of the party's current prevailing rate and commence following the second inspection. The back charges will be deducted from the Project Closeout cost indicated on the Contractor's Schedule of Values.

§ 9.8.4.2 The Certificate of Substantial Completion shall establish a thirty (30) day period after the date of substantial completion within which the Contractor will have to complete all items on the accompanying punch list to the

Certificate of Substantial Completion. If Contractor does not complete the punch list within the time period specified herein, then Contractor shall reimburse Owner for all architectural, consultant, attorneys' and all other fees that Owner incurs as a result of Contractor's delay.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents. Owner shall, however, have the right to continue to withhold two hundred percent (200%) of the value of defective or uncompleted items ("Punch List Items"). The Contractor shall complete the Punch List Items within thirty days of Substantial Completion of the Work, unless otherwise specifically agreed to by the Owner in writing. The amounts so retained shall be paid on a monthly pro rata basis as the Punch List Items are satisfactorily corrected and/or completed. Owner shall also have the right to withhold payment in the event Contractor has not fully paid its Subcontractors, material suppliers, laborers or others furnishing services.

§ 9.9 Partial Occupancy or Use

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

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

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents. ~~Documents nor shall the Owner waive any rights under the Contract by such partial occupancy or use.~~

§ 9.10 Final Completion and Final Payment

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

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

satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees. Final payment is further subject to the provisions of Ind. Code § 36-1-12-14(f) regarding final payment, payment by the escrow agent, and withholding for uncompleted minor items.

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

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

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents;
- .4 latent defects; or
- .4—.5 audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.
- .4 Any such property, including areas used for temporary field offices, storage sheds and material storage and assembly, shall be restored to its original condition, unless otherwise specified, without cost to the Owner.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss. In the event of conflict between these Construction Documents and requirements of any Local, State or governing Federal Authority or laws, the most stringent requirement shall govern the Work.

§ 10.2.2.1 The Contractor represents that it is knowledgeable of the Occupational Safety And Health Act (OSHA) and promulgated regulations applicable to the performance of Work. The Contractor acknowledges and accepts affirmative duty of enforcing these regulations, and the Contractor shall promptly advise the Owner of investigations by the Federal safety and health inspectors at the Contractor's, subcontractor's or the sub-subcontractor's Work places or at the project site. The Contractor shall advise the Owner of the outcome(s) of all such investigations and/or inspections. The Contractor assumes full and exclusive responsibility and agrees to indemnify and hold the Owner

harmless against any and all consequences arising from the Contractor's violation of regulations governing the Work of this Project, including payment of any fines, penalties and/or interest assessed in connection therewith, court costs and all attorney fees that are incurred by the Owner related thereto.

§ 10.2.2.2 The provisions of Ind. Code § 36-1-12-20 and IOSHA regulations 29 CFR 1926, Subpart P, pertaining to trench safety systems are incorporated herein by this reference.

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

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

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

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

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

§ 10.2.8 Injury or Damage to Person or Property

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

§ 10.2.9 The Contractor acknowledges that the safety of the Owner's students, staff and visitors is of the utmost importance. The Contractor shall take no action which would jeopardize the safety of the Owner's students, staff, or visitors. The Contractor shall take all necessary and appropriate steps to preclude access to the construction site by the Owner's students, staff and visitors. Contractor shall be responsible for all safety precautions and requirements related to or arising out of its Work. Any fines generated as a result of Contractor's non-compliance with a local, state, or federal safety regulation shall be the responsibility of Contractor. Any fine issued to the Owner as a result of Contractor's (including its Subcontractors, equipment lessors, suppliers, Sub-subcontractors, and any other person or entity directly or indirectly acting for the Contractor) non-compliance shall be the responsibility of the Contractor and not the Owner.

§ 10.3 Hazardous Materials and Substances

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

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

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

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

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds

from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

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

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

§ 11.1.5 Refer to AIA Document A101™–2017, Exhibit A, Insurance and Bonds.

§ 11.1.6 Notwithstanding anything to the contrary in the Contract, no agreement or provision contained herein to procure or provide insurance shall be deemed or construed to constitute a waiver of liability, an agreement to exculpate a party from the consequences of its own negligence, or limit the Owner's recourse to the proceeds of such insurance.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner does not insure any equipment, scaffolding, towers, staging, forms or tools owned or rented by the Contractor; or any tools owned by mechanics, outbuilding, shops, or housing facilities.

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

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

§ 11.2.4 Refer to AIA Document A101™–2017, Exhibit A, Insurance and Bonds.

§ 11.3 Waivers of Subrogation

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

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

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

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

§ 11.5 Adjustment and Settlement of Insured Loss

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

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

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the

Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense. When a change in the Work is contemplated which may affect the Contract sum or duration of the Work, the Architect may issue a Proposal Request, AIA Form G709, the Contractor shall promptly, but in no case longer than ten (10) working days, issue a reply or change quotation, stipulating the change in cost and/or duration as a result of the proposed change. The issuance of a Proposal Request does not, in any way, authorize commencement of the Work therein described. Should, after review and consultation with the Owner, the Architect finds the Change Quotation by the Contractor to be acceptable, the Architect will issue a written Change Order to the Contractor within 30 days of receipt of the Change Quotation.

§ 12.2.2 After Substantial Completion

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

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

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

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

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

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

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

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

§ 13.1.1 Contractor and all Subcontractors are responsible to comply with Indiana Code as it pertains to public works projects. The following are notable requirements set forth in IC 5-16-13, in effect as of July 1, 2015, but are not inclusive of all requirements.

- .1 Contractor shall self-perform Work of at least 15 percent of total Contract price.
- .2 Contractor and all Subcontractors, regardless of tier, shall maintain General Liability Insurance of at least \$1,000,000 per occurrence and \$2,000,000 in aggregate.
- .3 Contractor and all Subcontractors, regardless of tier, shall not pay cash to its employees for Work performed on this public works Project.
- .4 Contractor and all Subcontractors, regardless of tier, shall comply with federal Fair Labor Standards Act of 1938.
- .5 Contractor and all Subcontractors, regardless of tier, shall be in compliance with workers compensation requirements of Indiana Code 22-3-5-1 and Indiana Code 22-3-7-34 and commits worker's compensation fraud if such Contractor or Subcontractor falsely classifies an employee as an independent contractor, sole proprietor, owner, partner, officer, or member of a limited liability company.
- .6 Contractor and all Subcontractor, regardless of tier, shall be in compliance with unemployment compensation system requirements of Indiana Code 22-4-1 through 22-4-39-5.
- .7 Contractor and all Subcontractors, regardless of tier, shall be in compliance with requirements for drug testing of its employees set forth in Indiana Code 4-13-18-1 through 4-13-18-7.

§ 13.1.2 Following provisions shall be in effect for Contracts awarded after December 31, 2016.

- .1 Contractor and all Subcontractors, regardless of tier, that are performing the constructing, altering, demolishing, or renovating of a public building or other structure must be qualified by the Indiana Department of Administration, and those contractors and subcontractors that are constructing, altering, or repairing highways, streets, or alleys must be qualified by INDOT.
 - .1 Suppliers of material are not required to be qualified by IDOA prior to doing work on public works projects. A "Supplier" is defined as "any person supplying materials, but no on site labor, to a Contractor or Subcontractor. IC 4-13.6-1-20.
 - .2 Contractors and Subcontractors, regardless of tier, performing work for local governmental entities awarded under Ind. Code 36-1-12 and whose contracts are less than \$300,000 are not required to have been qualified by IDOA or INDOT.
- .2 For public works by local governmental entities under Ind. Code 36-1-12, Contractor and its Subcontractors shall comply with requirements for drug testing of its employees set forth in Ind. Code 4-13-18 if estimated cost of public works Contract is at least \$150,000.
- .3 Contractor and all Subcontractors, regardless of tier, shall preserve its payroll and related records for three (3) years after completion of the project work and such records shall be open to inspection by the Indiana Department of Workforce Development.
- .4 If Contractor or Subcontractor, regardless of tier, employs 10 or more employees, then such Contractor/Subcontractor shall provide access to a training program applicable to tasks to be performed in normal course of employee's employment. Contractor or Subcontractor may comply with this training requirement through one of following: (i) an apprenticeship program; (ii) a program offered by Ivy Tech Community College of Indiana or Vincennes University; (iii) a program established by or for Contractor Subcontractor; (iv) a program offered by an entity sponsored by U. S. Department of Labor, Bureau of Apprenticeship and Training; (v) a program that results in award of an industry recognized portable certification; (vi) a program approved by Federal Highway Administration; or (vii) a program approved by INDOT.
- .5 If Contractor or first tier Subcontractor employs more than 50 journeymen, such Contractor/first tier Subcontractor shall participate in an apprenticeship or training program that meets standards established by or has been approved by any of following: U.S. Department of Labor, Bureau of Apprenticeship and Training; Indiana Department of Labor; Federal Highway Administration; or INDOT.

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

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

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

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

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

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

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

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

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to prosecute the Work promptly and diligently or to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; ~~or~~
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents; Documents;
- .5 shall institute proceedings or consents to proceedings requesting relief or arrangement under the Federal Bankruptcy Act or any similar or applicable federal or state law, or if a petition under any federal or state bankruptcy or insolvency law is filed against Contractor and such petition is not dismissed within 60 days from the date of filing;
- .6 admits in writing its inability to pay its debts generally as they become due;
- .7 makes a general assignment for the benefit of its creditors, or if a receiver, liquidator, trustee, or assignee is appointed on account of the Contractor's bankruptcy or insolvency, or if a receiver of all or any portion of the Contractor's properties is appointed; or
- .8 abandons the Work.

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

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and

- 3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

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

§ 14.5 Termination By the Owner for Contractor Employment of Known Unauthorized Aliens

§ 14.5.1 If the Contractor violates the provisions of Section 13.9.5, the Contractor shall remedy the violation not later than thirty (30) days after the date the Owner notifies the Contractor of the violation. If the Contractor fails to remedy the violation within such thirty (30) day period, the Owner shall terminate the Contract unless the Owner, in its sole and absolute discretion, determines that terminating the Contract would be detrimental to the public interest or to public property, in which event the Owner may elect to allow the Contract to remain in effect until the Owner procures a new contractor to perform the Work; provided, however, if the Owner so elects to allow the Contract to remain in effect for any amount of time, the Owner retains the right to immediately terminate the Contract thereafter even if a new contractor is not yet procured.

§ 14.5.2 If the Contract is terminated by the Owner pursuant to Section 14.5.1, the Contractor shall be liable to the Owner for actual damages.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

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

§ 15.1.2 Time Limits on Claims

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

§ 15.1.3 Notice of Claims

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

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

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. Documents for amounts not in dispute.

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

§ 15.1.5 Claims for Additional Cost

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

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

~~§ 15.1.7 Waiver of Claims for Consequential Damages~~

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

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

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

§ 15.2 Initial Decision

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

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

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

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

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

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

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

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

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

§ 15.3 Mediation

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

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings in accordance with the Indiana Rules for Alternate Dispute Resolution. The parties in good faith shall attempt to agree upon a mediator. If the parties cannot so agree within 10 business days of the notice, the parties shall jointly petition the Circuit Court of Sullivan County to provide a list of five mediators from which the parties shall alternately strike those not wanted. The parties shall strike within five business days of receipt of the list of mediators with the party that requested mediation striking first. The individual remaining at the conclusion of the striking process shall serve as the mediator.

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

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

§ 15.4 Arbitration

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

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

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

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

§ 15.4.4 Consolidation or Joinder

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

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

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

ARTICLE 16 MISCELLANEOUS PROVISIONS

§ 16.1 If any part of the Contract Documents are later found to be contrary to, prohibited by or invalid under applicable law, rules or regulations, that provision shall not apply and shall be omitted to the extent so contrary, prohibited or invalid, but the remainder of the Contract Documents shall not be invalidated and shall be given full force and effect insofar as possible.

§ 16.2 Notwithstanding anything herein to the contrary, pursuant to Ind. Code 36-1-12-15 and Ind. Code 5-16-6-1, the Contractor agrees:

1. That in the hiring of employees for the performance of Work under this Contract or any subcontract hereunder, neither the Contractor nor its Subcontractors, nor any person acting on behalf of the Contractor or its Subcontractors, shall, by reason of race, religion, color, sex, national origin, ancestry or disability, discriminate against any person who is qualified and available to perform the work to which the employment relates; and
2. that neither the Contractor nor its Subcontractors, nor any person acting on behalf of the Contractor or its Subcontractors, shall discriminate against or intimidate any employee hired for the performance of Work under this Contract on account of race, religion, color, sex, national origin, ancestry or disability; and
3. that there may be deducted from the amount payable to the Contractor by the Owner, under this Contract, a penalty of five dollars (\$5.00) for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of this Contract; and
4. that this Contract may be canceled or terminated by the Owner and all money due or to become due hereunder may be forfeited, for a second or any subsequent violation of this contract provision.

§ 16.3 In accordance with Ind. Code § 36-1-12-20, IOSHA regulations 29 C.F.R. 1926, Subpart P, for trench safety systems shall be incorporated into this Agreement and the cost for any trench safety systems shall be paid for (1) as a separate pay item; or (2) in the pay item of the principal work with which the safety systems are associated.

§ 16.4 Contractor shall, to the extent applicable, comply with the Owner's criminal history background and child protection index check policy(ies) and comply with applicable laws regarding such criminal history background and child protection index check policies.

§ 16.5 STEEL PRODUCTS

§ 16.5.1 In accordance with Indiana Code § 5-16-8, if any steel products are to be used or supplied in the performance of Contractor's Work, only steel products as defined in Section 16.5.2 shall be used or supplied in the performance of this Agreement or any of the subcontracts unless the head of the public agency determines, in writing, that the cost of steel products is deemed to be unreasonable.

§ 16.5.2 As defined in Indiana Code § 5-16-8-1, "Steel products" means products rolled, formed, shaped, drawn, extruded, forged, cast, fabricated, or otherwise similarly process, or processed by a combination of two (2) or more of such operations, from steel made in the United States by the open hearth, basic oxygen, electric furnace, Bessemer or other steel making process.

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. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Access to Site.
 - 4. Coordination with occupants.
 - 5. Work restrictions.
 - 6. Specification and Drawing conventions.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 DEFINITIONS

- A. Architect also means Engineer, as applicable to the Project.

1.4 PROJECT INFORMATION

- A. Project Identification: Industrial Tech Lab Renovation - 2016-100.ITR
 - 1. Project Location: 910 E Co Road 975 N., Farmersburg, IN 47850
- B. Owner: Northeast School Corporation
 - 1. Owner's Representative: Mark Baker, 406 N. Vine Street, Hymera, IN 47855
- C. Architect: Schmidt Associates, Inc., 415 Massachusetts Avenue, Indianapolis, Indiana 46204-1640, 317-263-6226, 317-263-6224 (fax) www.schmidt-arch.com
 - a. Project Manager: Lisa Gomperts
 - b. Project Architect: Ryan Benson

c. Construction Administrator: Steve Spangler

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

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

1.5 WORK COVERED BY CONTRACT DOCUMENTS

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

1. Selective Demolition
2. Masonry and metal wall construction
3. Exterior window replacement
4. Acoustical Ceilings
5. Finishes
6. Casework and Visual Displays
7. New Sinks
8. New Unit Ventilators and ductwork
9. LED Lighting, New Electrical Distribution, Fire Alarm Upgrades
10. AV systems

B. NType of Contract:

1. Project will be constructed under a single Contract.

1.6 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform Work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to Industrial Technology Classrooms.
2. 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 for 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. 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. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.7 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy Site and existing building(s) 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.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - 3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.8 TIME OF COMPLETION

- A. Construction may start May 1 in the old Auto Shop area and May 22 for the remainder of the spaces.
- B. Substantial Completion shall be accomplished by July 31, 2020.

1.9 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 5 p.m., Monday through Friday, unless otherwise indicated.
 - 1. Weekend Hours: As coordinated with Owner.
 - 2. Early Morning Hours: As coordinated with Owner.
 - 3. Hours for Utility Shutdowns: As coordinated with Owner.
 - 4. Hours for Noisy Activity: As coordinated with Owner.
- C. 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.
- D. 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.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Restricted Substances: Use of tobacco products, including electronic vaping, and other controlled substances within the existing building or on Project site is not permitted.
 - 1. No alcohol or alcohol consumption, no non-prescription drugs or non-prescription drug consumption, and no weapons are permitted on Owner's property. Violation of these requirements shall be grounds for individual Contractor or subcontractor employee removal from Project site by Owner or Architect.
- F. Contractor/Student Interaction: Interaction (verbal and physical) between Contractor, subcontractor, and their employees with students or school system employees is not permitted. All communications shall be made through Owner or Architect. Violation of this requirement shall be grounds for individual Contractor or subcontractor employee dismissal from Project site by Owner or Architect. It is expected that Contractor, subcontractors, and their employees shall conduct themselves in a professional manner as determined by Architect at all times.
- G. Dress Code: Contractor, subcontractor, and their employees shall adhere to an appropriate dress code as determined by Architect. No bare torsos or clothing with foul language, liquor or drug messages will be permitted on Site. Shirts with minimum 3 inches length sleeves shall

be required.

- H. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.
- I. Background Checks: Contractor, including its subcontractors, shall comply with Indiana Code and submit to Owner a limited criminal history (cross-referenced with sexual offender registry) for all employees of Contractor and subcontractors who will work at Project and a document verifying a disposition (as defined in Indiana Code Section 10-13-3-7) that does not appear on limited criminal history. Copy of applicable statutory provisions is attached hereto as Exhibit 1 in Division 00 Document "Available Project Information". Contractor will not be allowed to begin work at Project until it has fully complied with this paragraph. Identification badges will be issued following compliance with this paragraph. Form to be used is available on Indiana State Police website, www.in.gov/isp, Limited Criminal History report. Insert additional paragraphs to specify restrictions on Contractor's use of premises or to specify limitations because of Owner occupancy.
- J. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. 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. 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.
 - 3. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes 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 direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of Allowances include the following:
 - 1. Contingency Allowances.
- C. Related Requirements:
 - 1. Section 014000 "Quality Requirements" for procedures governing the use of Allowances for testing and inspecting.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, 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.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in Allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each Allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of Allowance items that include installation as part of the Allowance.
- C. Coordinate and process submittals for Allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

- A. Coordinate Allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 CONTINGENCY ALLOWANCES

- A. Use the contingency Allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the Allowance.
- B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency Allowance are included in the Allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency Allowance will include Contractor's related costs and reasonable overhead and profit margins.
- D. At Project closeout, credit unused amounts remaining in the contingency Allowance to Owner by Change Order.

1.8 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.
- B. Submit claims for increased costs because of a change in scope or nature of the Allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Contingency Allowance: Include a contingency Allowance of \$25,000.00 for use according to Owner's written instructions.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
 - 2. Contractor shall submit prices for all indicated alternate bid items. Failure to submit bids for all alternates shall be cause for rejection of the entire Bid.
 - 3. Contract awards shall be based upon the best combination of Base Bid, plus the Alternate(s) chosen to be accepted by the Owner.
 - 4. Work that is provided under the alternates shall comply with all applicable provisions of the Contract Documents.
- B. Notification: Immediately following award of the Contract, notify each entity involved, in

writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 - Wall Cabinets
 - 1. Base Bid: No wall cabinets or tile backsplash in classrooms 138 or 140.
 - 2. Alternate: Add wall cabinets and tile backsplash in classrooms 138 and 140 as indicated in the Contract Documents.
- B. Alternate No. 2 - Cord Reels
 - 1. Base Bid: No ceiling mounted cord reels.
 - 2. Alternate: Add ceiling mounted cord reels as indicated in the Contract Documents.
- C. Alternate No. 3 - Manual Roller Shades
 - 1. Base Bid: No roller shades.
 - 2. Alternate: Add roller shades as indicated in the Contract Documents.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION 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. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for products selected under an allowance.
 - 2. Section 012300 "Alternates" for products selected under an alternate.
 - 3. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
 - 4. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A facsimile of form provided in Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the

following, as applicable:

- a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. 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 date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed unless otherwise indicated.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.3 MINOR CHANGES IN THE WORK

1.4 Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions." PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop Work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and Unit Costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting

an extension of the Contract Time.

- e. Quotation Form: Use forms acceptable to Architect.

- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and Unit Costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use form acceptable to Architect.

1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of Allowances.

1.6 CHANGE ORDER PROCEDURES

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

1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary

to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

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. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
 - 2. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 3. Section 013123.99 "Web-based Project Management" for requirements necessary to utilize "NewForma" as basis of communication and Project Management.
 - 4. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.

- b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange schedule of values consistent with format of AIA Document G703.
 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. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five 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 required, include evidence of insurance.
 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. 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.
9. 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.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 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: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 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. Architect will return incomplete applications without action.
 1. Notary seal shall be stamped in ink, not embossed, if payment application is electronically transmitted. Payment application will be returned unaccepted, if notary seal is not legible.
 2. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 3. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 4. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 5. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's Construction Schedule (preliminary if not final) .
 4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 5. Products list (preliminary if not final).
 6. Submittal 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.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "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. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

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 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. RFIs.
 - 4. Digital project management procedures.
 - 5. Project meetings.
- B. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.
- C. Architect also means Engineer, as applicable to the Project.

1.4 ACTION SUBMITTALS

- A. Performance and Payment Bonds, Certificate of Insurance: Provide within the time indicated in the Instructions to Bidders.
- B. Subcontract List: Within 15 days of starting construction operations, provide a written

summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
- C. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1. Post copies of list in project meeting room, in temporary field office, and in prominent location in built facility. Keep list current at all times.
- D. E-verify Affidavit: Provide within 15 days of starting construction operations.
- E. Proposed Schedule of Values: Provide within 15 days of starting construction operations.
- F. Preliminary Construction Schedule: Provide within 15 days of starting construction operations.
- G. Submittal Schedule: Provide within 15 days of starting construction operations.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each entity involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the Schedule of Values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Coordinate the addition of trade-specific information to coordination drawings in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
 - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - f. Indicate required installation sequences.
 - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Precedence Order for Coordination (and Coordination Drawings)
 - a. Structure and partitions have highest priority.
 - b. Equipment location and access.
 - c. Ceiling systems and items/devices recessed in ceiling that affect its elevation.
 - d. Gravity drainage lines.
 - e. High pressure ductwork and devices.
 - f. Large pipe mains, valves, and devices.
 - g. Pneumatic tube and material conveying systems.
 - h. Low pressure ductwork, diffusers, registers, grilles, HVAC equipment.
 - i. Fire protection piping, devices and heads.
 - j. Electrical conduit 3" and larger or collections of smaller conduit that cannot be contained within a 12" width and 4" depth.
 - k. Small piping, tubing, electrical conduit, and devices.
 - 1) Conduits installed in corridors shall be maintained at least 9" above finished ceiling.
 - 2) Conduits shall be grouped within a 12" width.
 - 3) Space utilized for conduit shall be selected to allow access to all devices which normally require adjustment, repair, resetting, etc.
 - l. Sleeves through rated partitions.
 - m. Access panels.
2. Cost of Changes required as a result of failure to perform, provide coordination drawings, participate in effort to resolve interferences, provide correct coordination drawings, or call attention to changes required in other work as result of modifications shall be paid for by responsible Contractor.
 - a. "Responsible Contractor" (as indicated in above paragraph) will be determined by the location of the Scope of Work as indicated on Precedence Order in this Section.
3. Responsibility to coordinate is inverse to Precedence Order above (i.e., lower precedence work is responsible to coordinate and react to higher precedence work).
4. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
5. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
6. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
7. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

8. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
 9. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 10. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
 11. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: DWG, Version , operating in Microsoft Windows operating system.
 2. File Submittal Format: Submit or post coordination drawing files using PDF format.
 3. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
 - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.

1.7 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. All RFIs shall be submitted electronically, with attachments in PDF format, by emailing to the Architect's Project Construction Administration Point Person (CAPP) or if electronic submission of RFIs is not possible, by mailing or faxing a hard copy to the Architect.
- C. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- D. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
1. Attachments shall be electronic files in PDF format.
- E. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract

- Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
- 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect of additional information.
 - 3. Architect's action on RFIs that may result in a change to the Contract Time, Contract Extent, or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time, Contract Extent, or the Contract Sum, notify Architect 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 with not less than the following:
- 1. Project name.
 - 2. Name and address of Contractor.
 - 3. Name and address of Architect.
 - 4. RFI number including RFIs that were returned without action or withdrawn.
 - 5. RFI description.
 - 6. Date the RFI was submitted.
 - 7. Date Architect's response was received.
 - 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- G. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected entities. Review response and notify Architect within seven days if Contractor disagrees with response.

1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
- 1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
 - 2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
 - 3. Digital Drawing Software Program: Contract Drawings are available as indicated in the AIA G201 "Digital Data Protocol Form".
 - 4. The following digital data files will be furnished for each appropriate discipline:

- a. Floor plans.
 - b. Reflected ceiling plans.
- B. Web-Based Project Software: Use Architect's web-based Project software site for purposes of hosting and managing Project communication and documentation until Final Completion.
 - 1. Web-based Project software site includes, at a minimum, the following features:
 - a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
 - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
 - c. Document workflow planning, allowing customization of workflow between project entities.
 - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
 - e. Track status of each Project communication in real time, and log time and date when responses are provided.
 - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
 - g. Processing and tracking of payment applications.
 - h. Processing and tracking of contract modifications.
 - i. Creating and distributing meeting minutes.
 - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
 - k. Management of construction progress photographs.
 - l. Mobile device compatibility, including smartphones and tablets.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - 3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.9 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is

- required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned entities shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Responsibilities and personnel assignments.
 - b. Tentative construction schedule.
 - c. Phasing.
 - d. Critical work sequencing and long lead items.
 - e. Designation of key personnel and their duties.
 - f. Lines of communications.
 - g. Use of web-based Project software.
 - h. Procedures for processing field decisions and Change Orders.
 - i. Procedures for RFIs.
 - j. Procedures for testing and inspecting.
 - k. Procedures for processing Applications for Payment.
 - l. Distribution of the Contract Documents.
 - m. Submittal procedures.
 - n. Preparation of Record Documents.
 - o. Use of the premises and existing building.
 - p. Work restrictions.
 - q. Working hours.
 - r. Owner's occupancy requirements.
 - s. Responsibility for temporary facilities and controls.
 - t. Procedures for moisture and mold control.
 - u. Procedures for disruptions and shutdowns.
 - v. Construction waste management and recycling.
 - w. Parking availability.
 - x. Office, work, and storage areas.
 - y. Equipment deliveries and priorities.
 - z. First aid.
 - aa. Security.
 - bb. Progress cleaning.
 3. Minutes: Record and distribute meeting minutes.

- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each entity present and to other entities requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time

convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 2. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned entities shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of Record Documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Procedures for completing and archiving web-based Project software site data files.
 - d. Submittal of written warranties.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Coordination of separate contracts.
 - l. Owner's partial occupancy requirements.
 - m. Installation of Owner's furniture, fixtures, and equipment.
 - n. Responsibility for removing temporary facilities and controls.
 4. Minutes: Record and distribute meeting minutes.
- E. Progress Meetings: Conduct progress meetings at biweekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
 2. Attendees: In addition to representatives of Owner and Architect, Contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind

schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

- 1) Interface requirements.
- 2) Sequence of operations.
- 3) Resolution of BIM component conflicts.
- 4) Status of submittals.
- 5) Deliveries.
- 6) Off-site fabrication.
- 7) Access.
- 8) Site use.
- 9) Temporary facilities and controls.
- 10) Progress cleaning.
- 11) Quality and work standards.
- 12) Status of correction of deficient items.
- 13) Field observations.
- 14) Status of RFIs.
- 15) Status of Proposal Requests.
- 16) Pending changes.
- 17) Status of Change Orders.
- 18) Pending claims and disputes.
- 19) Documentation of information for payment requests.

4. Minutes: Record and distribute the meeting minutes to each entity present and to entities requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013123.99 - WEB-BASED PROJECT MANAGEMENT

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. Contractor shall participate in the use of a web-based project management tool (Newforma) providing collaboration between the Owner, Architect/Engineer, and the Contractors.
- B. Related Sections include the following:
 - 1. Division 01 Section "Contract Modification Procedures" for administrative and procedural requirements for handling and processing Contract modifications.
 - 2. Division 01 Section "Payment Procedures" for administrative and procedural requirements necessary to prepare and process Applications for Payment.
 - 3. Division 01 Section "Project Management and Coordination" for administration of subcontractors and coordination with other contractors.
 - 4. Division 01 Section "Construction Progress Documentation" for administrative and procedural requirements for documenting the progress of construction during performance of the Work.
 - 5. Division 01 Section "Submittal Procedures" for administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

1.3 DEFINITIONS

- A. Team member: a representative of the Owner, Architect/Engineer, or Contractor with a web-based Project management user account.

1.4 WEB-BASED PROJECT MANAGEMENT TOOL

- A. Use and Training:
 - 1. Utilization of, and training in the use of Newforma as the web-based project management tool will be arranged for and supervised by the Architect.

2. Participation of the Architect/Engineer and Contractor is mandatory; others as determined by the Owner.
3. Architect shall provide access to the Contractor to the Newforma website.
4. All participants are required to have access to the internet and the Microsoft Internet Explorer browser (version 6.0 or higher). Broadband connection to the internet (e.g. Cable modem, ISDN, DSL, etc.) is recommended, but not required.

B. Functions:

1. Posting of Project Notices.
2. Correspondence Logging.
 - a. Letters between Contractors, Architect, Engineer, and Owner will be sent via Newforma.
3. Messaging between the team members.
4. Email to contacts outside of team members.
5. Meetings.
 - a. Agendas.
 - b. Minutes.
 - c. Scheduling.
 - d. Item Tracking.
6. Discussions.
7. Document Management.
 - a. Architect's Supplemental Instructions (ASI).
 - b. Daily Reports
 - c. Punch Lists
 - d. Requests for Information (RFI).
 - 1) Prime Contractor will submit all Request for Information (RFIs) via Newforma's Info Exchange.
 - 2) Submittals. Prime Contractor will upload all submittals via Newforma's Info Exchange.
 - a) Each submittal upload will be required to be in the form of a single PDF file, not multiple PDF files. Contractor will need the ability/software to merge/combine PDF files as necessary for submittal uploads.
 - 3) Prime Contractor will be required to submit full list of expected submittal items for uploading to Newforma.
 - e. Transmittals.

- f. Change Items.
 - g. Construction Reports.
- C. Utilization of the web-based project management tool shall be implemented by the Architect/Engineer.
- D. Training sessions will be provided by the Architect and are introductory in nature. Contractor is responsible for becoming proficient with the detailed use of the tool.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 013123.99

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. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Startup construction schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Construction schedule updating reports.
 - 4. Submittals Schedule.
 - 5. Daily construction reports.
 - 6. Site condition reports.
- B. Related Requirements:
 - 1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.
 - 5. Division 01 Section "Closeout Procedures" for incorporating Project closeout procedures into the Construction Schedule.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
 - 1. Predecessor Activity: An activity that precedes another activity in the network.
 - 2. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the Schedule of Values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

- C. Event: The starting or ending point of an activity.
- D. Milestone: A key or critical point in time for reference or measurement.
- E. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.
- F. Architect also means Engineer, as applicable to the Project.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF file.
- B. Startup construction schedule.
 - 1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- D. Construction Schedule Updating Reports: Submit with Applications for Payment.
- E. Daily Construction Reports: Submit at weekly intervals.
- F. Site Condition Reports: Submit at time of discovery of differing conditions.

1.5 COORDINATION

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

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - 1. Use Microsoft Project, Primavera, Trimble Prolog, for current Windows operating system.
- B. Time Frame: Extend schedule from date established for commencement of the Work 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.
- C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect/Engineer.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect/Engineer's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- D. Constraints: Include constraints and Work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 2. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use-of-premises restrictions.
 - f. Provisions for future construction.

- g. Seasonal variations.
 - h. Environmental control.
- 3. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- F. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.
 - 1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.
- G. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and the Contract Time.
- H. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- I. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, equipment required to achieve compliance, and date by which recovery will be accomplished.

- J. Distribution: Distribute copies of approved schedule to Architect/Engineer Owner, separate contractors, testing and inspecting agencies, and other entities 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 entities and post in the same locations. Delete entities from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 STARTUP CONSTRUCTION SCHEDULE

- A. Gantt-Chart Schedule: Submit startup, horizontal, Gantt-chart-type construction schedule within seven days of date established for commencement of the Work.
- 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 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

1.8 GANTT-CHART SCHEDULE REQUIREMENTS

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 15 days of date established for commencement of the Work.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

1.9 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions, including presence of rain or snow.

7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

- B. Site Condition Reports: Immediately on discovery of a difference between Site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 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. Section Includes:

- 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.

- B. Related Requirements:

- 1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Section 013100 "Project Management and Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
 - 3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 4. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
 - 5. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
 - 6. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 7. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect/Engineer's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

- C. "As Specified" Submittals: Contractor supplying one of the exact, listed manufacturer/product and model/assembly number (if applicable) "as specified" within the Technical Specifications (Divisions 02-49).
- D. Exposed Finish: Items including surfaces, assemblies, elements and covers visible, in whole or in part, when the Project is substantially complete.
- E. Architect also means Engineer, as applicable to the Project.

1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the Schedule of Values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 15 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal Category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled dates for purchasing.
 - h. Scheduled date of fabrication.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
1. Project name.
 2. Date.
 3. Name of Architect.
 4. Name of Contractor.
 5. Name of firm or entity that prepared submittal.
 6. Names of subcontractor, manufacturer, and supplier.
 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
 8. Category and type of submittal.
 9. Submittal purpose and description.
 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 11. Drawing number and detail references, as appropriate.
 12. Indication of full or partial submittal.
 13. Location(s) where product is to be installed, as appropriate.
 14. Other necessary identification.
 15. Remarks.
 16. Signature of transmitter.
- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- E. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website.

1.6 SUBMITTAL PROCEDURES

- A. General: The following submittal procedures have been developed to most effectively expedite the procurement and installation of the Work while properly documenting compliance with the Contract Documents.
1. Classification of Submittals: To expedite the review process, submittals have been

classified. By classifying the submittals, attention is placed on expediting the Action Submittals, which require time for responsive action. The classifications are as follows:

- a. Action Submittals
 - b. Informational Submittals
 - c. As Specified (No Submittal)
2. Submittals Schedule: Contractor's preparation of a schedule that identifies all submittals, by classification, provides a comprehensive document which indicates all parties' intentions regarding submittals.
 3. Expediting Reviews: Contractor is encouraged to expedite the review process through the use of electronic submittals and coordinating reviews that can be most effectively coordinated at the jobsite field office.
 4. Operation / Maintenance Manuals and Record Documents shall be prepared and maintained through the progress of the Work. Intermittent and partial submittals will not be accepted. Submission shall occur as part of the Project Closeout process.

B. Procedure for submittal review will be as follows:

1. Contractor shall submit for review by the Architect a list of products/systems provided "As Specified."
2. Architect will review the "As Specified" list against the Contract Documents.
3. Contractor shall submit Submittal Schedule, which indicates the submittal classification of Action, Informational, or As Specified.
4. Architect will review the Submittal Schedule.
5. Contractor shall proceed with submittal process as outlined herein.
6. Contractor shall prepare for and initiate Exposed Finishes Review Conference(s) for concurrent review of exposed finishes by the Owner and Architect.
7. Contractor shall accumulate all required submittals, including "As Specified" submittals, and maintain a field record and use these for the basis of Operation and Maintenance Data.

C. Process for "As Specified" Submittals

1. Contractor shall submit a list of all products/systems being provided "As Specified." These items will then be marked as not to be submitted until Closeout.
 - a. This list shall be submitted within seven (7) calendar days after the Subcontractors and Products List is submitted.
 - 1) Refer to Division 00 Document "Subcontractors and Products."
 - b. This list shall be submitted prior to the overall Submittal Schedule confirming all items to be submitted.
2. Approval by the Architect of "As Specified" submittals requires that Contractor only submit for review by the Architect the following submittal types:

- a. Action Submittals:
 - 1) Shop Drawings.
 - 2) Samples for Verification (to be reviewed concurrently at an Exposed Finishes Review Conference).
 - b. Informational Submittals:
 - 1) Coordination Drawings.
 - 3. Contractor shall keep a complete and current field record of all product data and all other submittals noted in the Technical Specifications for products being provided "As Specified."
 - a. This field record shall be available for review by the Architect and Owner throughout construction.
 - b. This field record shall be compiled into the Operation and Maintenance manuals as part of the Project.
 - 1) Refer to Division 01 Section "Operation and Maintenance Data."
 - 4. If the Technical Specifications list approved manufacturers, but not specific products, then all submittals specified are required for review by the Architect prior to installation.
- D. Submittals Schedule: In order to properly manage and coordinate the processing of Submittals, a Submittals Schedule shall be prepared by the Contractor and submitted to the Architect within seven (7) calendar days from the Architect's approval of the Contractor's list of "As Specified" submittals. A Submittals List of Action Submittals follows this Section (or will be issued by Addendum) for use by the Contractor. Contractor shall use this Submittals List, adding Contact and Scheduled Date for First Submittal information and recommended changes. In general, Product Data and Shop Drawings shall be combined to minimize number of Submittals.
- 1. Submittals Schedule shall have the following information arranged in a tabular format:
 - a. Specification Number and title.
 - b. Submittal classification (indicate Action, Informational, or As Specified).
 - c. Name of subcontractor.
 - d. Description of the Work covered.
 - e. Scheduled date for first submittal.
 - f. Scheduled date for Architect's final release or approval.
 - 2. Reviews of Submittals by Architect will not commence without receipt of Submittals Schedule.
 - 3. As appropriate, Contractor shall revise and reissue the Submittals Schedule.
 - 4. Comply with requirements in Division 01 Section "Construction Progress

Documentation" for scheduled performance of related construction activities.

- E. 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. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
 - 3. To expedite the review of submittals, Contractor shall coordinate with Architect meetings to conduct a collective review of similar items such as exterior finishes and interior finishes. These meetings may occur at the jobsite field office where samples and submittals can be collected and maintained.
- F. Electronic copies of CAD Drawings of Contract Drawings may be acquired from Architect for Contractor's use in preparing submittals.
 - 1. Drawings will be distributed as indicated in the AIA G201-2013.
 - 2. Drawings shall not release the Contractor from the responsibility for determining exact quantities, dimensions, and locations of Work.
- G. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
 - 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
 - 5. Concurrent Consultant Review: Where Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- H. 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 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall indicate Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product shall be installed, as appropriate.
 - l. Other necessary identification.
- I. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- J. Transmittal:
 1. Electronic Submittals: All Submittals shall be submitted electronically, with attachments in PDF format, via Newforma (see Web-Based Project Management), or if electronic submittal is not possible (large format drawings, samples, etc.), by mailing a hard copy to Schmidt Associates, ATTN: Submittals Clerk.
 2. Hard Copy Submittals: When electronic submittal is not possible, package each submittal individually and appropriately for transmittal and handling. Transmit each submittal with the information provided below on Contractor letterhead. Architect will discard submittals received from sources other than Contractor.
 3. Transmittal Information: Provide the following information in an email for electronic submittals or on Contractor letterhead for hard copy submittals:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.

- f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Drawing number and detail references, as appropriate.
 - j. Transmittal number.
 - k. Submittal and transmittal distribution record.
 - l. Remarks.
 - m. Signature of transmitter.
4. On Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- K. 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 "No Resubmittal Required."
 - 4. 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.
- L. Use for Construction: Use only final submittals with mark indicating "No Resubmittal Required."

1.7 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
- 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams that show factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. PDF 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 42 inches .
 3. BIM Incorporation: Develop and incorporate Shop Drawing files into BIM established for Project.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
 4. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
 5. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
 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.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples shall be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: 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. Number of Samples: Submit one set of Samples. Mark up and retain one returned Sample set as a project record Sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
 2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
 3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
 4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
 6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- H. Test and Research Reports:
1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
 2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit PDF file of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
- C. BIM Incorporation: Incorporate delegated-design drawing and data files into BIM established for Project.
 1. Prepare delegated-design drawings in the following format: Same digital data software program, version, and operating system as original Drawings, as indicated on AIA G201-2013.

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
 - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. Reviewed as Submitted - No Resubmittal Required.
 - 2. Reviewed as Noted - No Resubmittal Required.
 - 3. Reviewed as Noted - Revise and Resubmit.
 - 4. Rejected - Revise and Resubmit.
 - 5. Not Required for Review - Returned.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.
- F. Architect will return without review submittals received from sources other than Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

Submittal Report - Expected

2016-100.1TR
Industrial Tech Renovations
Prepared On: 3/27/2020

| Submittal ID | Subject |
|--------------|---|
| 0-013100-01 | PROJECT MANAGEMENT AND COORDINATION - Performance and Payment Bonds, Certificate of Insurance |
| 0-013100-02 | PROJECT MANAGEMENT AND COORDINATION - Subcontract List |
| 0-013100-03 | PROJECT MANAGEMENT AND COORDINATION - Key Personnel Names |
| 0-013100-04 | PROJECT MANAGEMENT AND COORDINATION - E-verify Affidavit |
| 0-013100-05 | PROJECT MANAGEMENT AND COORDINATION - Proposed Schedule of Values |
| 0-013100-06 | PROJECT MANAGEMENT AND COORDINATION - Preliminary Construction Schedule |
| 0-013100-07 | PROJECT MANAGEMENT AND COORDINATION - Submittal Schedule |
| 0-017823-01 | OPERATION AND MAINTENANCE DATA - Initial Manual Submittal |
| 0-017823-02 | OPERATION AND MAINTENANCE DATA - Final Manual Submittal |
| 0-033000-01 | CAST-IN-PLACE CONCRETE - Product Data with Shop Drawings |
| 0-042200-01 | CONCRETE UNIT MASONRY - Product Data |
| 0-079200-01 | JOINT SEALANTS - Product Data, Joint Sealant Schedule |
| 0-079200-02 | JOINT SEALANTS - Samples for Verification |
| 0-081113-01 | HOLLOW METAL DOORS AND FRAMES - Product Data, Shop Drawings, Schedule |
| 0-084113-01 | ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS - Product Data, Shop Drawings |
| 0-085113-01 | ALUMINUM WINDOWS - Shop Drawings |
| 0-085113-02 | ALUMINUM WINDOWS - Samples for Verification |
| 0-087100-01 | DOOR HARDWARE - Product Data, Door Hardware Schedule, Keying Schedule |
| 0-088000-01 | GLAZING - Product Data, Glazing Schedule |
| 0-088000-02 | GLAZING - Glass Samples |
| 0-089000-01 | LOUVERS AND VENTS - Product Data with Shop Drawings |
| 0-092216-01 | NON-STRUCTURAL METAL FRAMING - Product Data |
| 0-092900-01 | GYPSUM BOARD - Product Data |
| 0-093000-01 | TILING - Product Data with Shop Drawings |
| 0-096513-01 | RESILIENT BASE AND ACCESSORIES - Product Data |
| 0-096513-02 | RESILIENT BASE AND ACCESSORIES - Samples |
| 0-096519-01 | RESILIENT TILE FLOORING - Product Data with Shop Drawings and Product Schedule |
| 0-096723-01 | RESINOUS FLOORING - LEVEL 1 - Product Data |

| Submittal ID | Subject |
|--------------|--|
| 0-096723-02 | RESINOUS FLOORING - LEVEL 1 - Samples for Verification |
| 0-099123-01 | INTERIOR PAINTING - Product Data with Product List |
| 0-099600-01 | HIGH PERFORMANCE COATINGS - Manufacturer's Data Sheets, Shop Drawings |
| 0-099600-02 | HIGH PERFORMANCE COATINGS - Selection Samples |
| 0-099600-03 | HIGH PERFORMANCE COATINGS - Verification Samples |
| 0-101100-01 | VISUAL DISPLAY UNITS - Product Data with Shop Drawings |
| 0-122413-01 | ROLLER WINDOW SHADES - Product Data with Shop Drawings and Window Treatment Schedule |
| 0-123200-01 | MANUFACTURED WOOD CASEWORK - Product Data with Shop Drawings |
| 0-220518-01 | ESCUTCHEONS FOR PLUMBING PIPING - Product Data |
| 0-220523-01 | BALL VALVES FOR PLUMBING PIPING - Product Data |
| 0-220529-01 | HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT - Product Data |
| 0-220553-01 | IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT - Product Data with Equipment Label Schedule, Valve Schedule and Valve Numbering Scheme |
| 0-221116-01 | DOMESTIC WATER PIPING (BUILDING) - Product Data |
| 0-224100-01 | RESIDENTIAL PLUMBING FIXTURES - Product Data with Shop Drawings |
| 0-224233-01 | WASH FOUNTAINS - Product Data with Shop Drawings |
| 0-230523-01 | GENERAL-DUTY VALVES FOR HVAC PIPING - Product Data |
| 0-230529-01 | HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT - Product Data with Shop Drawings |
| 0-230553-01 | IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT - Product Data with Valve Schedules |
| 0-230553-02 | IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT - Samples |
| 0-230713-01 | DUCT INSULATION - Product Data |
| 0-230719-01 | HVAC PIPING INSULATION - Product Data |
| 0-232113-01 | HYDRONIC PIPING - Delegated-Design Submittal |
| 0-233113-01 | METAL DUCTS - Product Data, Delegated Design Submittal |
| 0-233300-01 | AIR DUCT ACCESSORIES - Product Data with Shop Drawings |
| 0-233423-01 | HVAC POWER VENTILATORS - Product Data, Delegated-Design Submittal |
| 0-233713-01 | DIFFUSERS, REGISTERS, AND GRILLES - Product Data with Grille Schedule |
| 0-233723-01 | HVAC GRAVITY VENTILATORS - Product Data, Delegated Design Submittal |
| 0-238223-01 | VERTICAL UNIT VENTILATORS - Product Data and Shop Drawings |
| 0-260544-01 | SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING - Product Data |
| 0-260923-01 | LIGHTING CONTROL DEVICES - Product Data with Shop Drawings |
| 0-262416-01 | PANELBOARDS - Product Data with Shop Drawings |
| 0-262726-01 | WIRING DEVICES - Product Data with Shop Drawings |

| Submittal ID | Subject |
|--------------|--|
| 0-262813-01 | FUSES - Product Data |
| 0-262816-01 | ENCLOSED SWITCHES AND CIRCUIT BREAKERS - Product Data with Shop Drawings |
| 0-265119-01 | LED INTERIOR LIGHTING - Product Data, Shop Drawings, Product Schedule |
| 0-265213-01 | EMERGENCY AND EXIT LIGHTING - Product Data, Shop Drawings |
| 0-271513-01 | COMMUNICATIONS COPPER HORIZONTAL CABLING - Product Data |
| 0-284621-01 | ADDRESSABLE FIRE-ALARM SYSTEMS - Product Data, Shop Drawings, General Submittal Requirements |

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. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.
- C. Related Requirements:
 - 1. Section 012100 "Allowances" for testing and inspection allowances.
 - 2. Division 01 Section "Construction Progress Documentation" for developing a schedule of required tests and inspections.
 - 3. Division 01 Section "Execution" for repair and restoration of construction disturbed by testing and inspecting activities.
 - 4. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced" unless otherwise further described means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

- B. Field Quality-Control Tests: Tests and inspections that are performed on Site for installation of the Work and for completed Work.
- C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- D. Mockups: Full-size physical assemblies that are constructed on Site either as freestanding temporary built elements or as part of permanent construction. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Laboratory Mockups: Full-size physical assemblies constructed and tested at testing facility to verify performance characteristics.
 - 2. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on Site as freestanding temporary built elements or as part of permanent construction, consisting of multiple products, assemblies, and subassemblies.
- E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests: Tests and inspections that are performed at the source; for example, plant, mill, factory, or shop.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and

completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect.

- K. Architect also means Engineer, as applicable to the Project.

1.4 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 CONFLICTING REQUIREMENTS

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

1.6 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups.
1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
 2. Indicate manufacturer and model number of individual components.
 3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data: For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:
 - 1. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.
- F. Reports: Prepare and submit certified written reports and documents as specified.
- G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's Construction Schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced

in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.
 2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, telephone number, and email address of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspection.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, telephone number, and email address of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.10 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. 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.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will

- perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
 - K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups of size indicated or, if not indicated, as directed by Architect.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed to perform same tasks during the construction at Project.
 - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 6. Obtain Architect's approval of mockups before starting corresponding work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 8. Demolish and remove mockups when directed unless otherwise indicated.
 - L. Integrated Exterior Mockups: Construct integrated exterior mockup according to approved Shop Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials. Comply with requirements in "Mockups" Paragraph.
- 1.11 QUALITY CONTROL
- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
 - 2. Payment for these services will be made from testing and inspection allowances, as

- authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
1. Unless otherwise indicated, 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.
 2. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspection will be performed.
 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform duties of Contractor.
- E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including

service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

- F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- G. Associated Contractor Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. 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 inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's Construction Schedule. Update as the Work progresses.
 - 1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Engage a qualified testing agency 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 Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for Work restrictions and limitations on utility interruptions.
 - 2. Section 017300 "Execution" for progress cleaning.
 - 3. Divisions 02 through 33 for temporary heat, ventilation, and humidity requirements for Work results in those Sections.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Sewer: Owner's existing sewer system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
 - 1. Additional work required either as a result of Contractor failing to maintain this service in proper order or causing a violation of existing utility requirements, Contractor will be back-charged for costs incurred by Owner.
- C. Water Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
 - 1. Failure to maintain this service in proper order or obvious waste of the Owner's water

utility will be back-charged to Contractor.

- D. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- E. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction Site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Implementation and Termination Schedule: Within 15 days of date established for commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.
- C. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.
- D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- E. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.
- F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of Work.
 - 2. HVAC system isolation schematic drawing.
 - 3. Location of proposed air-filtration system discharge.
 - 4. Waste-handling procedures.
 - 5. Other dust-control measures.

1.5 QUALITY ASSURANCE

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

- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the United States Access Board's ADA-ABA Accessibility Guidelines.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Contractor shall provide all necessary precaution and standard of care to prevent mold contamination within building Project site. This shall include but not be limited to, means, methods, water intrusion/damage, storage and installation of materials, scheduling as it relates to building moisture conditions, quality control of building envelope construction and HVAC installation, and HVAC operation during construction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- B. Dust-Control Adhesive-Surface Walk-Off Mats: Provide mats minimum 36 by 60 inches .

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
 - 1. Contractor is responsible for providing their own temporary storage / office trailer, if desired on the Project.
 - 2. Contractor shall be responsible for making actual connection from electrical power service provided by the Electrical Contract in the Building Bid Package.
- B. Common-Use Field Office : Of sufficient size to accommodate needs of Owner, Architect, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

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

2.3 EQUIPMENT

- A. Fire Extinguishers : Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
 3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials

that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.3 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- D. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- E. Temporary Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 - 1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.
- F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing Work, isolate the HVAC system in area where Work is to be performed.
 - a. Disconnect supply and return ductwork in Work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within Work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited Work within occupied areas using portable dust-containment devices.
 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.
- G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- H. Lighting : Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone line(s) for each field office.
1. At each telephone and fire extinguisher location, post a list of important telephone numbers as follows:
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
- J. Electronic Communication Service :
1. Provide portable electronic communication service, that includes electronic mail for all Project Managers and Superintendents assigned to this Project:
 - a. Internet Service: Broadband modem, router and ISP, equipped with hardware

firewall, and WIFI providing minimum 20 Mbps upload and 40 Mbps download speeds at each computer.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

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

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

C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

1. Provide one space designated for the use by the Architect/Engineer in close proximity to Field Office.

D. Water/Moisture Remediation :

1. If moisture intrusion/damage occurs within building, or related HVAC system(s), Contractor shall provide a method acceptable to Architect for cleaning and drying the potential areas of contamination as required. If results of moisture intrusion/damage directly affect building finish materials (stored or installed) as it pertains to potential mold contamination, Contractor shall provide all necessary cleaning, drying and testing of these materials and systems as required by Architect.
2. In the event mold contamination is discovered/encountered in the construction process (including post construction, as it relates to the installation process), Contractor shall submit a remediation plan to Owner/Architect/Engineer with remedial action to follow within 48 hours of discovery.
3. At the conclusion of the remediation phase, Contractor shall provide 'clearance testing' procedures with documentation to Owner/Architect/Engineer to affirm that the remedial steps have been successfully completed. Porous building/system materials (i.e., drywall, wood, acoustical ceiling tile, building insulation, duct insulation, etc.) shall be tested to affirm acceptable standards for moisture levels within the product(s) or system(s) affected, after remedial procedures are completed.
4. Remediation Reference Guidelines:
 - a. NYCG-Assessment & Remediation of Fungi in Indoor Environments.
 - b. IICRC S500-Standard and Reference Guide for Professional Water Damage

Restoration.

- c. EPA-Mold Remediation in Schools and Commercial Buildings.
- d. ACGIH-Bioaerosols, Assessment, and Control.

- E. ASCR-Fungal Contamination: A Comprehensive Guide for Remediation.
- F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 - 3. Maintain and touch up signs so they are legible at all times.
- G. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- H. Waste Disposal Facilities : Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- I. Lifts and Hoists : Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- J. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Section 011000 "Summary."
- C. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- D. Barricades, Warning Signs, and Lights : Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- E. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.
- G. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 3. Insulate partitions to control noise transmission to occupied areas.
 - 4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 5. Protect air-handling equipment.
 - 6. Provide walk-off mats at each entrance through temporary partition.
- H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be

followed. Instruct personnel in methods and procedures. Post warnings and information.

3.6 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.
 - 1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
 - 2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
 - 3. Indicate methods to be used to avoid trapping water in finished work.
- B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.
- C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard and replace stored or installed material that begins to grow mold.
 - 7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.
- D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and

exposure to water limits.

- a. 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 48 hours are considered defective and require replacing.
- b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
- c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.7 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision : Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover : Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal : Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. 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, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012300 "Alternates" for products selected under an Alternate.
 - 2. Section 012500 "Substitution Procedures" for requests for Substitutions.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process 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 as determined by Architect.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "Basis-of-Design Product," 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 additional manufacturers named in the specification. Characteristics listed above for "Basis of Design Product" will be required of and strictly enforced for comparable product of other listed acceptable manufacturers. Characteristics as determined by Architect that are not comparable to "Basis

of Design Product will be grounds for rejection of submitted comparable product and "Basis of Design Product" shall be provided by Contractor.

1. If Contractor utilizes comparable product of other listed acceptable manufacturers, Contractor is responsible for all changes in Work required by use of other than "Basis of Design" or scheduled product. No additional costs to Owner will be allowed for modifications required in Work by use of comparable product. See Comparable Products Article.

1.4 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "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, select product 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 and vandalism. 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 determine compliance with the Contract Documents and to determine 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. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

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: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. See other Sections for specific content requirements and particular requirements for submitting special warranties.

- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require 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.
 - a. It is responsibility of Contractor to research comparable product and its required interface with systems indicated in Contract Documents.
 - 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 architects and owners, if requested.
 - 5. Samples, if requested.
 - 6. Products utilized as comparable products shall require no alterations of adjacent products, systems, or Work of which they are a part or with which they interface. Alterations of adjacent Work or additional Work required by use of comparable products are responsibility of Contractor providing comparable products and that Contractor shall provide adjustments required to provide a properly operating product and system at no additional cost to Owner, Architect/Engineer, or other Contractors. Systems which may require alterations shall include, but not be limited to, mechanical, plumbing, electrical, technology, and landscape, as well as architectural systems.
 - a. If use of comparable product requires time of Architect/Engineer to redesign a

system to incorporate comparable product or to accommodate variations in system for comparable product, that time will be charged to Contractor utilizing comparable product.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Installation of the Work.
 - 3. Cutting and patching.
 - 4. Coordination of Owner-installed products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for limits on use of Project site.
 - 2. Section 013300 "Submittal Procedures" for submitting surveys.
 - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 4. Section 024119 "Selective Demolition" for demolition and removal of selected portions of the building.

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 construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.

- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. 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. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Mechanical systems piping and ducts.
 - f. Control systems.
 - g. Communication systems.
 - h. Fire-detection and -alarm systems.
 - i. Electrical wiring systems.
 - j. Operating systems of special construction.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or 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. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.

- d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching 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 provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: 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, mechanical and electrical systems, 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; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, 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. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. 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 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 caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. 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 Architect promptly.

- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- D. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 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 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- 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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. 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.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 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.
- I. 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.

- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, 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. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. 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.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. 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.
- G. 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 neatly to minimum 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 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.

H. 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 practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical 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 minimize 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, prepare substrate and apply primer and intermediate paint coats appropriate for substrate 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 and ensures thermal and moisture integrity of building enclosure.

- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

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 personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. 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 waste materials more than seven days during normal weather or three 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.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- 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. 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.

- H. 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.
- I. 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.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 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 and relative humidity.

END OF SECTION 017300

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. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
- B. Related Requirements:
 - 1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
 - 2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 3. Section 017900 "Demonstration and Training" for requirements to train the Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.
 - 4. Division 02 - 33 for specific closeout and special cleaning requirements for Work of those Sections.

1.3 DEFINITIONS

- A. Architect also means Engineer, as applicable to the Project.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at final completion.

1.5 CLOSEOUT SUBMITTALS

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

1.6 MAINTENANCE MATERIAL SUBMITTALS

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

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including Project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
 - 5. Submit testing, adjusting, and balancing records.
 - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Advise Owner of changeover in utility services.
 6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 8. Complete final cleaning requirements.
 9. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. 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.

1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.

- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, 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 Architect.
 - d. Name of Contractor.
 - e. Page number.
 - 4. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect will return annotated file.
 - b. PDF electronic file. Architect will return annotated file.
 - c. Web-based project software upload. Utilize software feature for creating and updating list of incomplete items (punch list).
 - d. Three paper copies. Architect will return two copies.

1.10 SUBMITTAL OF PROJECT WARRANTIES

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

construction period by separate agreement with Contractor.

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and

maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g. Sweep concrete floors broom clean in unoccupied spaces.
 - h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j. Remove labels that are not permanent.
 - k. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA ACR. Provide written report on completion of cleaning.
 - o. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
 - p. Leave Project clean and ready for occupancy.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 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. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Emergency manuals.
 - 2. Systems and equipment operation manuals.
 - 3. Systems and equipment maintenance manuals.
 - 4. Product maintenance manuals.
- B. Related Requirements:
 - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

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.
- C. Architect also means Engineer, as applicable to the Project.

1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to

revisions and field conditions.

- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.
 - 2. Submit one paper copy and one pdf copy. Architect will return one copy.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-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, subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. 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 storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
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.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: 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: 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 and contact information for Contractor.
 6. Name and contact information for Architect.
 7. Names and contact information for major consultants to the Architect that designed the

systems contained in the manuals.

8. 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.
- 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."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 2. 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.
 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Content: Organize manual into a separate section for each of the following:
 1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- C. Type of Emergency: Where applicable for each type of emergency indicated below, include

instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- E. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
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.
- B. 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. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor has 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.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
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.

D. 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.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

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.

- B. 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 warranties and bonds as described below.
- C. 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 and Drawing or schedule designation or identifier where applicable.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; 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.
 - a. 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.
 - 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.
- E. 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 video recording, if available.
- F. 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.
 - G. 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.
 - H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
 - I. 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.
 - J. 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 maintenance manuals.
- 1.11 PRODUCT MAINTENANCE MANUALS
- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
 - B. 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.
 - C. 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 and drawing or schedule designation or identifier where applicable.
 - D. 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.

- E. 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.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. 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 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for final property survey.
 - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 DEFINITIONS

- A. Architect also means Engineer, as applicable to the Project.

1.4 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up record prints.
 - 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit PDF electronic files of scanned record prints.
 - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
 - b. Final Submittal:

- 1) Submit PDF electronic files of scanned marked-up record prints.
 - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.
- D. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.5 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
 2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Construction Change Directive.
 - k. Changes made following Architect's written orders.

- l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
 - 3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
 - 1. Format: Annotated PDF electronic file with comment function enabled.
 - 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 - 3. Refer instances of uncertainty to Architect for resolution.
 - 4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
 - a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
 - b. Architect will provide data file layer information. Record markups in separate layers.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 - 1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Format: Annotated PDF electronic file with comment function enabled.
 - 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 - 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

1.6 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 - 5. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file.

1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:

- a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
- a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:

- a. Diagnosis instructions.
- b. Repair instructions.
- c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
- d. Instructions for identifying parts and components.
- e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 017900

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.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.

- B. Related Requirements:

- 1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
 - 3. Section 017300 "Execution" for cutting and patching procedures.
 - 4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

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.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 QUALITY ASSURANCE

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

1.6 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. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-Site is not permitted.
- F. 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.

PART 2 - PRODUCTS

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.
- E. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
 - 2. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- F. Survey of Existing Conditions: Record existing conditions by use of measured drawings.
 - 1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

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. 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.
 - 3. 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.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

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.
- B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- D. 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.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- D. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Roofing Section for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.
 - 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.
 - 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- 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 033000 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Slabs-on-grade, footings and retaining walls.

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; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

- A. Product Data with Shop Drawings:
 - 1. Product Data: For each type of product indicated.
 - 2. Shop Drawings:
 - a. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Qualification Data: For manufacturer.
- C. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- D. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Curing compounds.
 - 6. Bonding agents.
 - 7. Adhesives.
 - 8. Semirigid joint filler.
 - 9. Joint-filler strips.
 - 10. Repair materials.
- E. Field quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

- E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Products: Subject to compliance with requirements, provide one of the products specified.
 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

- A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- B. 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.
- C. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Plain-Steel Wire: ASTM A 82, as drawn.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.4 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C or F.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S 3M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.6 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.

- B. Chemical Admixtures: 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.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

2.7 VAPOR BARRIERS

- A. Plastic Vapor Barrier: ASTM E 1745, Class A with a permeance of 0.01 as tested before and after mandatory conditioning (ASTM E 1745 Section 7.1 and subparagraph 7.1.1-7.1.5) less than 0.01 perms (grains/(ft² hr in Hg)). Include manufacturer's recommended adhesive or pressure-sensitive tape.
1. Products:
 - a. Fortifiber Corporation; Moistop Ultra 15.
 - b. Reef Industries; Griffolyn G 15.
 - c. Stego Industries, Stego Wrap 15.

2.8 CURING MATERIALS

- A. Water: Potable.
- B. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
1. Products:
 - a. Burke by Edoco; Aqua Resin Cure.
 - b. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; W.B. Resin Cure.
 - c. Dayton Superior Corporation; Day Chem Rez Cure (J-11-W).
 - d. Euclid Chemical Company (The); Kurez DR VOX.
 - e. Meadows, W. R., Inc.; 1100 Clear.
 - f. Symons Corporation, a Dayton Superior Company; Resi-Chem Clear Cure.
 - g. US Mix Products Company; US Spec Maxcure Resin Clear.
 - h. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.10 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/C 109M.
 - 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. Ardex; K-15 Self-Leveling Underlayment Concrete.
 - b. BASF Construction Chemicals, Inc.; Chemrex Self-Leveling Underlayment.
 - c. Euclid Chemical Company (The); Level Magic.
 - d. L&M Construction Chemicals, Inc.; Levelex.
 - e. Specialty Construction Brands, Inc., an H.B. Fuller company; TEC EZ Level.
- B. Repair Overlayment: 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 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/C 109M.

5. Products: Subject to compliance with requirements, provide one of the following:
- a. Ardex; K-15 Self-Leveling Underlayment Concrete.
 - b. BASF Construction Chemicals, Inc.; Chemrex Self-Leveling Underlayment.
 - c. Euclid Chemical Company (The); Level Magic.
 - d. L&M Construction Chemicals, Inc.; Levellex.
 - e. Specialty Construction Brands, Inc., an H.B. Fuller company; TEC EZ Level.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Slabs-on-Grade, Footings, Retaining Walls: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
 2. Minimum Cementitious Materials Content: 520 lb/cu. yd..
 3. Slump Limit: 5 inches, plus or minus 1 inch.
 4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
 6. All concrete to have limestone aggregate.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 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 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. Construct forms tight enough to prevent loss of concrete mortar.
- D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- E. 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.
- F. 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.
- G. Chamfer exterior corners and edges of permanently exposed concrete.

- H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- K. 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, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

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 after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
- 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 unless approved by Architect.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that

would reduce bond to concrete.

- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 4. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 6. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
1. Verify that vapor barrier is in place and not damaged and that lapped seams are taped properly in compliance with manufacturer's instructions. Do not proceed with concrete placement until damaged vapor barrier has been patched, sealed, and repaired.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked

- around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess 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 average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
- 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.7 FINISHING FORMED SURFACES

- A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- 1. Apply to concrete surfaces to be covered with a coating or covering material applied directly to concrete.
- B. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
- 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Trowel Finish: After applying float finish, apply first troweling 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 exposed to view.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - 3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch

3.9 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes 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 the Work.

3.10 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. 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.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. 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.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.11 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in 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 inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher

- than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

END OF SECTION 033000

SECTION 042200 - CONCRETE UNIT MASONRY

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. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Miscellaneous masonry accessories.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include name of manufacturer, brand name, and type.
 - 3. Mortar admixtures.
 - 4. Preblended, dry mortar mixes. Include description of type and proportions of

- ingredients.
 - 5. Grout mixes. Include description of type and proportions of ingredients.
 - 6. Reinforcing bars.
 - 7. Joint reinforcement.
 - 8. Anchors, ties, and metal accessories.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
- 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 - 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- C. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 FIELD CONDITIONS

- A. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left

exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect sills, ledges, and projections from mortar droppings.
2. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
 1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers,

- bonding, and other special conditions.
- 2. Provide bullnose units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.

- 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
- 2. Density Classification: Normal weight unless otherwise indicated.
- 3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
- 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.5 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

- 1. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than that of CMUs.
- 2. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

- 1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C 91/C 91M.

- 1. Products: Subject to compliance with requirements, provide product by one of the following:
 - a. Cemex S.A.B. de C.V..
 - b. Essroc, Italcementi Group..

- c. Holcim (US) Inc..
- d. Lafarge North America Inc..
- e. Lehigh Cement Company.

E. Aggregate for Mortar: ASTM C 144.

- 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
- 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

F. Aggregate for Grout: ASTM C 404.

G. Water: Potable and containing no materials deleterious to masonry or mortar.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - b. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - c. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.8 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:

- 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
- 2. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
- 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.

- 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

2.10 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime masonry cement mortar unless otherwise indicated.
 - 3. For reinforced masonry, use portland cement-lime masonry cement mortar.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 - 1. For reinforced masonry, use Type S.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.

3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Verify that substrates are free of substances that would impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh

masonry.

- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- C. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8

inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
 2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
 2. Install preformed control-joint gaskets designed to fit standard sash block.
 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar, or rake out joint for application of sealant.
 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.8 LINTELS

- A. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.9 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.10 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.11 MASONRY WASTE DISPOSAL

- A. Masonry Waste: Remove excess clean masonry waste and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042200

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

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. Wood blocking and nailers.
- B. Related Requirements:
 - 1. Divisions 02 through 14 for coordination of blocking.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NHLA: National Hardwood Lumber Association.
 - 3. NLGA: National Lumber Grades Authority.
 - 4. SPIB: The Southern Pine Inspection Bureau.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. 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.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. Application: Treat items indicated on Drawings, and the following:

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Mixed southern pine; SPIB.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Northern species; NLGA.
 - 5. Eastern softwoods; NeLMA.
- 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. Provide one of following at all wall-mounted items locations, unless otherwise indicated:
1. Solid Wood Backing: Minimum 3/4 inch thick by 6 inches wide solid wood (southern pine).
 2. Flexible Wood Backing Plate: "Danback" as manufactured by ClarkDietrich Building Systems.
 3. Flat Strap and Backing Plate: Steel sheet in length and width indicated.
 - a. Minimum Base Metal Thickness: 0.0296 inch.
 4. At following locations provide minimum solid wood, two inches by 6 inches backing/blocking. Provide additional thickness and width as required by indicated loading requirements.
 - a. Grab bars.
 - b. Wall-mounted handrails.
 - c. Wall-mounted upper cabinets.
 - d. Toilet partitions.
 - e. Wall-mounted TVs.
 - f. Baby changing stations.
 - g. Wall-mounted microwaves.
 - h. Hand dryers.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Wood Screws: ASME B18.6.1.
- D. Screws for Fastening to Metal Framing: ASTM C 1002, length as recommended by screw manufacturer for material being fastened.
- 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.

2.5 METAL FRAMING ANCHORS

- A. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 1. Provide metal clips for fastening gypsum board at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- G. Install supplementary framing and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, wall-mounted door hardware items, wall-mounted handrails, wall-mounted acoustical items, and similar construction.
 1. It is responsibility of work of this Section to coordinate all blocking locations for wall-mounted and supported items for Divisions 02 through 14.
- H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with

function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

- I. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- J. Use steel common nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or 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.

3.3 PROTECTION

- A. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 061600 - SHEATHING

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. Wall sheathing.
 - 2. Parapet sheathing.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for plywood backing panels.
 - 2. Section 072100 "Thermal Insulation" for rigid cavity wall insulation that forms exterior wall (building) air barrier.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Parapet sheathing:
 - a. Compliance Data: Submit report indicating panel has been tested and passed NFPA 285.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- B. Factory mark panels to indicate compliance with applicable standard.

2.2 WALL SHEATHING

- A. Plywood Sheathing: , Exterior, Structural I sheathing.
 - 1. Span Rating: Not less than 16/0.
 - 2. Nominal Thickness: Not less than 1/2 inch .
- B. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; GlasRoc.
 - b. Continental Building Products; WDFZ.
 - c. Georgia-Pacific Building Products; Dens-Glass Gold.
 - d. National Gypsum Company; Gold Bond eXP Extended Exposure Sheathing.
 - e. United States Gypsum Co.; Securock.
 - 2. Type and Thickness: Regular, 1/2 inch thick.
 - 3. Size: 48 by 96 inches for vertical installation.

2.3 PARAPET SHEATHING

Insulated Substrate Wall Panel: 5/8 inch thick exterior plywood sheathing factory-laminated to 3 inches thick polyisocyanurate rigid insulation. Assembly shall have been tested and passed NFPA 285 compliance for application indicated. Field-laminated assembly is not acceptable.

- 1. Product/Manufacturer: Subject to compliance with requirements, provide one of the following:
 - a. "Xci Ply" / Hunter Panels.
 - b. EnergyShield Ply Pro / Atlas Roofing Corporation.

2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- E. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.
 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
 2. ICC-ES evaluation report for fastener.
- D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall Sheathing:
 - a. Screw to cold-formed metal framing.
 - b. Space panels 1/8 inch apart at edges and ends.

3.3 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 - 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 - 2. Install panels with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 - 3. Install panels with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
- C. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of panels.
 - 2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.4 PARAPET SHEATHING

- A. Install panels with plywood side facing exterior. Place panels in manufacturer's recommended pattern. Fasten panels through spacers using threaded fasteners and spacing recommended or approved by panel manufacturer. Only factory-assembled panels as specified are acceptable.

END OF SECTION 061600

SECTION 070150.19 - PREPARATION FOR RE-ROOFING

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. Partial roof tear-off.
- 2. Removal of base flashings.

- B. Related Sections:

- 1. Section 011000 "Summary" for use of the premises and phasing requirements.
- 2. Section 015000 "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for reroofing preparation.
- 3. Division 23 Sections for HVAC equipment removal and reinstallation.
- 4. Division 26 Sections for electrical equipment disconnection and reconnection.

1.3 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.
- B. Existing Membrane Roofing System: [Built-up asphalt] [Built-up coal-tar] [EPDM] [CSPE] [PVC] [TPO] [APP-modified bituminous] [SBS-modified bituminous] <Insert roof type> roofing membrane, roof insulation, surfacing, and components and accessories between deck and roofing membrane.
- C. Partial Roof Tear-Off: Removal of a portion of existing membrane roofing system from deck or removal of selected components and accessories from existing membrane roofing system.

- D. Existing to Remain: Existing items of construction that are not indicated to be removed.

1.5 ACTION SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installer of new membrane roofing system.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning membrane roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately below reroofing area. Conduct reroofing so Owner's operations will not be disrupted. Provide Owner with not less than [72] <Insert number> hours' notice of activities that may affect Owner's operations.
 - 1. Coordinate work activities daily with Owner so Owner can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area.
 - 2. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated before proceeding with work over the impaired deck area.
- B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- D. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
- E. Limit construction loads on roof to <Insert load> rooftop equipment wheel loads and <Insert load> for uniformly distributed loads.
- F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
- G. Hazardous Materials: It is not expected that hazardous materials such as asbestos-containing materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work. Existing roof will be left no less watertight than before removal.
2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during reroofing, by methods and with materials so as not to void existing roofing system warranty. Notify warrantor before proceeding.
 1. Notify warrantor of existing roofing system on completion of reroofing, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 INFILL MATERIALS

- A. Use infill materials matching existing membrane roofing system materials unless otherwise indicated.
 1. Infill materials are specified in Section <Insert Section number> "<Insert title of applicable roofing membrane Section>."

2.2 AUXILIARY REROOFING MATERIALS

- A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of [existing and]new membrane roofing system.
- B. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approval's "Approval Guide."
- C. Metal Flashing Sheet: Metal flashing sheet is specified in Section 076200 "Sheet Metal Flashing and Trim."

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect existing membrane roofing system that is indicated not to be reroofed.
 - 1. Loosely lay 1-inch- minimum thick, molded expanded polystyrene (MEPS) insulation over the roofing membrane in areas indicated. Loosely lay 15/32-inch plywood or OSB panels over MEPS. Extend MEPS past edges of plywood or OSB panels a minimum of 1 inch.
 - 2. Limit traffic and material storage to areas of existing roofing membrane that have been protected.
 - 3. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
- B. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- C. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
 - 1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.
- E. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

- A. General: Notify Owner each day of extent of roof tear-off proposed for that day[and obtain authorization to proceed].
- B. Remove aggregate ballast from roofing membrane.[Store aggregate ballast for reuse.]
- C. Partial Roof Tear-Off: Where indicated, remove existing roofing membrane and other membrane roofing system components down to the deck.
 - 1. Remove [cover boards] [roof insulation] [and] [substrate boards].

2. Remove excess asphalt from steel deck. A maximum of 15 lb/100 sq. ft. of asphalt is permitted to remain on steel decks.
3. Remove fasteners from deck[or cut fasteners off slightly above deck surface].

3.3 DECK PREPARATION

- A. Inspect deck after partial tear-off of membrane roofing system.
- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed or if deck appears or feels inadequately attached, immediately notify Architect. Do not proceed with installation until directed by Architect.
- C. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect. Do not proceed with installation until directed by Architect.
- D. Provide additional deck securement as indicated on Drawings.
- E. Replace deck as indicated on Drawings. Replacement deck is specified in Section <Insert Section number> "<Insert Section title>."

3.4 INFILL MATERIALS INSTALLATION

- A. Immediately after removal of selected portions of existing membrane roofing system, and inspection and repair, if needed, of deck, fill in the tear-off areas to match existing membrane roofing system construction.
 1. Installation of infill materials is specified in Section <Insert Section number> "<Insert Section title>."
 2. Install new roofing membrane patch over roof infill area. If new roofing membrane is installed the same day tear-off is made, roofing membrane patch is not required.

3.5 EXISTING BASE FLASHINGS

- A. Remove existing base flashings around parapets, curbs, walls, and penetrations.
 1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings [of same metal, weight or thickness, and finish.] [specified in Section 076200 "Sheet Metal Flashing and Trim."] [specified in Section 077100 "Roof Specialties."]
- C. Inspect parapet sheathing for deterioration and damage. If parapet sheathing has deteriorated, immediately notify Architect.

3.6 DISPOSAL

- A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
 - 1. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION 070150.19

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

- 1. Cavity wall insulation and accessories.
 - a. Creates building envelope air barrier and vapor barrier in exterior walls. Separate air barrier product/system is not required.
- 2. Concealed building insulation (interior).
- 3. Types of insulation:
 - a. Extruded polystyrene foam-plastic board.
 - b. Glass-fiber blanket.
 - c. Mineral-wool blanket.
 - d. Spray-applied polyurethane insulation.

B. Related Requirements:

- 1. Section 042000 "Unit Masonry" for ties and accessories that are part of cavity wall insulation/air barrier system in exterior cavity walls.
- 2. Section 061600 "Sheathing" for board sheathing installed directly over wood or steel framing.
- 3. Section 075419 "Polyvinyl-Chloride (PVC) Roofing" Section 075423 "Thermoplastic Polyolefin (TPO) Roofing" for insulation specified as part of roofing construction.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

- 1. Submittals for cavity wall insulation/air barrier system shall be submitted concurrently with masonry ties and associated accessories submittals. If submittals for each component of system are not submitted concurrently, review of all submittals will be delayed until all component submittals have been received.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.
- C. Certificate from insulation manufacturer that insulation and sheathing assembly has passed specified ASTM E 2357 air barrier testing and specified ASTM E 331 for water penetration.

1.5 CLOSEOUT SUBMITTALS

- A. Thermal Performance Warranty: Manufacturer's minimum 50-year thermal performance warranty for cavity wall insulation.
- B. Insulation assembly manufacturer's representative's mockup observation report and three Project observation reports made during installation of materials.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with fire-test-response characteristics indicated, as determined by testing identical products in compliance with test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 136.
- C. Air Barrier Performance: Provide cavity wall insulation and related materials with information from manufacturer indicating insulation assembly has passed testing based on ASTM E 2357, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies or ASTM E 283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtainwalls, and Doors Under Specified Pressure Difference Across Specimen.
- D. Water Penetration Performance: Provide cavity wall insulation and related materials with information from manufacturer indicating insulation assembly has passed testing based on ASTM E 331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- E. Mockup: Provide mockup of cavity wall insulation as part of masonry wall mockup specified in Section 042000 - Unit Masonry. Cavity wall insulation manufacturer's representative shall

observe and accept mockup prior to continuing cavity wall installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD

- A. Extruded polystyrene boards in this article are also called "XPS boards." Roman numeral designators in ASTM C 578 are assigned in a fixed random sequence, and their numeric order does not reflect increasing strength or other characteristics.
- B. Cavity Wall Insulation
 - 1. Extruded Polystyrene Board, Type IV : ASTM C 578, Type IV, 25-psi minimum compressive strength; unfaced; maximum flame-spread and smoke-developed indexes of 25 and 450, respectively, per ASTM E 84.
 - a. Basis-of-Design Product/Manufacturer: Subject to compliance with requirements, provide "Styrofoam Ultra SL" as manufactured by DuPont.
 - 1) Aged R-value: 5.6 minimum per inch thickness.
 - 2) Total (minimum) Thickness: 3 inches, single layer with ship-lapped vertical edges.
 - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.2 GLASS-FIBER BLANKET

- A. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
 - 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
- B. Glass-Fiber Blanket, Unfaced <Insert drawing designation>: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Guardian Building Products, Inc.
 - c. Johns Manville; a Berkshire Hathaway company.
 - d. Knauf Insulation.
 - e. Owens Corning.

2.3 MINERAL-WOOL BLANKETS

- A. Mineral-Wool Blanket, Unfaced <Insert drawing designation>: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Rockwool.
 - b. Thermafiber Inc.; an Owens Corning company.

2.4 SPRAYED POLYURETHANE FOAM INSULATION

- A. Closed-cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame spread and smoke developed indexes of 75 and 450, respectively, per ASTM E 84. Product shall contain no CFCs or urea formaldehyde. Product shall comply with current state building code, including acceptable fire rating.
 - 1. Manufacturers/Products: Subject to compliance with requirements, provide on of following:
 - a. DuPont; "Froth Pak".

- b. DuPont; "Great Stuff Pro" or "Great Stuff Door and Window"
- c. Touch'n Seal/Foam Kit 200FR.
- d. Manufacturer/Product that complies with current state building code for specific application indicated.

2.5 INSULATION FASTENERS

- A. Temporary Fasteners: "Thermal-Grip" ci prong washer as manufactured by Rodenhouse Fastening Systems 616-454-3100; sales@rodenhouse-inc.com or comparable product acceptable to insulation manufacturer.

2.6 ACCESSORIES

- A. Seam Sealant and Transition Material
 - 1. Provide "LiquidArmor LT" seam-sealing sealant and transition material recommended, approved, and warranted by cavity wall rigid foam-plastic board insulation manufacturer.
- B. Insulation for Miscellaneous Voids:
 - 1. Sprayed polyurethane foam insulation specified above.
- C. Adhesive for Bonding Insulation: Product compatible with insulation, air and water barrier materials, accessories, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation, or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation or sprayed-foam. Remove projections that interfere with placement.
 - 1. Installed insulation shall provide continuous coverage without interruption and be connected to all building envelope components to provide continuous building air barrier when completed.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.
- E. Water-Piping Coordination: If water piping is indicated within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- F. For preformed insulation units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

- A. Install units of foam-plastic board insulation with temporary insulation fasteners as recommended by manufacturer to hold insulation in place until masonry ties are installed. Fit courses of insulation between obstructions, with edges butted tightly in all directions. Press units firmly against inside substrates indicated. Seal joints and unavoidable spaces with insulation manufacturer's recommended seam sealant or spray-applied polyurethane foam.
 - 1. Provide bead of sprayed polyurethane foam at bottom of insulation in cavity to seal bottom of insulation to substrate.
 - 2. At top of cavity, provide sprayed polyurethane foam approximately 4 inches high by 2 inches thick full length of wall to seal insulation to substrate.
 - 3. Insulation shall be continuous with no interruptions full height and width of cavity.
- B. Install boards with length of boards (ship-lapped edges) oriented vertically and parallel to studs for ease of installation and to allow water to drain to ground.

1. Secure boards temporarily with "Thermal Grip" fastener only. Complete board installation with two-piece masonry wall ties designed for this purpose and specified in Division 04 Section "Unit Masonry." Drill pilot holes for CMU substrate installation.
2. Wall ties shall be inserted through insulation board according to manufacturer's instructions. Do not allow shaft of fastener to "drift" or "wobble." Rubber washer on back of pintle shaft is intended to seal shaft hole in foamboard insulation. Do not necessarily align wall ties with edges of insulation board.
 - a. Should tie shaft hole through foam board insulation be enlarged, cover exposed portions of hole with seam sealant or specified sprayed polyurethane foam.

C. Sealing Joints:

1. Seal all joints of rigid cavity insulation including joints with adjacent material other than extruded polystyrene and adjacent construction with seam sealant recommended and warranted by insulation manufacturer.
2. Miscellaneous holes and voids in cavity wall insulation, including enlarged veneer anchoring locations, shall be sealed with seam sealant or specified spray-applied foam insulation.
3. Execution of cavity wall insulation installation, sealing of joints, transition sealing, and filling of miscellaneous holes and voids shall result in establishment of an uninterrupted, monolithic insulation plane that shall create building envelope air barrier.

D. Transition Sealing and Strip Installation

1. Install sealant, strips, transition strips, and auxiliary materials according to insulation manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
2. Coordinate installation of cavity (exterior) wall insulation with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
3. Install butyl-based strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over both substrates.

E. Connect and seal exterior wall air barrier (rigid insulation front face) continuously with roofing membrane, concrete below-grade structures, below grade waterproofing; floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

1. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within those temperature ranges.
2. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply sealant or transition strips so that a minimum of 3 inches of coverage is achieved over both substrates. Maintain 3 inches of full contact over firm bearing to perimeter frames. Roll transition strip firmly to ensure adhesion.
3. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors,

and miscellaneous penetrations of air barrier membrane with specified spray-applied foam insulation.

4. Seal top of wall flashings to rigid insulation with an additional 4-inch-wide transition strip.

- F. Install specified sprayed polyurethane foam insulation where indicated and into miscellaneous voids and cavity spaces inside building at juncture of exterior wall and roof to complete monolithic, uninterrupted building air barrier. If sprayed polyurethane foam insulation has not passed NFPA 286, foam insulation shall be completely covered by 15 minute thermal barrier (one layer of 1/2 inch gypsum board) to separate it from interior of building.

3.5 INSTALLATION OF SPRAY-APPLIED FOAM INSULATION

- A. Install spray-applied foam insulation according to manufacturer's written instructions. Place in miscellaneous voids and cavity spaces. Place spray-applied foam to provide airtight exterior building envelope.
- B. Install spray-applied foam insulation in interruptions and voids of rigid board insulation in exterior wall cavity to provide a monolithic insulation plane.

3.6 FIELD QUALITY CONTROL

- A. Cavity wall insulation manufacturer's representative shall make three observations during installation to verify proper installation of insulation/air barrier system assembly and provide report for each observation.
- B. Juncture of Wall to Roof Insulation
 1. Contractor shall request final in-wall inspection for building envelope completion verification with Architect.

3.7 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING

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. Adhered polyvinyl-chloride (PVC) roofing system.
- 2. Roof insulation.

B. Related Requirements:

- 1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
- 2. Section 072100 "Thermal Insulation" for insulation beneath the roof deck.
- 3. Section 221423 "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.4 ACTION SUBMITTALS

A. Product Data, Shop Drawings:

- 1. Product Data: For each type of product.
- 2. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
 - a. Base flashings and membrane terminations.
 - b. Tapered insulation, including slopes.
 - c. Roof plan showing orientation of steel roof deck and orientation of roofing, fastening spacings, and patterns for mechanically fastened roofing.
 - d. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

B. Samples for Verification: For the following products:

1. Sheet roofing, of color required.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing system to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for roofing system identical to that used for this Project.

1. Manufacturer whose membrane is private-labeled is not acceptable.

- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product, that is eligible to receive manufacturer's special warranty, and is listed below:

1. AAA Roofing.
2. B & L Roofing.
3. Blackmore and Buckner.
4. C. E. Reeve.
5. C. L. Schust.
6. Danco Roofing
7. Dudeck Roofing.
8. E. C. Babilla
9. Fredricks, Inc.
10. Hinshaw Roofing.
11. HRC Roofing.
12. Indianapolis Roofing and Sheet Metal.
13. Korellis Roofing Co.
14. Lehman Roofing.
15. McGuff Roofing, Inc.
16. Midland Engineering.
17. Midwest Roofing and Sheet Metal.
18. Nu-Tec Roofing
19. R. Adams
20. Royalty Roofing
21. Sentry Roofing Inc.
22. Slaytile Roofing
23. Smither Roofing Co.
24. South Central Roofing, Inc.
25. Steve's Roofing.

- C. Installer Prequalification Requirements: Following information shall be provided to Architect for Architect's review for prequalification. Architect's review for prequalification cannot be

assured to be completed within time for bidding for this Project.

1. History and information about company, including following:
 - a. Projects completed in previous 5 years that were 100, 000 square feet or more.
 - b. Evidence that company is licensed to work in Indiana.
 - c. Evidence of Registered Retail Merchant Certificate.
 - d. Certificate of Qualification to Provide Construction Services for Public Work Projects for the State of Indiana (Public Works Division of Indiana).
 - e. Summary of work-related injuries and illnesses (OSHA Form 300A).
 - f. Provide completed ACORD 25 form of current insurance coverages.
 - g. Provide current audited financial statement for most recently completed fiscal year.
2. Roofing Manufacturer's Qualification of Roofing Installer: list roofing manufacturer system(s) company is qualified or certified by roofing manufacturer to install. List roofing type, manufacturer, and status (qualified or certified tier identification) with manufacturer.
 - a. Provide roofing company's certification letter.
 - b. List name(s) of personnel (minimum superintendent) that have been trained by roofing manufacturer that will be assigned to Project and their current status with roofing manufacturer's training.
 - c. Customer References: Provide contact name and telephone number for 3 previous projects completed. One of 3 required shall be project of minimum size required above.
3. Affiliations: List current affiliations with work-related organizations such as National Roofing Contractors Association.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, roofing accessories, and other components of roofing system.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain components including roof insulation and fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roofing and base flashings shall remain watertight.
 - 1. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
 - 2. Impact Resistance: Roofing system shall resist impact damage when tested according to ASTM D 3746 or ASTM D 4272.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.
- C. Roofing System Design: Tested by a qualified testing agency to resist the following uplift

pressures:

1. Corner Uplift Pressure: As indicated on Structural Drawings.
 2. Perimeter Uplift Pressure: As indicated on Structural Drawings.
 3. Field-of-Roof Uplift Pressure: As indicated on Structural Drawings.
- D. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class B; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.3 PVC ROOFING

- A. PVC Sheet: ASTM D 4434/D 4434M, Type III, polyester fabric reinforced.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlisle SynTec Incorporated; Sure Flex PVC.
 - b. Duro-Last Roofing, Inc; DL 60.
 - c. GAF Materials Corporation; EverGuard PVC.
 - d. Sarnafil Inc; SikaPlan.
 - e. Versico Incorporated; Versa Flex PVC.
 2. Thickness: 60 mils, nominal.
 3. Exposed Face Color: Gray.

2.4 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet.
- C. Bonding Adhesive: Manufacturer's standard, water based.
- D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roofing to substrate,

and acceptable to roofing system manufacturer.

- F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.5 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by PVC roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Contractor's Option:
 - 1. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, 1.6-lb/cu. ft. minimum density, square edged.
 - a. Calculations for total R-value requirements of this insulation shall be determined based on aged R-value of 5.0 per inch thickness.
 - b. Product acceptable and warranted by roofing membrane manufacturer.
 - 2. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.
 - a. Calculations for total R-value requirements of this insulation shall be determined based on aged R-value of 5.0 per inch thickness.
 - b. Provide product acceptable and warranted by membrane manufacturer.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.6 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.

- D. Cover Board: Roofing membrane manufacturer's approved and warranted cover board containing no wood or wood fiber.

2.7 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick and acceptable to roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.3 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.
- D. Install insulation under area of roofing to achieve required thickness. Install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
 - 1. Provide insulation total thickness as indicated on Drawings for total minimum R-value of 20.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Mechanically Fastened and Adhered Insulation: Install each layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Mechanically fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
 - 2. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
 - 1. Adhere cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.5 ADHERED ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to roofing system manufacturer's written instructions. Unroll roofing and allow to relax before retaining.

1. Install sheet according to ASTM D 5036.
- B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.
- C. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- E. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roofing with side laps shingled with slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.
 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- H. Spread sealant bed over deck-drain flange at roof drains, and securely seal roofing in place with clamping ring.

3.6 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.7 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.9 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075419

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Copings.
 - 2. Roof-edge specialties.
 - 3. Roof-edge drainage systems.
 - 4. Reglets and counterflashings.

- B. Related Requirements:

- 1. Section 042000 "Unit Masonry" for reglets installed as work of Section 042000 but furnished by Section 077100.
 - 2. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
 - 3. Section 077200 "Roof Accessories" for roof hatches, and other manufactured roof accessory units.
 - 4. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

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

- 1. Meet with Unit Masonry installer to coordinate locations and requirements of reglets for roofing system interface.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For roof specialties.

- 1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
 - 2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 - 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 - 4. Detail termination points and assemblies, including fixed points.

5. Include details of special conditions.

B. Samples for Verification:

1. Include Samples of each type of roof specialty on final application material to verify finish and color selection, in manufacturer's standard sizes.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products meeting requirements that are SPRI ES-1 tested to specified design pressure.

1. Products (units) shall be manufactured in specified manufacturer's facilities. Products (units) fabricated by installer or other fabricator will not be acceptable unless fabricator can demonstrate to Architect's satisfaction that products (units) have been tested and passed SPRI Wind Design Standard.

- B. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section .

1. Provide coping, fascia, gravel stops, and edge metal from one manufacturer and single source for Project. Mixing of items and components from different manufacturers or shop-formed components is not acceptable.

- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and set quality standards for fabrication and installation.

1. Build mockup of typical roof edge as directed by Architect.
2. Build mockup of typical roof edge, including fascia gutter and downspout, approximately 10 feet long, including supporting construction, seams, attachments, and accessories.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.
- B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.8 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. SPRI Wind Design Standard: Manufacture and install roof-edge specialties tested according to SPRI ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: As indicated on Drawings.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COPINGS

- A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 feet, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
1. All components of coping, caps, corners, and system shall be manufactured by same manufacturer. Fabricated (by installer in shop or in field) components are not acceptable.
 2. All fasteners shall be concealed, unless approved by Architect prior to installation. Exposed rivets, screws, and tek screws are not acceptable. Unless attachment is intended by manufacturer to be movable, seams shall be fully welded. Open or lapped seams are not acceptable unless indicated on Shop Drawings and reviewed by Architect.
 3. Basis-of-Design Product: Subject to compliance with requirements, provide "Perma-Tite Coping" as manufactured by Metal Era Inc. or comparable product by one of the following:
 - a. Architectural Products Company.
 - b. ATAS International, Inc.
 - c. Division 7 Metals.
 - d. Exceptional Metals.
 - e. Pac-Clad.
 - f. Roofing membrane manufacturer's approved and warranted product that complies with requirements of this Section.
 4. Formed Aluminum Sheet Coping Caps: Formed aluminum of thickness determined by width of covered wall: Up to 16 inches - 0.050 inch; 16+ inches to 24 inches - 0.063 inch; 24+ inches to 36 inches - 0.080 inch.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 5. Corners: Factory mitered and continuously welded.
 - a. Corner units shall have minimum 18 inches length legs measured on inside of each leg.

6. Coping-Cap Attachment Method: Snap-on, fabricated from coping-cap material.
 - a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.

2.3 ROOF-EDGE SPECIALTIES

- A. General: All roof edge flashings, including components, shall be manufactured by same manufacturer at manufacturer's facility. Fabricated components, whether in installer's shop or in field are not acceptable.
- B. Canted Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on compression-clamped metal fascia cover in section lengths not exceeding 12 feet Insert dimension and a continuous formed galvanized-steel sheet cant, 0.028 inch thick, minimum, with extended vertical leg terminating in a drip-edge cleat. Provide matching corner units.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide "Perma-Tite Fascia" as manufactured by Metal Era Inc. or comparable product by one of the following:
 - a. Architectural Products Company.
 - b. ATAS International, Inc.
 - c. Division 7 Metals.
 - d. Exceptional Metals.
 - e. Pac-Clad.
 - f. Roofing membrane manufacturer's approved and warranted product, that complies with requirements of this Section.
 2. Formed Aluminum Sheet Fascia Covers: Aluminum sheet of thickness as determined by fascia height indicated on Drawings: Up to 4 inches - 0.040 inch; 4+ inches to 8 inches - 0.050 inch; 8+ inches to 10 inches - 0.063 inch; 10+ inches to 16 inches - 0.080 inch.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 3. Corners: Factory mitered and continuously welded.
 4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
- C. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous metal receiver with integral drip-edge cleat to engage fascia cover and secure single-ply roof membrane. Provide matching corner units.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide "Anchor-Tite Fascia" as manufactured by Metal Era Inc. or comparable product by one of the

following:

- a. Architectural Products Company.
 - b. Division 7 Metals.
 - c. Exceptional Metals.
 - d. Pac-Clad.
 - e. Roofing membrane manufacturer's approved and warranted product that complies with requirements of this Section.
2. Formed Aluminum Sheet Fascia Cover: Aluminum sheet of following thickness as determined by fascia face height indicated on Drawings: Up to 4 inches - 0.040 inch; 4+ inches to 8 inches - 0.050 inch; 8+ inches to 10 inches - 0.063 inch; 10+ inches to 16 inches - 0.080 inch.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 3. Corners: Factory mitered and continuously welded.
 4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
 5. Receiver: Manufacturer's standard material and thickness.

2.4 ROOF-EDGE DRAINAGE SYSTEMS

- A. General: All roof edge drainage systems, including components shall be manufactured by manufacturer at manufacturer's facility. Fabricated (at installer's shop or in field) components are not acceptable.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Architectural Products Company.
 2. ATAS International, Inc.
 3. Division 7 Metals.
 4. Exceptional Metals.
 5. Metal-Era, Inc.
 6. Pac-Clad.
- C. Gutters: Manufactured in uniform section lengths not exceeding 12 feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1 inch above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.
 1. Formed Aluminum: Provide thickness based on overall girth of gutter as follows: Up to 15 inches - 0.032 inch; 15+ inches to 20 inches - 0.040 inch; 20+ inches to 25 inches - 0.050 inch; 25+ inches to 30 inches - 0.063 inch.

2. Gutter Profile: according to SMACNA's "Architectural Sheet Metal Manual."
 3. Corners: Factory mitered and continuously welded.
 4. Gutter Supports: Gutter brackets and straps with finish matching the gutters.
- D. Downspouts: Plain rectangular complete with mitered elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
1. Formed Aluminum: 0.040 inch thick.
- E. Aluminum Finish: Two-coat fluoropolymer.
1. Color: As selected by Architect from manufacturer's full range.

2.5 REGLETS AND COUNTERFLASHINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cheney Flashing Company.
 2. Fry Reglet Corporation.
 3. Heckmann Building Products, Inc.
 4. Hickman Company, W. P.
 5. Metal-Era, Inc.
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
1. Stainless Steel: 0.019 inch thick.
 2. Corners: Factory mitered and continuously welded.
 3. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 4. Masonry Type, Embedded: Furnish reglets with offset top flange for embedment in masonry mortar joint to masonry installer.
- C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding 12 feet designed to snap into reglets and compress against base flashings with joints lapped, from the following exposed metal:
1. Stainless Steel: 0.019 inch thick.
- D. Stainless-Steel Finish: No. 2B (bright, cold rolled, unpolished).

2.6 MATERIALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

- B. Aluminum Sheet: ASTM B 209 , alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.

2.7 MISCELLANEOUS MATERIALS

- A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. All fasteners shall be concealed, unless approved by Architect prior to installation. Exposed rivets, screws, and tek screws are not acceptable. Unless attachment is intended by manufacturer to be movable, seams shall be fully welded. Open seams are not acceptable. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Aluminum: Aluminum or Series 300 stainless steel.
- B. Seams: Fully welded unless manufacturer intends seams to be movable.
- C. Lapped seams are not acceptable unless indicated on manufacturer's Shop Drawings and reviewed by Architect.
- D. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Coil-Coated Aluminum Sheet Finishes:
 - 1. High-Performance Organic Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish 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.

- b. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil .
- E. Finishes shall be applied at manufacturer's facility or manufacturer's supplier's facility. Finish (spray) applied at installer's shop or in field is not acceptable, unless instructed or approved in writing by manufacturer as included under manufacturer's finish warranty.
 - 1. Architect and Owner reserve right to reject shop- or field-applied coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Do not allow coatings to touch roofing membrane or other substrates not indicated

below.

2. Coat concealed side of uncoated aluminum and stainless-steel roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal concealed joints with butyl sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 COPING INSTALLATION

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.
2. Interlock face-leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's required spacing that meets performance requirements.

3.4 ROOF-EDGE SPECIALTIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to

meet performance requirements as indicated in manufacturer's written instructions.

3.5 ROOF-EDGE DRAINAGE-SYSTEM INSTALLATION

- A. General: Install components to produce a complete roof-edge drainage system according to manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.
- B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.
 - 1. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.
 - 1. Connect downspouts to underground drainage system indicated.

3.6 REGLET AND COUNTERFLASHING INSTALLATION

- A. General: Coordinate installation of reglets and counterflashings with installation of base flashings.
- B. Embedded Reglets: See Section 042000 "Unit Masonry" for installation of reglets at parapet masonry walls for use with roof counterflashing.
- C. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof hatches.
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
 - 2. Section 077100 "Roof Specialties" for manufactured fasciae, copings, gravel stops, gutters and downspouts, and counterflashing.

1.3 COORDINATION

- A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.
- B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1.4 ACTION SUBMITTALS

- A. Product Data with Shop Drawings:
 - 1. Product Data: For each type of roof accessory.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Shop Drawings: For roof accessories.
 - a. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and

field-assembled work.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.6 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

2.2 ROOF HATCH

- A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Babcock-Davis.
 - b. Bilco Company (The).
 - c. Nystrom, Inc.

- B. Type and Size: Single-leaf lid, 30 by 54 inches.
- C. Loads: Minimum 40-lbf/sq. ft. external live load and 20-lbf/sq. ft. internal uplift load.
- D. Hatch Material: Aluminum sheet.
 - 1. Thickness: Manufacturer's standard thickness for hatch size indicated.
 - 2. Finish: Mill.
- E. Construction:
 - 1. Insulation: Polyisocyanurate board.
 - a. R-Value: 12.0 according to ASTM C 1363.
 - 2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
 - 3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
 - 4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 - 5. Fabricate curbs to minimum height of 12 inches above roofing surface unless otherwise indicated.
- F. Hardware: Spring operators, hold-open arm, stainless-steel spring latch with turn handles, stainless-steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
 - 1. Provide two-point latch on lids larger than 84 inches.
- G. Safety Railing System: Roof-hatch manufacturer's standard system including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
 - 1. Height: 42 inches above finished roof deck.
 - 2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
 - 3. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
 - 4. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 - 5. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
 - 6. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members.
 - 7. Fabricate joints exposed to weather to be watertight.
 - 8. Fasteners: Manufacturer's standard, finished to match railing system.

9. Finish: Manufacturer's standard.
 - a. Color: As selected by Architect from manufacturer's full range.

2.3 METAL MATERIALS

- A. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 1. Mill Finish: As manufactured.
 2. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness and thermal resistivity as indicated.
- C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPAC2; not less than 1-1/2 inches thick.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Underlayment:
 1. Felt: ASTM D 226/D 226M, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
 2. Polyethylene Sheet: 6-mil- thick polyethylene sheet complying with ASTM D 4397.
 3. Slip Sheet: Building paper, 3 lb/100 sq. ft. minimum, rosin sized.
 4. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 5. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 6. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
 7. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

- F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- G. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane silicone polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- H. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- I. Asphalt Roofing Cement: ASTM D 4586/D 4586M, asbestos free, of consistency required for application.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install roof accessories according to manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.

3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
1. Coat concealed side of stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
 3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.
- C. Roof-Hatch Installation:
1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 2. Attach safety railing system to roof-hatch curb.
- D. Seal joints with elastomeric butyl sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780/A 780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting."
- C. Clean exposed surfaces according to manufacturer's written instructions.
- D. Clean off excess sealants.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 079200 - JOINT SEALANTS

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. Nonstaining silicone joint sealants.
 - 2. Mildew-resistant joint sealants.
 - 3. Latex joint sealants.

1.3 ACTION SUBMITTALS

- A. Product Data, Joint Sealant Schedule:
 - 1. Product Data: For each joint-sealant product.
 - 2. Joint-Sealant Schedule: Include the following information:
 - a. Joint-sealant application, joint location, and designation.
 - b. Joint-sealant manufacturer and product name.
 - c. Joint-sealant formulation.
 - d. Joint-sealant color.
- B. Samples for Verification: For each kind 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.
 - 1. Submit or resubmit appropriate color match (see Schedule in PART 3) with material sealant is required to match for final approval. If material to match is existing or previously installed, submit for final approval on Project site.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace 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 agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
 - 1. Architectural sealants shall have a VOC content of 250 g/L or less.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 NONSTAINING SILICONE JOINT SEALANTS

- A. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 795.
 - b. Pecora Corporation; 895NST.
 - c. Tremco Incorporated; Spectrem 2.

2.3 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 786-M White.
 - b. Pecora; 898 NST.
 - c. Sika; Sikasil GP.
 - d. Tremco Incorporated; Tremsil 200.

2.4 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. BASF Construction Chemicals - Building Systems; Sonolac.
- b. Pecora Corporation; AC-20.
- c. Tremco Incorporated; Tremflex 834.

2.5 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and 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), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. 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. Provide self-adhesive tape where applicable.

2.6 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 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 2. Clean porous joint substrate surfaces by brushing, grinding, 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. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by 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 or primer 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.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

- C. Install sealant backings of kind indicated 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 in subparagraphs 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 profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 CLEANING

- A. 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.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Control and expansion joints in unit masonry.
 - b. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
 - 2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement .
 - 1. Joint Locations:
 - a. Perimeter joints between interior wall surfaces and frames of doors, windows, and elevator entrances.
 - b. Other joints as indicated on Drawings.
 - 2. Joint Sealant: Acrylic latex.
 - 3. Joint-Sealant Color: Paintable.
- C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces .
 - 1. Joint Locations:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - 2. Joint Sealant: Silicone, mildew resistant, acid curing, S, NS, 25, NT.
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint Sealant Colors:
 - 1. Provide following colors, unless indicated otherwise on Drawings:
 - a. Exterior sealants used to seal around exterior windows and door frames shall match adjacent masonry mortar.
 - b. Interior sealants at windows and door frames shall be paintable (latex) white.

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 hollow-metal work.
- B. Related Requirements:
 - 1. Section 087100 "Door Hardware" Section 087111 "Door Hardware (Descriptive Specification)" for door hardware for hollow-metal doors.
 - 2. Section 099600.99 "High-performance Coatings" for preparation and priming of exterior doors and interior doors indicated to be high-performance coated.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

- A. Product Data, Shop Drawings, Schedule:
 - 1. Product Data: For each type of product.
 - a. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
 - 2. Shop Drawings: Include the following:
 - a. Elevations of each door type.

- b. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - c. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - d. Locations of reinforcement and preparations for hardware.
 - e. Details of each different wall opening condition.
 - f. Details of anchorages, joints, field splices, and connections.
 - g. Details of accessories.
 - h. Details of moldings, removable stops, and glazing.
 - i. Details of conduit and preparations for power, signal, and control systems.
3. 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 final Door Hardware Schedule.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - 1. Provide additional protection to prevent damage to 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 vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ceco Door; ASSA ABLOY.
 - 2. Curries Company; ASSA ABLOY.
 - 3. MPI Group, LLC (The).
 - 4. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - 3. Frames:
 - a. Materials: Uncoated, steel sheet, minimum thickness of 0.053 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Face welded Full profile welded.
 - 4. Exposed Finish: Prime.

2.3 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Maximum-Duty Doors and Frames: SDI A250.8, Level 4. .
 - 1. Physical Performance: Level A according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A40 coating.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Manufacturer's standard polystyrene, polyurethane, or polyisocyanurate core at manufacturer's discretion.

3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum A40 coating.
 - b. Construction: Face welded Full profile welded.
4. Exposed Finish: Prime.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 2. 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, minimum thickness of 0.042 inch, and as follows:
 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.5 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. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z 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.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Power-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.

- F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- G. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- H. Glazing: Comply with requirements in Section 088000 "Glazing."
- I. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 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 metal thickness. 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. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
 - 3. Top Edge Closures: Close top edges of doors with inverted closures of same material as face sheets.
 - 4. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 - 5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 6. 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 or as required to comply with published listing of qualified testing agency.
- C. 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. Sidelite 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.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. 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 one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - b. 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.
 6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 7. Door Silencers: Except on weather-stripped frames, 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.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- 2.7 STEEL FINISHES
- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer, except exterior doors and interior doors indicated to be high-performance coated.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
2. Exterior doors and frames and interior doors and frames indicated to be high-performance coated shall be prepared and primed as specified in Section 099600.99 "High-performance Coatings".

2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

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. 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. 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 for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
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. 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.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Install door silencers in frames before grouting.
 - d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - f. Field apply bituminous coating to backs of frames that will be 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 power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 5. 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.
 6. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 7. 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 Steel Doors:

- a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
- b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
- c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
- d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

D. Glazing: Comply with installation requirements in Section 088000 "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, except exterior doors and frames and interior doors and frames indicated to be high-performance coated shall be prepared and primer touched up as specified in Section 0990600.99 "High-performance Coatings".
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections, except exterior doors and frames and interior doors and frames indicated to have high-performance coatings shall be cleaned and touchup coated as specified in Section 0990600.99 "High-performance Coatings".

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 ACTION SUBMITTALS

A. Product Data with Shop Drawings:

- 1. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- 2. 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.
 - a. Indicate dimensions and locations of mortises and holes for hardware.
 - b. Indicate dimensions and locations of cutouts.
 - c. Indicate requirements for veneer matching.
 - d. Indicate doors to be factory finished and finish requirements.
 - e. Indicate fire-protection ratings for fire-rated doors.

B. Samples for Verification:

- 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
- 2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges

representing actual materials to be used.

- a. Provide samples for each species of veneer and solid lumber required.
 - b. Finish veneer-faced door samples with same materials proposed for factory-finished doors.
3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors from single manufacturer.
- B. 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.
 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on 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 ambient temperature and humidity conditions at occupancy levels 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. Marshfield Door Systems, Inc.
 5. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

- A. WDMA I.S.1-A Performance Grade:
1. Heavy Duty unless otherwise indicated.
 2. Extra Heavy Duty: Classrooms, public toilets, janitor's closets, assembly spaces, exits.
 3. Standard Duty: Closets (not including janitor's closets), private toilets.
- B. Particleboard-Core Doors:
1. Particleboard: ANSI A208.1, Grade LD-2.
 2. Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
- C. Structural-Composite-Lumber-Core Doors:
1. Structural Composite Lumber: WDMA I.S.10.
 - a. Screw Withdrawal, Face: 700 lbf.
 - b. Screw Withdrawal, Edge: 400 lbf.
- D. 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.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: Red oak.
3. Cut: Plain sliced (flat sliced).
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. Exposed Vertical Edges: Same species as faces.
8. Core: Particleboard Either glued wood stave or structural composite lumber.
9. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.4 LOUVERS AND 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. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch- thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 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. Finish doors at factory.
- C. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Transparent Finish:
- 1. Grade: Premium.
 - 2. Finish: WDMA TR-6 catalyzed polyurethane.
 - 3. Staining: Match Architect's sample.
 - 4. Effect: Semifilled finish, produced by applying an additional finish coat to partially fill the wood pores.
 - 5. Sheen: Satin.

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 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

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. Storefront framing for punched openings (fixed window).

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data, Shop Drawings, and Submittals:
 - 1. Product Data: For each type of product.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
 - a. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
 - b. Include full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
 - 1) Joinery, including concealed welds.
 - 2) Anchorage.
 - 3) Expansion provisions.
 - 4) Glazing.
 - 5) Flashing and drainage.

- c. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- B. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
 - 1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.
- C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
 - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.
- C. Single Source: System manufacturer shall manufacture framing, finish, and glass to achieve single source.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including, but not limited to, excessive deflection.
 - b. Noise or vibration created by wind and thermal and structural movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water penetration through fixed glazing and framing areas.
 - e. Failure of operating components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 - 2. Failure also includes the following:
 - a. Thermal stresses transferring to building structure.
 - b. Glass breakage.
 - c. Noise or vibration created by wind and thermal and structural movements.
 - d. Loosening or weakening of fasteners, attachments, and other components.
 - e. Failure of operating units.
- B. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

C. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.

D. Structural: Test according to ASTM E 330/E 330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of at a static-air-pressure differential of 6.24 lbf/sq. ft..

F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

G. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas as a system shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient (SHGC): Fixed glazing and framing areas as a system shall have SHGC of no greater than 0.40 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas as a system shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.

H. Thermal Movements: Allow for thermal movements resulting from ambient and surface

ALUMINUM-FRAMED ENTRANCES AND
STOREFRONTS

temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 - c. Interior Ambient-Air Temperature: 75 deg F.

2.3 STOREFRONT SYSTEMS

- A. Basis-of-Design Product: Exterior Applications: Subject to compliance with requirements, provide "Trifab 451 UT" framing system and "500T" Thermal Entrance Doors as manufactured by Kawneer North America or comparable product by one of the following:
 1. EFCO Corporation.
 2. Oldcastle BuildingEnvelope.
 3. Tubelite Inc.
 4. YKK AP America Inc.
- B. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 1. Exterior Framing Construction: Thermally broken.
 2. Glazing System: Retained mechanically with gaskets on four sides.
 3. Glazing Plane: Center, unless otherwise indicated.
 4. Finish: Clear anodic finish as indicated.
 5. Fabrication Method: Field-fabricated stick system.
 6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
- C. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- D. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- E. Venting Windows: Manufacturer's standard units, complying with AAMA/WDMA/CSA 101/1.S.2/A440, with self-flashing mounting fins, and as follows:
 1. Window Type: Awning .
 2. Minimum Performance Class: AW.
 3. Minimum Performance Grade: 50 .

4. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:
 - a. Cam-action sweep sash lock and keeper at meeting rails.
 - b. Spring-loaded, snap-type lock at jambs.
 - c. Steel or bronze operating arms.
 - d. Limit Devices: Concealed friction adjuster and adjustable stay bar limit devices designed to restrict sash opening.
 - 1) Limit clear opening to 4 inches for ventilation; with custodial key release.
5. Insect Screens: Provide removable insect screen on each operable exterior sash, with screen frame finished to match window unit, complying with SMA 1004 or SMA 1201, and as follows:
 - a. Fabric: Manufacturer's standard aluminum wire fabric or glass-fiber mesh fabric.
6. Glazing: Same as adjacent aluminum-framed entrances and storefront glazing.
7. Finish: Match adjacent aluminum-framed entrances and storefront finish.

2.4 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."

2.5 MATERIALS

- A. Sheet and Plate: ASTM B 209.
- B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
- C. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
- D. Structural Profiles: ASTM B 308/B 308M.

2.6 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- D. Subsills and subsill extensions: Manufacturer's standards.
- E. Subframes and receptors (for retrofit applications): Manufacturer's standard thermally-broken system.
- F. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Fabricate components that, when assembled, have the following characteristics:
 1. Profiles that are sharp, straight, and free of defects or deformations.
 2. Accurately fitted joints with ends coped or mitered.
 3. Physical and thermal isolation of glazing from framing members.
 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 5. Provisions for field replacement of glazing from exterior .
 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- D. Storefront Framing: Fabricate components for assembly using screw-spline system.
- E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

A. General:

- 1. Comply with manufacturer's written instructions.
- 2. Do not install damaged components.
- 3. Fit joints to produce hairline joints free of burrs and distortion.
- 4. Rigidly secure nonmovement joints.
- 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
- 6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

- 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
- 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed, as specified in Section 079200 "Joint Sealants," to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 088000 "Glazing."

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

- 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
- 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
- 3. Alignment:

- a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
 - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 084113

SECTION 085113 - ALUMINUM WINDOWS

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 aluminum windows for exterior locations.
- B. Related Requirements:
 - 1. Section 077100 "Roof Specialties" for coordinating finish with fenestration units.
 - 2. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.
 - 3. Section 084413 "Glazed Aluminum Curtain Walls" for coordinating finish among aluminum fenestration units.
 - 4. Section 088000 "Glazing" for glass in windows.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For aluminum windows.
 - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- B. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
 - 1. Exposed Finishes: 2 by 4 inches .
 - a. Color Samples shall be submitted on same material as final application. Photographic, digital, or other Sample material is not acceptable.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.
 - c. Aluminum Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: AAMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: AW.
 - 2. Minimum Performance Grade: 80.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.50 Btu/sq. ft. x h x deg F.
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.
- E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, as follows:
 - 1. CRF for frame: Not less than 70.
 - 2. CRF for glass: Not less than 66.
- F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.
- G. Sound Transmission Class (STC): Rated for not less than 33 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- H. Outside-Inside Transmission Class (OITC): Rated for not less than 26 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.
- I. Forced Entry Resistance: Grade 10 in compliance with ASTM F 588.

2.3 ALUMINUM WINDOWS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide "OptiQ Ultra Thermal Windows AA4325 Series" as manufactured by Kawneer, an Alcoa Company or comparable product by one of the following:
 - 1. EFCO Corporation.
 - 2. Graham Architectural Products Corporation.
 - 3. Peerless Products Inc.
 - 4. Wausau Window and Wall Systems; Apogee Wausau Group.
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
 - 1. Awning: Project out.
- C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact and is similar to construction utilized in "Basis of Design" model as determined by Architect.
- D. Glazing: Glass and glazing system are specified in Section 088000 "Glazing".
- E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
 - 1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- F. Projected Window Hardware:
 - 1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
 - a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.
 - 2. Hinges: Non-friction type, not less than two per sash.
 - 3. Lock: Lever handle and cam-action lock with keeper.
 - 4. Limit Devices: Concealed support arms with adjustable, limited, hold-open limit devices designed to restrict sash opening.

- a. Limit clear opening to 4 inches for ventilation; with custodial key release.
- G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

- A. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- B. Panning Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.
- C. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

2.5 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
 - 1. Type and Location: Full, inside for project-out sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
 - 1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
- C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.
 - 1. Wire-Fabric Finish: Natural bright.

2.6 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.

- D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
- C. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
 - 2. Air-Infiltration Testing:

- a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
 3. Water-Resistance Testing:
 - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.
- 3.4 ADJUSTING, CLEANING, AND PROTECTION
- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
 - B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 1. Keep protective films and coverings in place until final cleaning.
 - C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
 - D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085113

SECTION 087100 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
- C. Related Sections:
 - 1. Division 08 Section “Door Hardware Schedule”.
 - 2. Division 08 Section “Hollow Metal Doors and Frames”.
 - 3. Division 08 Section “Flush Wood Doors”.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.
- E. Standards: All hardware specified herein shall comply with the following industry standards:
 - 1. ANSI/BHMA Certified Product Standards - A156 Series
 - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
 - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
- E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
- F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors.

Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

- H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of the hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods:
 - 1. Seven years for heavy duty cylindrical (bored) locks and latches.
 - 2. Five years for exit hardware.
 - 3. Twenty five years for manual surface door closer bodies.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 HANGING DEVICES

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.

- d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
 - a. Hager Companies (HA).
 - b. Ives (IV).
 - c. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK).
 - d. Stanley Hardware (ST).

2.3 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:
 - a. Door Controls International (DC).
 - b. Ives (IV).
 - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - d. Trimco (TC).

- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
 5. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Ives (IV).
 - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - d. Trimco (TC).

2.4 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinders: Original manufacturer cylinders complying with the following:
1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
 2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 5. Keyway: Manufacturer's Patented.
- C. Patented Cylinders: ANSI/BHMA A156.5, Grade 1, certified patented cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
1. Manufacturers:
 - a. Medeco (MC) - X4 Series.
 - b. No Substitutions.
- D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
 2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
 3. New System: Key locks to a new key system as directed by the Owner.
- E. Key Quantity: Provide the following minimum number of keys:
1. Change Keys per Cylinder: Two (2)
 2. Master Keys (per Master Key Level/Group): Five (5).
 3. Construction Keys (where required): Ten (10).
- F. Construction Keying: Provide construction master keyed cylinders.
- G. Key Registration List (Bitting List):
1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
 2. Provide transcript list in writing or electronic file as directed by the Owner.
- H. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
1. Manufacturers:
 - a. Lund Equipment (LU).
 - b. MMF Industries (MM).
 - c. Telkee (TK).

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified.
1. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt.
 2. Locks are to be non-handed and fully field reversible.
 3. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.2 requirements to 9 million cycles.
 4. Manufacturers:
 - a. Sargent Manufacturing (SA) – 10 Line.
 - b. No Substitution.

2.6 AUXILIARY LOCKS

- A. Mortise Deadlocks, Small Case: ANSI/BHMA A156.36, Grade 1, small case mortise type deadlocks constructed of heavy gauge wrought corrosion resistant steel. Steel or stainless steel bolts with a 1" throw and hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other specified locksets.
 - 1. Manufacturers:
 - a. Sargent Manufacturing (SA) - 4870 Series.
 - b. No Substitution.

2.7 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
 - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
 - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
 - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
 - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
 - 4. Dustproof Strikes: BHMA A156.16.

2.8 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
 - 1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
 - 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.

3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
 4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
 5. Motorized Electric Latch Retraction: Devices with an electric latch retraction feature must use motors which have a maximum current draw of 600mA. Solenoid driven latch retraction is not acceptable.
 6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
 7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
 8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
 9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
 11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
 - a. Sargent Manufacturing (SA) - 80 Series.
 - b. Von Duprin (VD) – 98/99 Series
- C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable-iron top and bottom retainers and a primed paint finish.
1. Provide keyed removable feature where specified in the Hardware Sets.
 2. Provide stabilizers and mounting brackets as required.
 3. Manufacturers:

- a. Sargent Manufacturing (SA) - 980S Series.
- b. Von Duprin (VD) – 4950/9950 Series.

2.9 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

- 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
- 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
- 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
- 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
- 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
- 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

- 1. Manufacturers:
 - a. Sargent Manufacturing (SA) – 281
 - b. LCN Closers (LC) – 4040XP Series.

2.10 ARCHITECTURAL TRIM

A. Door Protective Trim

- 1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.

2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, .050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Hager Companies (HA).
 - b. Ives (IV).
 - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - d. Trimco (TC).

2.11 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. Hager Companies (HA).
 - b. Ives (IV).
 - c. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
 - d. Trimco (TC).

2.12 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and

provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. National Guard Products (NG).
 - 2. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).
 - 3. Reese Enterprises, Inc. (RE).
 - 4. Zero Products (ZE).

2.13 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.14 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating 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.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

B. The supplier is responsible for handing and sizing all products as listed in the door hardware sets. Quantities listed are for each pair of doors, or for each single door.

C. Manufacturer's Abbreviations:

1. MK - McKinney
2. RO - Rockwood
3. SA - Sargent
4. AD - Adams Rite
5. MC - Medeco
6. HS - HES
7. PE - Pemko
8. OT - OTHER
9. SU - Securitron
10. DJ - Don-Jo

Hardware Sets

Set: 1.0 – NOT USED

Set: 2.0 – NOT USED

Set: 3.0 – NOT USED

Set: 4.0

Description: Retro-fit: Panic Egress Pair - Lockable

| | | | |
|-----------------------|-----------------------|-------|----|
| 1 Removable Mullion | L980S | PC | SA |
| 2 Exit Device (Lever) | LC 43 8813 ETJ | US32D | SA |
| 2 Mortise Cylinder | 100200N as req'd | 26 | MC |
| 1 Mullion Cylinder | 60 980C1 for I/C Core | US26D | SA |
| 1 I/C Core | 320201N | 26 | MC |
| 1 Filler Plates | Hinge/Strike as req'd | | RO |
| 1 Balance of Hardware | Re-use Existing | | OT |

Notes: Existing Door x Existing Frame.

Verify hardware preparations in existing door and frame. Revise hardware set as required for retrofit capability.

Entry by key when locked, lever trim when unlocked.
Free egress at all times.

Set: 5.0 – NOT USED

Set: 6.0

Description: Panic Egress Pair - Lockable

| | | | | |
|---|----------------------|--------------------------|-------|----|
| 6 | Hinge (heavy weight) | T4A3786 NRP | US26D | MK |
| 1 | Removable Mullion | L980S | PC | SA |
| 2 | Exit Device (Lever) | LC 43 8813 ETJ | US32D | SA |
| 2 | Mortise Cylinder | 100200N as req'd | 26 | MC |
| 1 | Mullion Cylinder | 60 980C1 for I/C Core | US26D | SA |
| 1 | I/C Core | 320201N | 26 | MC |
| 2 | Door Closer | 351 O / 351 P10 as req'd | EN | SA |
| 2 | Kick Plate | K1050 8" HGT x BEV x CSK | US32D | RO |
| 2 | Door Stop | 406/409/441CU | US26D | RO |
| 2 | Silencer | 608 | | RO |

Notes: New Door & Frame.

Entry by key when locked, lever trim when unlocked.
Free egress at all times.

Set: 7.0

Description: Retro-fit: Panic Egress - Classroom Function

| | | | | |
|---|---------------------|-----------------------|-------|----|
| 1 | Exit Device (Lever) | LC 43 8813 ETJ | US32D | SA |
| 1 | Mortise Cylinder | 100200N as req'd | 26 | MC |
| 1 | Filler Plates | Hinge/Strike as req'd | | RO |

Notes: Existing Door x Existing Frame.

Verify existing hardware preparations in door and frame.
Revise hardware set as required for retrofit capability.

Entry by key when locked, lever trim when unlocked.
Free egress at all times.

Set: 8.0

Description: Retro-fit: Panic Egress Pair x NL Function x Cylinder Dogging

| | | | | |
|---|-----------------------|-------------------|-------|----|
| 1 | Removable Mullion | L980S | PC | SA |
| 1 | Exit Device (EO x CD) | 16 43 8810 PTB | US32D | SA |
| 1 | Exit Device (NL x CD) | LC 16 43 8804 PSB | US32D | SA |
| 2 | Mortise Cylinder | 100200N as req'd | 26 | MC |

| | | | | |
|---|------------------|-----------------------|-------|----|
| 1 | Mullion Cylinder | 60 980C1 for I/C Core | US26D | SA |
| 1 | Rim Cylinder | 100400xN as req'd | 26 | MC |
| 1 | I/C Core | 320201N | 26 | MC |
| 1 | Filler Plates | Hinge/Strike as req'd | | RO |

Notes: Existing Door x Existing Frame.

Verify existing hardware preparations in door and frame.
Revise hardware set as required for retrofit capability.

Entry by key when locked. Free egress at all times.
Push/Pull operation by exit device dogging with lock cylinder.

Set: 9.0

Description: Push/Pull Function - Lockable

| | | | | |
|---|------------------|--------------------------|-------|----|
| 3 | Hinge | TA2314 | US26D | MK |
| 1 | Mortise Deadlock | LC 4877 | US26D | SA |
| 1 | Mortise Cylinder | 100200N as req'd | 26 | MC |
| 1 | Push Plate | 70E | US32D | RO |
| 1 | Pull Plate | BF 110x70C | US32D | RO |
| 1 | Door Closer | 351 O / 351 P10 as req'd | EN | SA |
| 1 | Kick Plate | K1050 8" HGT x BEV x CSK | US32D | RO |
| 1 | Door Stop | 406/409/441CU | US26D | RO |
| 3 | Silencer | 608 | | RO |

Notes: New Door x New Frame.

Set: 10.0

Description: Privacy Function x Closer

| | | | | |
|---|--------------|--------------------------|-------|----|
| 3 | Hinge | TA2314 | US26D | MK |
| 1 | Privacy Lock | 28 10U65 GL | US26D | SA |
| 1 | Door Closer | 351 O / 351 P10 as req'd | EN | SA |
| 1 | Kick Plate | K1050 8" HGT x BEV x CSK | US32D | RO |
| 1 | Door Stop | 406/409/441CU | US26D | RO |

Notes: New Door x New Frame.

Set: 11.0

Description: Push/Pull Function

| | | | | |
|---|-------------|--------------------------|-------|----|
| 3 | Hinge | TA2314 | US26D | MK |
| 1 | Push Plate | 70E | US32D | RO |
| 1 | Pull Plate | BF 110x70C | US32D | RO |
| 1 | Door Closer | 351 O / 351 P10 as req'd | EN | SA |
| 1 | Kick Plate | K1050 8" HGT x BEV x CSK | US32D | RO |
| 1 | Door Stop | 406/409/441CU | US26D | RO |
| 3 | Silencer | 608 | | RO |

Notes: New Door & Frame.

Set: 12.0

Description: Office Function

| | | | | |
|---|------------------|-------------------|-------|----|
| 3 | Hinge | TA2714 NRP | US26D | MK |
| 1 | Office Lock | LC 28 10G05 GJ | US26D | SA |
| 1 | KIL/KIK Cylinder | 2020xxxN as req'd | 26 | MC |
| 1 | Door Stop | 406/409/441CU | US26D | RO |
| 3 | Silencer | 608 | | RO |

Notes: New Door & Frame.

Set: 13.0

Description: Passage Function

| | | | | |
|---|---------------|---------------|-------|----|
| 3 | Hinge | TA2714 NRP | US26D | MK |
| 1 | Passage Latch | 28 10U15 GJ | US26D | SA |
| 1 | Door Stop | 406/409/441CU | US26D | RO |
| 3 | Silencer | 608 | | RO |

Notes: New Door & Frame.

Set: 14.0 – NOT USED

Set: 15.0 – NOT USED

Set: 16.0 – NOT USED

Set: 17.0 – NOT USED

Set: 18.0

Description: Retro-fit: Lockset x Wrap Plate for Classrooms

| | | | | |
|---|---------------------------------|-------------------|-------|----|
| 1 | Dormitory Lock | LC 28 10G54 GJ | US26D | SA |
| 1 | KIL/KIK Cylinder | 2020xxxN as req'd | 26 | MC |
| 1 | Wrap Plate for Cylindrical Lock | 9K-CW (verify) | | DJ |
| 1 | Balance of Hardware | Re-use Existing | | OT |

Notes: Existing Door & Frame.

Verify strike preparations in existing hollow metal frame.
Revise hardware set as required for retrofit capability.

Set: 19.0

Description: Retro-fit: New Cylinder for Existing Lockset or Panic Exit Hardware

| | | | | |
|---|---------------------|-------------------|----|----|
| 1 | Mortise Cylinder | 100200N as req'd | 26 | MC |
| | | or | | |
| 1 | Rim Cylinder | 100400xN as req'd | 26 | MC |
| | | or | | |
| 1 | KIL/KIK Cylinder | 2020xxxN as req'd | 26 | MC |
| 1 | Balance of Hardware | Re-use Existing | | OT |

Notes: Existing Door & Frame.

Field verify existing locking/latching hardware and supply only cylinder as required to establish a new, patented master key system.

Set: 20.0

Description: Retro-fit: Existing Exterior Openings

| | | | | |
|---|---------------------|------------------------|----|----|
| 1 | Mortise Cylinder | 100200N as req'd | 26 | MC |
| | | or | | |
| 1 | Rim Cylinder | 100400xN as req'd | 26 | MC |
| | | or | | |
| 1 | KIL/KIK Cylinder | 2020xxxN as req'd | 26 | MC |
| 1 | Door Contact / RX | By Security Contractor | | SU |
| 1 | Balance of Hardware | Re-use Existing | | OT |

Notes: Existing Door & Frame.

Field verify existing locking/latching hardware and supply cylinder as required to establish a new, patented master key system.

Set: 21.0 – NOT USED

Set: 22.0 – NOT USED

END OF SECTION 087100

SECTION 088000 - GLAZING

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. Glass for windows and doors.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

- A. Product Data, Glazing Schedule, :
 - 1. Product Data: For each type of product.
 - 2. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12

inches square.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1.9 WARRANTY

- A. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

- 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in glass schedules or comparable product by one of the following:
 - 1. AGC Glass Company North America, Inc.
 - 2. Cardinal Glass Industries.
 - 3. Guardian Industries Corp.; SunGuard.
 - 4. Oldcastle BuildingEnvelope.
 - 5. Pilkington North America.
 - 6. PPG Industries, Inc.
 - 7. Trulite Glass & Aluminum Solutions, LLC.
 - 8. Vetrotech Saint-Gobain.
 - 9. Viracon, Inc.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
 - 1. Obtain tinted glass from single source from single manufacturer.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 - 1. Design Wind Pressures: As indicated on Drawings.
 - 2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 - 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- D. Thermal and Optical Performance Properties: Provide glass with performance properties

specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: "Glazing Manual."
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
1. Minimum Glass Thickness for Exterior Lites: 6 mm.
 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- E. Strength: Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
 - 2. Perimeter Spacer: Stainless steel.
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 804.3 tape, where indicated.
 - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
 - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
 - 1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and

other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- D. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- E. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- F. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- G. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- H. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry

surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC GLASS SCHEDULE

- A. Glass Type TG-1: Clear fully tempered float glass.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.

3.8 INSULATING GLASS SCHEDULE

- A. Glass Type IG-1: Low-E-coated, clear insulating glass.

1. Basis-of-Design Product: "SunGuard SuperNeutral 54" as manufactured by Guardian Industries Corp. .
2. Overall Unit Thickness: 1 inch.
3. Minimum Thickness of Each Glass Lite: 6 mm.
4. Outdoor Lite: Fully tempered float glass.
5. Interspace Content: Argon.
6. Indoor Lite: Fully tempered float glass.
7. Low-E Coating: Sputtered on second surface.
8. Shading Coefficient: 0.32 maximum.
9. U-Factor: 0.29 maximum.
10. Visible Light Transmittance: 54 percent minimum.
11. Solar Heat Gain Coefficient: 0.28 maximum.
12. Safety glazing required.

END OF SECTION 088000

SECTION 089000 - LOUVERS AND VENTS

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. Related Sections:
 - 1. Section 081113 "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: Determine loads based on pressures as indicated on Drawings.
- B. 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.
- C. 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 ACTION SUBMITTALS

A. Product Data with Shop Drawings:

1. Product Data: For each type of product indicated.
 - a. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
2. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
 - a. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
 - b. Show mullion profiles and locations.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.
- B. 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 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
- B. Fasteners: Use types and sizes to suit unit installation conditions.
 1. Use tamper-resistant 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.
- C. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal

to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 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. Maintain equal louver blade spacing to produce uniform appearance.
- C. 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.
 - 2. Sills shall slope away from opening to drain water and not allow water to accumulate.
- D. Include supports, anchorages, and accessories required for complete assembly.
- E. 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. 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.
- F. Provide subsills made of same material as louvers for recessed louvers.
- G. Join frame members to each other and to fixed louver blades with fillet welds, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Drainable-Blade Louver:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide ESD-435 as manufactured by Greenheck Fan Corporation or comparable product by one of the following:
 - a. Airolite Company, LLC (The)).
 - b. American Warming and Ventilating, Inc.; a Mestek company.
 - c. Construction Specialties, Inc.

- d. Industrial Louvers, Inc.
 - e. Louvers & Dampers, Inc.; a division of Mestek, Inc.
 - f. Reliable Products, Inc.
 - g. Ruskin Company; Tomkins PLC.
- 2. Louver Depth: 6 inches.
 - 3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
 - 4. Mullion Type: Exposed.
 - 5. Louver Performance Ratings:
 - a. Free Area: Not less than 7.5 sq. ft. for 48-inch- wide by 48-inch- high louver.
 - b. Point of Beginning Water Penetration: Not less than 1050 fpm.
 - c. Air Performance: Not more than 0.15-inch wg static pressure drop at 1000-fpm free-area intake velocity.

- 6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

LOUVER SCREENS

- B. General: Provide screen at each exterior louver.
 - 1. Screen Location for Fixed Louvers: Interior face.
 - 2. Screening Type: Bird screening.
- C. Secure screen frames to louver frames with stainless-steel machine screws, spaced a maximum of 6 inches from each corner and at 12 inches o.c.
- D. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 - 1. Metal: Same kind and form of metal as indicated for louver to which screens are attached. Reinforce extruded-aluminum screen frames at corners with clips.
 - 2. Finish: Same finish as louver frames to which louver screens are attached.
 - 3. Type: Non-rewirable, U-shaped frames.
- E. Louver Screening for Aluminum Louvers:
 - 1. Bird Screening: Aluminum, 1/2-inch- square mesh, 0.063-inch wire.

2.4 FINISHES, GENERAL

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

2.5 ALUMINUM FINISHES

- A. Finish louvers after assembly.

- B. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

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 and vents 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 galvanized and 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 Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers and vents 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 092216 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior partitions.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Carpentry" for blocking in interior and exterior walls where required.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For steel studs and runners and firestop tracks,, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40 or coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40.
- B. Studs and Tracks: ASTM C 645.
 - 1. Steel Studs and Tracks:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) ClarkDietrich Building Systems; "ProSTUD 20".
 - 2) MarinoWARE; Viper Stud "Viper 20":
 - a) Minimum Stud Base-metal Thickness/Yield Strength: 0.0195 inch/57 ksi.
 - b) Minimum Track Base-metal Thickness/Yield Strength: 0.0195 inch/50 ksi
 - 3) MBA Building Supplies; "ProSTUD".
 - 4) Telling Industries.
 - b. Depth: As indicated on Drawings.
- C. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 1-1/2-inch minimum vertical movement.
 - 2. Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: provide one of the following:
 - 1) BlazeFrame Industries; Bare Slotted Track (BST/BST 2).
 - 2) ClarkDietrich Building Systems; SLP-TRK Slotted Deflection Track.
 - 3) MBA Building Supplies; Slotted Deflecto Track.
 - 4) Telling Industries; .
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

- E. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: 1-1/2 inches.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
- F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.0179 inch.
 - 2. Depth: As indicated on Drawings.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
 - 2. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
- E. Direct Furring:
 - 1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

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. Section Includes:
 - 1. Interior gypsum board.
- B. Related Requirements:
 - 1. Section 061053 "Miscellaneous Carpentry" for blocking in interior walls.
 - 2. Section 092216 "Non-Structural Metal Framing" for non-structural steel framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Product Data: For each type of product.
 - a. Submit UL Designation information for fire-rated assemblies with Product Data.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install gypsum panels until installation areas are enclosed and conditioned.

- C. Do not install panels that are wet, moisture damaged, or 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 PERFORMANCE REQUIREMENTS

- 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. UL designation indicated on Drawings is specific to manufacturer listed for that designation. If a manufacturer's products other than products specific to indicated designation are utilized, provide UL designation for that manufacturer's tested assembly and products.
- 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.

2.2 GYPSUM BOARD, GENERAL

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

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation.
 - b. Continental Building Products, LLC.
 - c. Georgia-Pacific Building Products.
 - d. National Gypsum Company.
 - e. USG Corporation.
 - 2. Thickness: 5/8 inch.

3. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, or rolled zinc, plastic, or paper-faced galvanized-steel sheet.
2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - e. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints 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 drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.

B. 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.

- C. 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.
- D. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Accumetric LLC.
 - b. Franklin International.
 - c. Grabber Construction Products.
 - d. Hilti, Inc.
 - e. Pecora Corporation.
 - f. Specified Technologies, Inc.
 - g. USG Corporation.
 - 2. Sealant shall have a VOC content of 250 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. 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 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.

- C. 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.
- D. 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.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. 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.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. 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.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. 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 instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
 - 1. Install where indicated and where Drawings indicate Wall Type containing an "i".

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Type X: Vertical surfaces unless otherwise indicated.
- B. Single-Layer Application:

1. 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.
2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 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 according to ASTM C 840 and in specific locations approved by Architect for visual effect.
 1. Minimum location of control joints:
 - a. All doors (from both jambs to top of GWB wall).
 - b. Windows shall be reviewed with recommendations on control joint locations.
 - c. Large openings where opening is not framed with gypsum wallboard on all four sides.
 2. Distance between control joints:
 - a. Partitions: 30 feet maximum in either direction.
 - b. Interior ceilings: 30 feet maximum in either direction.
 3. At control joint locations:
 - a. Leave a 1/2 inch continuous opening between gypsum board for insertion of surface mounted joint.
 - b. Interrupt framing with a 1/2 inch gap, wherever there is a control joint in structure.
 - c. Provide separate supports for each control joint flange.
 - d. Provide an adequate seal or safin insulation behind control joint where sound or fire ratings are prime consideration.
- 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.

3.5 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 for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. 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. Metal edge strips.
- B. Related Sections:
 - 1. Section 012300 "Alternates".
 - 2. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

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 with Shop Drawings:
 - 1. Product Data: For each type of product indicated.
 - 2. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile

substrates and finished tile surfaces.

B. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Full-size units of each type of trim and accessory.
3. Metal edge strips in 6-inch lengths.

1.5 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type 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. Waterproof membrane.
2. Joint sealants.
3. Metal edge strips.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of wall tile installation.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 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.

1.7 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 TCA 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 TILE PRODUCTS

- A. Tile Type CWT : Glazed wall tile.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Imola; Slash or comparable product by one of the following:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Daltile; Division of Dal-Tile International Inc.
 - 2. Module Size: 3 x 12 inches.
 - 3. Thickness: 5/16 inch.

4. Face: Pattern of design indicated, with manufacturer's standard edges.
5. Finish: Bright, clear glaze.
6. Tile Color and Pattern:
 - a. CWT- 1: Yellow SLSH 73Y with Plain Face.
 - b. CWT-2: Yellow SLSH1 73Y with Textured Face.
7. Grout Color: As selected by Architect from manufacturer's full range.
8. Mounting: Factory, back mounted.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Internal Corners: Field-buttet square corners.

2.3 SETTING MATERIALS

A. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; a subsidiary of H. B. Fuller Company.
2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.1.

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. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; a subsidiary of H. B. Fuller Company.
2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.

4. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- C. Medium-Bed, Latex-Portland Cement Mortar: Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of 5/8 inch.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; a subsidiary of H. B. Fuller Company.
 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 3. Provide prepackaged, dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive at Project site.

2.4 GROUT MATERIALS

- A. Polymer-Modified Tile Grout: ANSI A118.7.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bonsal American; an Oldcastle company.
 - b. Bostik, Inc.
 - c. Custom Building Products.
 - d. Laticrete International, Inc.
 - e. MAPEI Corporation.
 - f. TEC; a subsidiary of H. B. Fuller Company.
 2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
 3. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
- B. Grout for PregROUTed Tile Sheets: Same product used in factory to pregROUT tile sheets.

2.5 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 Division 07 Section "Joint Sealants."

1. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.
- B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.
- C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant.
 - b. Dow Corning Corporation; Dow Corning 786.
 - c. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
 - d. Laticrete International, Inc.; Latacil Tile & Stone Sealant.
 - e. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
 - f. Tremco Incorporated; Tremsil 600 White.
- D. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc.; Chem-Calk 550.
 - b. Degussa Building Systems; Sonneborn Sonolastic SL 2.
 - c. Pecora Corporation; Dynatrol II-SG.
 - d. Sika Corporation; Sikaflex-2c SL.
 - e. Tremco Incorporated.; THC-901.
- E. Chemical-Resistant Sealants: For chemical-resistant floors, provide chemical-resistant elastomeric sealant of type recommended and produced by chemical-resistant mortar and grout manufacturer for type of application indicated, with proven service record and compatibility with tile and other setting materials, and with chemical resistance equivalent to mortar/grout.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Atlas Minerals & Chemicals, Inc.

2.6 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. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless-steel, ASTM A 666, 300 Series exposed-edge material.
- C. 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.
- D. 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.

2.7 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 installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
 - 3. 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 adhesives or 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 TCA's "Handbook for Ceramic Tile Installation" for TCA 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 TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
- 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. 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.
- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 1. Glazed Wall Tile: 1/16 inch.
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. 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 Division 07 Section "Joint Sealants."

3.4 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 epoxy and 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.

3.5 INTERIOR TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations, Masonry or Concrete:

1. Tile Installation W202: Thin-set mortar; TCA W202.
 - a. Tile Type: CWT.
 - b. Thin-Set Mortar: Dry-set Latex- Medium-bed, latex- portland cement mortar.
 - c. Grout: Polymer-modified unsanded 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. Section includes acoustical panels and exposed suspension systems for interior ceilings.

1.3 ACTION SUBMITTALS

- A. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:
 - 1. Acoustical Panels: Set of 6-inch- square Samples of each type, color, pattern, and texture.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

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. Acoustical Ceiling Units: Full-size panels equal to 2 percent of quantity installed, but not less than one box.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site 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.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, 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. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Class A according to ASTM E 1264.
 - 2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- C. 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 according to ASTM E 795.

- D. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.4 NON-DIRECTIONAL FISSURED PANEL FOR ACOUSTICAL PANEL CEILING APC-1

- A. Products:
 - 1. Fine Fissured, Armstrong World Industries, Inc.
 - 2. Baroque, CertainTeed Corp. (The).
 - 3. Radar Climaplus, USG Interiors, Inc.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 2.
 - 2. Pattern: As indicated by manufacturer's designation.
- C. Color: White.
- D. LR: Not less than 0.80.
- E. NRC: Not less than 0.55.
- F. CAC: Not less than 33.
- G. Edge Detail: Square.
- H. Size: As indicated on Drawings.
- I. Suspension System: Provide suspension system that complies with requirements in Part 2 "Non-Fire-Resistance-Rated, Direct-Hung Suspension Systems", Article for wide-face, capped, double-web, steel suspension system.

2.5 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Armstrong World Industries, Inc.
 2. CertainTeed Corporation.
 3. Chicago Metallic Corporation.
 4. United States Gypsum Company.
- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
- C. 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, G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.
1. Structural Classification: Intermediate-duty system.
 2. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 3. Face Design: Flat, flush.
 4. Cap Material: Cold-rolled steel.
 5. Cap Finish: Painted white.

2.6 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion Postinstalled bonded anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633, Class SC 1 (mild) service condition.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.135-inch- diameter wire.
- C. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 079200 "Joint Sealants."

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.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. 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 unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical panel ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- 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 to structure 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. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. 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.
 7. 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.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. 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.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- D. 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 precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 3. Protect lighting fixtures and air ducts according to requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.

- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

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.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

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:
 - 1. Section 096519 "Resilient Tile Flooring" for resilient floor tile.

1.3 ACTION SUBMITTALS

- A. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

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 RESILIENT BASE (VWB)

- A. Resilient Base:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flexco, Inc.
 - b. Johnsonite.
 - c. Roppe Corporation, USA.
- B. Resilient Base Standard: ASTM F 1861.
1. Material Requirement: Type TV (vinyl, thermoplastic).
 2. Manufacturing Method: Group I (solid, homogeneous).
 3. Style: Cove (base with toe).
- C. Minimum Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.
- H. Finish: Matte.
- I. Colors: To match Johnsonite Charcoal 20.

2.2 RESILIENT MOLDING ACCESSORY

- A. Resilient Molding Accessory:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flexco, Inc.
 - b. Johnsonite.
 - c. Roppe Corporation, USA.
- B. Description: Transition strips.
- C. Material: Vinyl.
- D. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 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. 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. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Job-Formed 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 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. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from marks, 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.
 - 1. Apply two coat(s).
- E. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

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. Vinyl composition floor tile (VCT).
- B. Related Sections:
 - 1. Section 096513 "Resilient Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.3 ACTION SUBMITTALS

- A. Product Data with Shop Drawings and Product Schedule:
 - 1. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - a. Show details of special patterns.
 - 2. Product Schedule: For floor tile. Use same designations indicated on Drawings.
- B. Samples for Verification: Chip-size (2" X 2") units of each color and pattern of floor tile required.

1.4 MATERIALS MAINTENANCE SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.
- B. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile 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. Store floor tiles on flat surfaces.

1.7 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 floor tile 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. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

- A. Products: Subject to compliance with requirements, provide the following:
 - 1. Armstrong World Industries, Inc.; Premium Excelon Raffia Stream.
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch.
- E. Size: 12 by 24 inches.
- F. Colors: As indicated by manufacturer's designations.
 - 1. VCT-1: (Field)
 - a. Avalanche Z5900.
 - 2. VCT-2: (Blue)
 - a. Electricity Z5937.

2.2 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 floor tile and substrate conditions indicated.
- C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.
- D. Sealers and Finish Coats for Resilient Floor Tile: Premium-type products as recommended by manufacturer for resilient floor tile.

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 floor tile.
- 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. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
 - c. Installer may choose to install resilient tile manufacturer's approved and warranted substrate sealer or mortar with integral sealer instead of waiting for moisture vapor emission rate and relative humidity compliance at no additional cost to Owner.
- C. 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.
- D. Do not install floor tiles until they are same temperature as 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.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern) in pattern of colors and sizes indicated.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from marks, 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 floor tile surfaces before applying liquid floor polish.
1. Apply two coat(s).

- E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096723.13 - RESINOUS FLOORING - LEVEL 1

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. Resinous flooring system concrete floor coating, pigmented (CFC).

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.

1.5 INFORMATIONAL SUBMITTALS

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Material Test Reports: For each resinous flooring system, by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Engage a flooring installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Apply full-thickness mockups on 96-inch- square floor area selected by Architect.
 - a. Include 96-inch length of integral cove base with inside and outside corner.
 - 2. Simulate finished lighting conditions for Architect's review of mockups.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- B. Flammability: Self-extinguishing according to ASTM D 635.

2.2 MANUFACTURERS

- A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from manufacturer recommended in writing by manufacturer of primary materials.

2.3 RESINOUS FLOORING CONCRETE FLOOR COATING (CFC-1)

- A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide "General Polymers 3746 Epoxy Coating" as manufactured by Sherwin-Williams or comparable product by one of the following:
 - a. Carboline
 - b. Key Resin Company.
 - c. Stonhard, Inc.
 - d. Tnemec Company, Inc.
- B. System Characteristics:
 - 1. Color: To Match General Polymers Steel Gray #54.
 - 2. Wearing Surface: Textured for slip resistance.
 - 3. Overall System Thickness: 8 to 10 mils DFT per coat; 16 to 20 mils DFT total.
- C. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.
- D. Top Coats:
 - 1. Resin: Epoxy.
 - 2. Formulation Description: Epoxy.
 - 3. Type:
 - a. CFC-1: Pigmented.
 - 4. Application Method: Squeegee and backroll.
 - 5. Number of Coats: Two.
 - 6. Thickness of Coats: 8 to 10 mils.

- E. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:
1. Impact Resistance: 100 in. lbs. direct, 80 in. lbs. in compliance with ASTM D 2794.
 2. Abrasion Resistance: 150 mgs maximum weight loss according to ASTM D 4060.
 3. Hardness: H Pencil Hardness in compliance with ASTM D 3363.
 4. Adhesion: 550 psi in compliance with ASTM D 4541.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
1. Roughen concrete substrates as follows:
 - a. Grind surfaces with an apparatus that abrades the concrete surface and contains the dispensed dust within the apparatus.
 - b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
 3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lbs. of water/1000 sq. ft. of slab area in 24 hours.
 - b. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 90 percent relative humidity level measurement.
 4. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Patching and Filling: Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.
- D. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.2 APPLICATION

- A. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- C. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

3.3 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may, at any time and any number of times during resinous flooring application, require material samples for testing for compliance with requirements.
 1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
 3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.
- B. Core Sampling: At the direction of Owner and at locations designated by Owner, take one core sample per 1000 sq. ft. of resinous flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring. Correct deficiencies in installed flooring as indicated by testing.

3.4 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 096723.13

SECTION 099123.99 - 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 masonry units (CMUs).
 - 2. Metal (Aluminum, Steel, Galvanized Steel).
 - 3. 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 099600.99 "High-Performance Coatings" for high-performance and special-use coatings.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than five 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 with Product List:

1. Product Data: For each type of product. Include preparation requirements and application instructions.
2. Product List: For each product indicated, include the following:
 - a. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.
 - b. Provide a statement from applicator that VOC content of all products used on Project comply with state and federal required VOC content.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

1.5 QUALITY ASSURANCE

- ##### A. Provide paint systems from one (same) manufacturer for entire Project, unless chosen manufacturer does not offer system specified.

1.6 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.

1.7 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 the following:
 - 1.
 - 2. Benjamin Moore & Co.
 - 3. PPG Paints.
 - 4. Sherwin-Williams; Paint Stores Group

2.2 PAINT, GENERAL

- A. Material Compatibility:
 - 1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- B. VOC Content: Paints and coatings applied at the project site shall comply with VOC content limits of authorities having jurisdiction.
- C. Colors: As indicated in a color schedule.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner may 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 paints 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. Masonry (Clay and CMUs): 12 percent.
 - 2. 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 applicable to substrates and paint systems 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. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints 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 areas where shop paint is abraded. 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 by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations.
 - 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. Panelboards.
 - b. Uninsulated metal piping.
 - c. Pipe hangers and supports.
 - d. Metal conduit.
 - e. Tanks that do not have factory-applied final finishes.
 - f. Duct and equipment that is not insulated.
 - 2. Paint the following work where exposed in occupied spaces:

- a. Panelboards.
 - b. Uninsulated metal piping.
 - c. Pipe hangers and supports.
 - d. Metal conduit.
 - e. Duct and equipment that is not insulated.
 - f. 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. CMU Substrates:
 1. Latex System:
 - a. Block Filler:
 - 1) S-W PrepRite Block Filler, B25W25 Block filler, latex, interior/exterior.
 - 2) PPG Paints, 6-15 Speedhide Interior/Exterior Latex Block Filler
 - b. Intermediate Coat: Latex, interior matching topcoat.
 - c. Topcoat: Latex, interior eggshell:

- 1) S-W ProMar200 Zero Voc Latex Eg-Shelat, B20-2600 Series , at 4.0 mils wet, 1.7 dry , per coat.
 - 2) PPG Paints; Speedhide Zero, 0 VOC Latex Eggshell, 6-4310XI series applied at 1.5 DFT per coat.
 - d. Topcoat: Latex, interior semi-gloss:
 - 1) S-W ProMar200 Zero Voc Latex Semi-Gloss, B31-2600 Series , at 4.0 mils wet, 1.6 dry , per coat.
 - 2) PPG Paints; Speedhide Zero, 0 VOC Latex Semi-Gloss, 6-4510XI series applied at 1.5 DFT per coat.
- B. Metal Substrates (Aluminum, Steel, and Galvanized Steel):
 1. Latex System
 - a. Prime Coat:
 - 1) Primer, rust-inhibitive, water-based: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series at 5.0 to 10 mils wet, 2.0 to 4.0 mils dry.
 - 2) PPG Paints; Pitt-Tech Plus Int/Ext DTM Industrial Primer, 90-912 series applied at 2 to 4 mils DFT.
 - b. Intermediate Coat: Water-based acrylic, interior, matching topcoat.
 - c. Topcoat: Water-based acrylic, semi-gloss:
 - 1) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series at 2.5 to 4.0 mils dry, per coat.
 - 2) PPG Paints; Pitt-Tech Plus Int/Ext DTM Semi-Gloss Industrial Enamel, 90-1210 series applied at 2 to 4 mils DFT.
 - d. Topcoat: Water-based acrylic, gloss:
 - 1) S-W Pro Industrial Acrylic Gloss Coating, B66-660 Series at 2.5 to 4.0 mils dry, per coat.
 - 2) PPG Paints; Pitt-Tech Plus Int/Ext DTM Gloss Industrial Enamel, 90-1310 series applied at 2 to 4 mils DFT.
 2. Water-Based Dry-Fall System:
 - a. Topcoat: Dry-fall latex, flat:
 - 1) S-W Pro Industrial Waterborne Acrylic Dry-fall Flat, B42-80 Series at 6.0 mils wet, 1.7 mils dry.
 - 2) PPG Paints; Speedhide Super Tech Interior WB Flat Dry-Fog, 6-725XI series applied at 2.2 mils DFT.

- b. Topcoat: Dry-fall latex, eggshell:
 - 1) S-W Pro Industrial Waterborne Acrylic Dry-fall Eg-Shel, B42-2 Series at 6.0 mils wet, 1.9 mils dry.
 - 2) PPG Paints
- C. Gypsum Board Substrates:
 - 1. Latex System
 - a. Prime Coat: Primer, latex, interior:
 - 1) S-W ProMar 200 Zero VOC Latex Primer, B28W2600 at 4.0 mils wet, 1.5 mils dry.
 - 2) PPG Paints, Speedhide Zero 0 VOC Latex Sealer, 6-4900XI applied at 1.4 mils DFT.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: Latex, interior, egg shell:
 - 1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series at 4.0 mils wet, 1.7 mils dry.
 - 2) PPG Paints; Speedhide Zero 0 VOC Latex Eggshell, 6-4310XI series applied at 1.5 mils DFT per coat.
 - d. Topcoat: Latex, interior, semi-gloss:
 - 1) S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series at 4.0 mils wet, 1.6 mils dry.
 - 2) PPG Paints; Speedhide Zero 0 VOC Latex Semi-Gloss, 6-4510XI series applied at 1.5 mils DFT per coat

3.7 COLOR SCHEDULE

- A. P-1: Sherwin Williams; Gossamer Veil SW9165.
- B. P-2: Sherwin Williams; Kilkenny SW6740.
- C. P-3: Sherwin Williams; Peppercorn SW7674.

END OF SECTION 099123.99

SECTION 099600.99 - 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. This Section includes shop and field surface preparation and shop and field painting of various substrates.
 - 1. Surface preparation, including shop application of metal primer, and field applications of primers and finishes are specified in 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 Structures.
 - b. Precast Concrete.
 - c. Steel Trim, Doors.
 - 2. Interior Substrates:
 - a. Steel.
 - b. Concrete Masonry Units (CMU).
 - c. Gypsum Wall Board Walls.
 - d. Steel Trim, Doors.
- 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 Section "Interior Painting" for general field painting.

1.3 REFERENCES

- A. ASTM D 16 - Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
- B. ASTM D 4263 - Indicating Moisture in Concrete by the Plastic Sheet Method.

- C. ASTM D 6386 – Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
- D. ASTM F 1869 - Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- E. International Concrete Repair Institute (ICRI) Guideline No. 310-2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
- F. SSPC-SP 1 - Solvent Cleaning.
- G. SSPC-SP 2 - Hand Tool Cleaning.
- H. SSPC-SP 3 - Power Tool Cleaning.
- I. SSPC-SP 6/NACE 3 - Commercial Blast Cleaning.
- J. SSPC-SP 13/NACE 6 - Surface Preparation of Concrete.
- K. SSPC-SP 16 - Brush off Blast Cleaning of Galvanized Steel, Stainless Steel.
- L. SSPC-PA2 Measurement of Dry Coating with Magnetic Gauges.

1.4 DEFINITIONS

- A. Definitions of Painting Terms: In accordance with ASTM D 16, unless otherwise specified.
- B. Dry Film Thickness (DFT): Thickness of a coat of paint in fully cured state measured in mils (1/1000 inch).

1.5 ACTION SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Manufacturer's Data Sheets, Shop Drawings,:
 - 1. Manufacturer's Data Sheets: On each product to be used, including:
 - a. Preparation instructions and recommendations.
 - b. Storage and handling requirements and recommendations.
 - c. Installation methods.
 - d. Operation and maintenance data.
 - e. Provide material analysis, including vehicle type and percentage by weight and by volume of vehicle, resin and pigment.
 - f. Submit manufacturer's Material Safety Data Sheets (MSDS) and other safety requirements.

2. Shop Drawings:

- a. Submit a complete list of products proposed for use, including identifying product names and catalog numbers.
 - 1) Arrange in same format as COATING SYSTEMS below.
 - 2) Include applicable manufacturer's data and recommendations.

- C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- D. Verification Samples: For each finish product specified, two samples, minimum size 3 X 4 inch square, representing actual product, color, and patterns.

1.6 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Quality Assurance: Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.
- B. Project Quality Assurance: Materials provided for Project shall be from same manufacturer or intermediate and finish coat manufacturer shall accept compatibility with applied primer and warrant application of their products over applied primer. Materials submitted that are not from same manufacturer shall be submitted to Architect for review prior to use with a letter assuring their compatibility.
- C. Applicator's Quality Assurance: Submit list of a minimum of 5 completed projects of similar size and complexity to this Work. Include for each project:
 1. Project name and location.
 2. Name of Owner.
 3. Name of Contractor.
 4. Name of Architect.
 5. Name of coating manufacturer.
 6. Approximate area of coatings applied.
 7. Date of completion.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 1. Prepare 10 feet by 10 feet mock-up for each coating system specified using same materials, tools, equipment, and procedures intended for actual surface preparation and application.

2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 3. Refinish mock-up area as required to produce acceptable work.
 4. Retain mock-ups to establish intended standards by which coating systems will be judged.
- E. Pre-application Meeting: Convene a pre-application meeting before start of application of coating systems. Require attendance of parties/entities directly affecting work of this section, including Contractor, Architect, applicator, and manufacturer's representative. Review the following:
1. Environmental requirements.
 2. Protection of surfaces not scheduled to be coated.
 3. Surface preparation.
 4. Application methods.
 5. Repair.
 6. Field quality control.
 7. Cleaning.
 8. Protection of coating systems.
 9. One-year inspection.
 10. Coordination with other work.
- F. Application Report
1. During application (approximately halfway through completion) Contractor shall engage manufacturer's representative to observe application and indicate results of coating system application or required corrections. Provide report to Architect indicating status of application, representative's comments, and applicator's plan, if corrections are required.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to Site in manufacturer's original, unopened containers and packaging, with labels clearly identifying:
1. Coating or material name.
 2. Manufacturer.
 3. Color name and number.
 4. Batch or lot number.
 5. Date of manufacture.
 6. Mixing and thinning instructions.
- B. Storage:
1. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions.
 2. Keep containers sealed until ready for use.

3. Do not use materials beyond manufacturer's shelf life limits.
- C. Handling: Protect materials during handling and application to prevent damage or contamination.
- D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Weather:
 1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.
 2. Surface Temperature: Minimum of 5 degrees F (3 degrees C) above dew point and rising.
 3. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer's instructions.
 4. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog, or mist.
 5. Wind: Do not spray coatings if wind velocity is above manufacturer's recommended limit.
- C. Ventilation: Provide ventilation during coating, evaporation, drying, and curing stages in confined or enclosed areas in accordance with manufacturer's instructions.
- D. Dust and Contaminants:
 1. Schedule coating work to avoid excessive dust and airborne contaminants.
 2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Subject to requirements specified, provide products listed as manufactured by Tnemec Company Incorporated, Kansas City, Missouri (800) 863-6321, or products listed as manufactured by following:
 1. PPG Paints, Pittsburgh, PA.
 2. Sherwin-Williams Company; Cleveland, OH.

- B. Bidders desiring to use coatings other than those specified shall submit those with their proposal based on the specified materials, together with the information required in and within time stated in Instructions to Bidders.

2.2 HIGH PERFORMANCE COATINGS GENERAL

- A. Materials Compatibility: Provide shop and field primers, and finish-coat materials that are compatible with each other and with substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.3 COATING SYSTEMS FOR EXTERIOR STEEL

- A. Exterior Steel:
 - 1. Surface Preparation: Refer to Structural Drawings and Division 05 Section "Structural Steel".
 - 2. Primer: Refer to Structural Drawings and Division 05 Section "Structural Steel".
 - 3. Intermediate Coat: Tnemec Series L69 applied at DFT 4.0 to 6.0 mils.
 - 4. Intermediate Coat: PPG Paints Amerlock 2 applied at DFT 4.0 to 6.0 mils.
 - 5. Intermediate Coat: Sherwin-Williams Macropoxy 646 FC applied at DFT 4.0 to 6.0 mils.
 - 6. Finish Coat: Tnemec Series 740 applied at DFT: 3.0 to 4.0 mils.
 - 7. Finish Coat: PPG Paints Amercoat 450 applied at DFT 3.0 to 4.0 mils.
 - 8. Finish Coat: Sherwin-Williams HiSolids Polyurethane applied at DFT 3.0 to 4.0 mils.

2.4 COATING SYSTEM FOR EXTERIOR PRECAST CONCRETE

- A. System Type: Modified Waterborne Acrylate:
 - 1. Surface preparation: Clean, dry, and free of form release agents and other contaminants. Bare cementitious surfaces may be slightly dampened with clean water if product is drying too rapidly during application.
 - 2. Primer: Tnemec, Series 156 (Enviro-Crete) applied at DFT 5.5 to 7.5 mils.
 - 3. Primer: PPG Paints: Perma-Crete Pitt-Flex applied at DFT 5.5 to 7.5 mils.
 - 4. Primer: Sherwin-Williams: SW Loxon XP applied at DFT 5.5 to 7.5 mils.
 - 5. Intermediate Coat: Tnemec, Series 156 (Enviro-Crete) applied at DFT 5.5 to 7.5 mils.
 - 6. Intermediate Coat: PPG Paints: Perma-Crete Pitt-Flex applied at DFT 5.5 to 7.5 mils.
 - 7. Intermediate Coat: Sherwin-Williams: Loxon XP applied at DFT 5.5 to 7.5 mils.
 - 8. Finish Coat: Tnemec, Series 156 (Enviro-Crete) applied at DFT 5.5 to 7.5 mils.
 - 9. Finish Coat: PPG Paints: Perma-Crete Pitt-Flex applied at DFT 5.5 to 7.5 mils.
 - 10. Finish Coat: Sherwin-Williams: Loxon XP applied at DFT 5.5 to 7.5 mils.

2.5 COATING SYSTEMS FOR INTERIOR STEEL

- A. Interior Exposed Structural Steel:

1. Surface Preparation: SSPC-2 or SSPC 3 and concrete surfaces shall be clean and dry.
2. Primer: Tnemec Series 115 applied at DFT 3.0 to 4.0 mils.
3. Primer: PPG Paints 90-912 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
4. Primer: Sherwin-Williams ProIndustrial ProCryl applied at DFT 3.0 to 4.0 mils.
5. Finish Coat: Tnemec Series 115 applied at DFT 3.0 to 4.0 mils.
6. Finish Coat: PPG Paints 90-912 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
7. Finish Coat: Sherwin-Williams Multi-Surface Acrylic, B66W1500 Series applied at DFT 1.5 to 2.5 mils.

B. Interior Steel Stairs and Steel Handrails:

1. Surface Preparation: SSPC-SP 6 (Shop)
2. Shop Primer: Tnemec Series 94-H20 applied DFT 3.0 to 4.0 mils.
3. Shop Primer: PPG Paints Amercoat 68HS applied at DFT 3.0 to 4.0 mils.
4. Shop Primer: Sherwin-Williams Zinc Clad 4100 applied at DFT 3.0 to 5.0 mils.
5. Intermediate Coat: Tnemec Series 1029 applied at DFT 3.0 to 4.0 mils.
6. Intermediate Coat: PPG Paints 90-1210 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
7. Intermediate Coat: Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane, B53 Series applied at 1.3 to 1.6 mils.
8. Finish: Tnemec Series 1029 applied at DFT 3.0 to 4.0 mils.
9. Finish Coat: PPG Paints 90-1210 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
10. Finish: Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane, B53 Series applied at DFT 1.3 to 1.6 mils.

C. Aluminum:

1. Surface Preparation: Clean, dry, and free of reactive surface agents.
2. Primer: Tnemec Series 115 applied at DFT 3.0 to 4.0 mils.
3. Primer: PPG Paints 90-1110 Pitt-Tech Plus Applied at DFT 3.0 to 4.0 mils.
4. Primer: Sherwin-Williams ProIndustrial ProCryl applied at DFT 3.0 to 4.0 mils.
5. Finish Coat: Tnemec Series 115 applied at DFT 3.0 to 4.0 mils.
6. Finish Coat: PPG Paints 90-1110 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
7. Finish Coat: Sherwin-Williams Pro Industrial Multi-Surface Acrylic, B66W1500 Series applied at DFT 1.5 to 2.5 mils.

2.6 COATING SYSTEMS FOR INTERIOR CONCRETE MASONRY UNITS (CMU)

A. Concrete Masonry Units:

1. Surface Preparation: Allow CMU to cure for 14 days. Level protrusions and mortar splatter.
2. Prime/Fill: Tnemec Series 130 applied at 60 to 80 square feet to totally fill porosity of CMU to create smooth surface.
3. Prime/Fill: PPG Paints 16-90 Pitt-Glaze applied at 60 to 80 square feet to totally fill porosity of CMU to create smooth surface.
4. Prime/Fill: Sherwin-Williams Pro Industrial Heavy Duty Block Filler, B42W150 Series

- applied at 60 to 80 square feet to totally fill porosity of CMU to create smooth surface.
5. Intermediate Coat: Tnemec Series 1029 applied at DFT 3.0 to 4.0 mils.
 6. Intermediate Coat: PPG Paints 90-1110 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
 7. Intermediate Coat: Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series applied at DFT 1.4 mils.
 8. Finish Coat: Tnemec Series 1029 applied at DFT 3.0 to 4.0 mils.
 9. Finish Coat: PPG Paints 90-1110 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
 10. Finish Coat: Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series (egshel) applied at DFT 1.4 mils.

B. Showers (CMU):

1. Surface Preparation: Allow substrate to cure for 14 days. Level protrusions.
2. Prime/Fill: Tnemec Series 130 applied at 60 to 80 square feet to totally fill porosity of CMU to create smooth finish.
3. Prime/Fill: PPG Paints 95-217 Cementitious Waterproofing Block Filler applied at 60 to 80 square feet to totally fill porosity of CMU to create smooth finish.
4. Prime/Fill: Sherwin-Williams Cement Plex 875 applied at 60 to 80 square feet to totally fill porosity of CMU to create smooth finish.
5. Intermediate Coat: Tnemec Series 280 applied at DFT 4.0 to 8.0 mils.
6. Intermediate Coat: PPG Paints Amerlock 2 applied at DFT 4.0 to 8.0 mils.
7. Intermediate Coat: Sherwin-Williams ProIndustrial HiPerformance Epoxy applied at DFT 4.0 to 8.0 mils.
8. Finish Coat: Tnemec Series 297 applied at DFT 4.0 to 8.0 mils.
9. Finish Coat: PPG Paints Amerlock 2 applied at DFT 4.0 to 8.0 mils.
10. Finish Coat: Sherwin-Williams ProIndustrial HiPerformance Epoxy applied at DFT 4.0 to 8.0 mils.

2.7 COATING SYSTEMS FOR GYPSUM WALL BOARD WALLS

A. Drywall Walls:

1. Surface Preparation: Clean free of dust and soiling.
2. Primer: Tnemec Series 151 applied at DFT 1.0 to 1.5 mils.
3. Primer: PPG Paints 17-921 Seal-Grip applied at DFT 1.0 to 1.5 mils.
4. Primer: Sherwin-Williams ProMar 200 Zero VOC Latex Primer, B28W2600 series applied at DFT 1.0 to 1.5 mils.
5. Intermediate Coat: Tnemec Series 1029 applied at DFT 3.0 to 4.0 mils.
6. Intermediate Coat: PPG Paints 90-1110 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
7. Intermediate Coat: Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 series, applied at 1.4 mils.
8. Finish Coat: Tnemec Series 1029 applied at DFT 3.0 to 4.0 mils.
9. Finish Coat: PPG Paints 90-1110 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
10. Finish Coat: Sherwin-Williams Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45 Series, applied at 1.4 mils.

2.8 COATING SYSTEMS FOR SHOP-PRIMED STEEL TRIM AND DOORS - INTERIOR AND EXTERIOR

A. Steel:

1. Surface Preparation: Clean and dry.
2. Primer: Tnemec Series 115 applied at DFT 3.0 to 4.0 mils.
3. Primer: PPG Paints 90-912 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
4. Primer: Sherwin-Williams ProIndustrial ProCryl applied at DFT 3.0 to 4.0 mils.
5. Intermediate Coat (Field): Tnemec Series 1029 applied at DFT 3.0 to 4.0 mils.
6. Intermediate Coat (Field): PPG Paints 90-1110 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
7. Intermediate Coat (Field): Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane, B53 Series, applied at DFT 1.3 to 1.6 mils.
8. Finish Coat (Field): Tnemec Series 1029 applied at DFT 3.0 to 4.0 mils.
9. Finish Coat (Field): PPG Paints 90-1110 Pitt-Tech Plus applied at DFT 3.0 to 4.0 mils.
10. Finish Coat (Field): Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane, B53 Series, applied at DFT 1.3 to 1.6 mils.

2.9 STEEL SHOP FINISHING

A. Surface Preparation:

1. Clean surfaces as follows immediately prior to priming.
 - a. Non-Immersion and Exterior Exposed: SSPC-SP6 Commercial Blast Cleaning Surfaces to be coated shall be clean, dry, smooth and free from dust and foreign matter which will adversely affect adhesion or appearance. Provide a minimum surface profile of 1.5 mils anchor pattern
 - b. Prior to application of primer, steel surfaces shall be prepared as stated above to receive coating system or in compliance with manufacturer's recommendations and specifications of The Society for Protective Coatings as indicated in Schedule of Coating Systems below.

B. Shop Applied Coatings:

1. Steel members shall be provided with one coat of primer as indicated in Schedule of Coating Systems below. Application of the primer coat shall follow immediately after surface preparation and cleaning and within an eight hour working day. Cleaned areas not receiving first coat within an eight hour period shall be re-cleaned prior to application of first coat.
 - a. Interior Exposure: Tnemec Series V69 H.B. Epoxoline II applied at 4.0 to 6.0 mils
 - b. Interior Exposure: PPG Paints Amercoat 385 applied at DFT 4.0 to 6.0 mils.
 - c. Interior Exposure: Sherwin-Williams Macropoxy 646 FC applied at 4.0 to 6.0 mils.
 - d. Exterior Exposures: Tnemec Series 94-H20 Hydro-Zinc, DFT 2.5 to 3.5 mils.

- e. Exterior Exposure: PPG Paints Amercoat 68HS applied at DFT 2.5 to 3.5 mils.
 - f. Exterior Exposure: Sherwin-Williams Zinc Clad 4100, DFT 3 to 5 mils.
- 2. Apply materials at film thicknesses specified by methods recommended by manufacturer in compliance with SSPC PA-1.
 - 3. Allow each coat of paint to dry thoroughly before applying succeeding coats.
 - 4. Make finish topcoats smooth, uniform in color, and free of laps, runs, dry spray, over-spray, and skipped or missed areas.
 - 5. Environmental conditions shall be in compliance with coating manufacturers printed instructions.

2.10 ACCESSORIES

A. Coating Application Accessories:

- 1. Accessories required for application of specified coatings: Provide in accordance with coating manufacturer's instructions, including thinners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

- A. Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings.
- B. Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

3.3 SURFACE PREPARATION OF STEEL

- A. Prepare steel surfaces in accordance with manufacturer's instructions.
- B. Fabrication Defects:
 - 1. Correct steel and fabrication defects revealed by surface preparation.
 - 2. Remove weld spatter and slag.
 - 3. Round sharp edges and corners of welds to a smooth contour.

4. Smooth weld undercuts and recesses.
5. Grind porous welds to pinhole-free metal.
6. Remove weld flux from surface.

- C. Ensure surfaces are dry.
- D. Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 6/NACE 3, unless otherwise specified.
- E. Abrasive Blast-Cleaned Surfaces: Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than 8 hours.
- F. Shop Primer: Prepare shop primer to receive field coat in accordance with manufacturer's instructions.

3.4 SURFACE PREPARATION OF CONCRETE AND MASONRY

- A. Prepare concrete and masonry surfaces in accordance with manufacturer's instructions.
- B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
- C. Test concrete for moisture in accordance with ASTM D 4263 and F 1869.
- D. Allow concrete and mortar to cure for a minimum of 28 days before coating.
- E. Level protrusions and mortar spatter.

3.5 SURFACE PREPARATION OF GYPSUM WALL BOARD

- A. Prepare gypsum board surfaces in accordance with manufacturer's instructions.
- B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
- C. Sand joint compound smooth and feather edge.
- D. Avoid heavy sanding of adjacent gypsum board surfaces, which will raise nap of paper covering.
- E. Do not apply putty, patching pencils, caulking, or masking tape to gypsum board surfaces to be painted.
- F. Lightly scuff-sand tape joints after priming to remove raised paper nap. Do not sand through primer.

3.6 APPLICATION

- A. Apply coatings in accordance with manufacturer's instructions.
- B. Mix and thin coatings, including multi-component materials, in accordance with manufacturer's instructions.
- C. Keep containers closed when not in use to avoid contamination.
- D. Do not use mixed coatings beyond pot life limits.
- E. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.
- F. Uniformly apply coatings at spreading rate required to achieve specified DFT.
- G. Apply coatings to be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.
- H. Stripe paint with brush critical locations on steel such as welds, corners, and edges using specified primer.

3.7 REPAIR

- A. Materials and Surfaces Not Scheduled to Be Coated: Repair or replace damaged materials and surfaces not scheduled to be coated.
- B. Damaged Coatings: Touch-up or repair damaged coatings. Touch-up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire surface where touch-up result is visibly different, either in sheen, texture, or color.
- C. Coating Defects: Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

3.8 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

B. Inspector's Services:

1. Verify coatings and other materials are as specified.
2. Verify surface preparation and application are as specified.
3. Verify DFT of each coat and total DFT of each coating system specified using wet film and dry film gauges.
4. Coating Defects: Check coatings for film characteristics or defects that would adversely affect performance or appearance of coating systems.
5. Report:
 - a. Submit written reports describing inspections made and actions taken to correct nonconforming work.
 - b. Report nonconforming work not corrected.
 - c. Submit copies of report to Architect and Contractor.

C. Manufacturer's Technical Services: Coordinate with coating manufacturer's technical service department or independent sales representative for current technical data and instructions.

3.9 CLEANING

- A. Remove temporary coverings and protection of surrounding areas and surfaces.

3.10 PROTECTION OF COATING SYSTEMS

- A. Protect surfaces of coating systems from damage during construction.
- B. Touch-up, or repair damaged products before Substantial Completion.

3.11 ONE-YEAR INSPECTION

- A. Owner will set date for one-year inspection of coating systems.
- B. Inspection shall be attended by Owner, Contractor, Architect, and manufacturer's representative.
- C. Repair deficiencies in coating systems as determined by Architect in accordance with manufacturer's instructions.

3.12 SCHEDULES

- A. Color Schedule:
1. HP-1: Sherwin Williams; Gossamer Veil SW9165.
 2. HP-2: Sherwin Williams; Kilkenny SW6740

3. HP-3: Sherwin Williams; Peppercorn SW7674.

END OF SECTION 099600.99

SECTION 101100 - VISUAL DISPLAY SURFACES

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. Markerboards.
- B. Related Sections:
 - 1. Division 09 Section "Gypsum Board••" for coordination of back-blocking requirements in gypsum board walls.

1.3 DEFINITIONS

- A. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes chalkboards, markerboards, and tackboards.
- B. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of chalkboards, markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.4 ACTION SUBMITTALS

- A. Product Data with Shop Drawings:
 - 1. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.
 - a. Include individual panel weights for sliding visual display units.
 - 2. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.
 - a. Show locations of panel joints.

- b. Include sections of typical trim members.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of motor-operated, sliding visual display units required for this Project.
- B. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.
- C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.
- B. Store visual display surfaces vertically with packing materials between each unit.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings 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.
- B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.
 - 1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.8 WARRANTY

- A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or

workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Surfaces lose original writing and erasing qualities.
 - b. Surfaces exhibit crazing, cracking, or flaking.
2. Warranty Period: 50 years from date of Substantial Completion.
3. Warranty Period: Life of the building.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Porcelain-Enamel Face Sheet: Porcelain-enamel-clad, ASTM A 463/A 463M, Type 1, stretcher-leveled aluminized steel, with 0.024-inch uncoated thickness; with porcelain-enamel coating fused to steel at approximately 1000 deg F.
 1. Gloss Finish: Low gloss; dry-erase markers wipe clean with dry cloth or standard eraser. Suitable for use as projection screen.
 - a. Products: Subject to compliance with requirements, provide the following:
 - 1) Claridge Products and Equipment, Inc.; LCS Markerboard.
- B. Porcelain-Enamel Face Sheet: Manufacturer's standard steel sheet with porcelain-enamel coating fused to steel; uncoated thickness indicated.
 1. Gloss Finish: Gloss as indicated; dry-erase markers wipe clean with dry cloth or standard eraser.
- C. Particleboard: ANSI A208.1, Grade M-1.
- D. Fiberboard: ASTM C 208.
- E. Extruded Aluminum: ASTM B 221, Alloy 6063.

2.2 MARKERBOARD ASSEMBLIES

- A. Porcelain-Enamel Markerboards: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction consisting of backing sheet, core material, and 0.021-inch-thick, porcelain-enamel face sheet with low-gloss finish.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. AARCO Products, Inc.
 - b. Claridge Products and Equipment, Inc.
 - c. Marsh Industries, Inc.; Visual Products Group.
2. Particleboard Core: 3/8 inch thick; with 0.015-inch- thick, aluminum sheet backing.
 3. Laminating Adhesive: Manufacturer's standard, moisture-resistant thermoplastic type.

2.3 MARKERBOARD ACCESSORIES

- A. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch- thick, extruded aluminum; of size and shape indicated on Drawings.
 1. Factory-Applied Trim: Manufacturer's standard.
- B. Chalktray: Manufacturer's standard, continuous.
- C. Map Rail: Provide the following accessories:
 1. Display Rail: Continuous and integral with map rail; fabricated from cork approximately 1 to 2 inches wide.
 2. End Stops: Located at each end of map rail.
 3. Map Hooks and Clips: Two map hooks with flexible metal clips for every 48 inches of map rail or fraction thereof.
 4. Flag Holder: One for each room.
 5. Paper Holder: Extruded aluminum; designed to hold paper by clamping action.

2.4 FABRICATION

- A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.
- B. Visual Display Boards: Factory Field assemble visual display boards unless otherwise indicated.
 1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.
- C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.
 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, .
 2. Provide manufacturer's standard vertical-joint spline system between abutting sections of markerboards.
 3. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by

Architect from manufacturer's standard structural support accessories to suit conditions indicated.

- D. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.
 - 1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine walls and partitions for proper preparation and backing for visual display surfaces.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.
- C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings,

cracks, defects, projections, depressions, and substances that will impair bond between visual display surfaces and wall surfaces.

3.3 INSTALLATION, GENERAL

- A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

1. Mounting Height for Grades 7 and Higher: 36 inches above finished floor to top of chalktray.

3.4 INSTALLATION OF FIELD-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

- A. Field-Assembled Visual Display Units: Coordinate field-assembled units with grounds, trim, and accessories indicated. Join parts with a neat, precision fit.
1. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of board, as acceptable to Architect.
 2. Provide manufacturer's standard vertical-joint spline system between abutting sections of markerboards.
 3. Provide manufacturer's standard mullion trim at joints between markerboards of combination units.
 4. Where size of visual display boards or other conditions require support in addition to normal trim, provide structural supports or modify trim as indicated or as selected by Architect from manufacturer's standard structural support accessories to suit conditions indicated.

3.5 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

- A. Visual Display Boards: Attach visual display boards to wall surfaces with egg-size adhesive gobs at 16 inches (400 mm) o.c., horizontally and vertically.
- B. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 16 inches (400 mm) o.c. Secure both top and bottom of boards to walls.
1. Field-Applied Aluminum Trim: Attach trim over edges of visual display boards and conceal grounds and clips. Attach trim to boards with fasteners at not more than 24 inches o.c.
 - a. Attach chalktrays to boards with fasteners at not more than 12 inches o.c.

3.6 CLEANING AND PROTECTION

- A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.
- C. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 101100

SECTION 122413 - ROLLER WINDOW SHADES

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 roller shades.
- B. Related Sections include the following:
 - 1. Section 012300 "Alternates".
 - 2. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.

1.3 ACTION SUBMITTALS

- A. Product Data with Shop Drawings and Window Treatment Schedule:
 - 1. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.
 - 2. Shop Drawings: Show location and extent of roller shades. Include elevations, sections, details, and dimensions not shown in Product Data. Show installation details, mountings, attachments to other work, operational clearances, and relationship to adjoining work.
 - 3. Window Treatment Schedule: For roller shades. Use same designations indicated on Drawings.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide roller shade band materials with the fire-test-response characteristics indicated, as determined by testing identical products per

test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. Flame-Resistance Ratings: Passes NFPA 701.

- D. Product Standard: Provide roller shades complying with WCMA A 100.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same designations indicated on Drawings and in a window treatment schedule.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 ROLLER SHADES

- A. Products: Subject to compliance with requirements, provide one of the following:
1. Draper Inc.; .
 2. Hunter Douglas, Inc.; Hunter Douglas Window Fashions Division; .
 3. Levolor; Levolor-Kirsch Window Fashions; a Newell Rubbermaid Company; .
 4. Lutron Shading Solutions by VIMCO; .
 5. MechoShade Systems, Inc.; .
 6. Nysan Shading Systems Ltd.; .
- B. Shade Band Material: PVC-coated polyester .
1. Fabric Width: 60 inches.
 2. Colors: As selected by Architect from manufacturer's full range
 3. Material Openness Factor: 5 percent.
 4. Bottom Hem: Straight.

- C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets; with removable spline fitting integral channel in tube for attaching shade material. Provide capacity for one roller shade band(s) per roller, unless otherwise indicated .
- D. Direction of Roll: .
- E. Mounting Brackets: Fascia end caps, fabricated from steel finished to match fascia or headbox.
- F. Fascia: L-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; continuous panel concealing front and bottom of shade roller, brackets, and operating hardware and operators; length as indicated ; removable design for access.
- G. Bottom Bar: Steel or extruded aluminum. Provide concealed, by pocket of shade material, internal-type bottom bar with concealed weight bar as required for smooth, properly balanced shade operation.
- H. Valance: As indicated by manufacturer's designation for style and color.
- I. Mounting: Inside Ceiling Bottom-up brackets mounting permitting easy removal and replacement without damaging roller shade or adjacent surfaces and finishes.
- J. Hold-Down Brackets and Hooks or Pins and Side Channels: Manufacturer's standard for fixing shade in place, keeping shade band material taut, and reducing light gaps when shades are closed.
- K. Shade Operation: Manual; with continuous-loop bead-chain, clutch, and cord tensioner and bracket lift operator.
 - 1. Pull: Manufacturer's standard hand-grip engaged pull and pole, in length required to make operation convenient from floor level, with hook for engaging ring.
 - 2. Position of Clutch Operator: Right side of roller, as determined by hand of user facing shade from inside, unless otherwise indicated on Drawings.
 - 3. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
 - 4. Lift-Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
 - 5. Loop Length: Length required to make operation convenient from floor level.
 - 6. Bead Chain: Nickel-plated metal.
 - 7. Operating Function: Stop and hold shade at any position in ascending or descending travel.

2.2 ROLLER SHADE FABRICATION

- A. Product Description: Roller shade consisting of a roller, a means of supporting the roller, a

flexible sheet or band of material carried by the roller, a means of attaching the material to the roller, a bottom bar, and an operating mechanism that lifts and lowers the shade.

- B. Concealed Components: Noncorrodible or corrosion-resistant-coated materials.
 - 1. Lifting Mechanism: With permanently lubricated moving parts.
- C. Unit Sizes: Obtain units fabricated in sizes to fill window and other openings as follows, measured at 74 deg F:
 - 1. Shade Units Installed between (Inside) Jambs: Edge of shade not more than 1/4 inch from face of jamb. Length equal to head to sill dimension of opening in which each shade is installed.
 - 2. Shade Units Installed Outside Jambs: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- D. Installation Brackets: Designed for easy removal and reinstallation of shade, for supporting fascia, roller, and operating hardware and for hardware position and shade mounting method indicated.
- E. Installation Fasteners: No fewer than two fasteners per bracket, fabricated from metal noncorrosive to shade hardware and adjoining construction; type designed for securing to supporting substrate; and supporting shades and accessories under conditions of normal use.
- F. Color-Coated Finish: For metal components exposed to view, apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pretreatment, application, baking, and minimum dry film thickness.
- G. Colors of Metal and Plastic Components Exposed to View: As selected by Architect from manufacturer's full range, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions, and located so shade band is not closer than 2 inches to interior face of

glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413

SECTION 123200 - MANUFACTURED WOOD CASEWORK

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. Plastic-laminate-faced wood cabinets of stock design.
 - 2. Plastic-laminate countertops.

- B. Related Sections:

- 1. Section 012300 "Alternates".
 - 2. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring manufactured wood casework.
 - 3. Section 064113 "Wood-Veneer-Faced Architectural Cabinets" for custom-fabricated wood cabinets.
 - 4. Section 064116 "Plastic-Laminate-Faced Architectural Cabinets" for custom-fabricated plastic-laminate-faced cabinets.
 - 5. Section 096513 "Resilient Base and Accessories" for resilient base applied to manufactured wood casework.

1.3 DEFINITIONS

- A. Exposed Portions of Cabinets: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and surfaces visible in open cabinets.
- B. Semiexposed Portions of Cabinets: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are defined as semiexposed.
- C. Concealed Portions of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, and ends and backs that are placed directly against walls or other cabinets.

1.4 ACTION SUBMITTALS

A. Product Data with Shop Drawings:

1. Product Data: For each type of product indicated.
2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show fabrication details, including types and locations of hardware. Show installation details, including field joints and filler panels. Indicate manufacturer's catalog numbers for casework.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- ##### A.
- Furnish complete touchup kit for each type and finish of manufactured wood casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish.

1.6 QUALITY ASSURANCE

- ##### A.
- Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- ##### B.
- Source Limitations: Obtain manufactured wood casework from single source from single manufacturer.
- ##### C.
- Quality Standard: Unless otherwise indicated, comply with requirements for modular cabinets in AWI's "Architectural Woodwork Quality Standards."
- ##### D.
- Product Designations: Drawings indicate sizes, configurations, and finish material of manufactured wood casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes and door and drawer configurations, of same finish material, and complying with the Specifications may be considered. Refer to Section 016000 "Product Requirements."

1.7 DELIVERY, STORAGE, AND HANDLING

- ##### A.
- Deliver manufactured wood casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.
- ##### B.
- Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install manufactured wood casework until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings 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.
- B. Field Measurements: Verify actual dimensions of construction contiguous with manufactured wood casework by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate layout and installation of framing and reinforcements in walls and partitions for support of manufactured wood casework.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of manufactured wood casework that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of components or other failures of glue bond.
 - b. Warping of components.
 - c. Failure of operating hardware.
 - d. Deterioration of finishes.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
 - 1. Plastic-Laminate-Faced Manufactured Casework:
 - a. Advanced Cabinet Systems
 - b. Stevens Industries, Inc.
 - c. TMI Systems Design Corporation.

2.2 MATERIALS, GENERAL

- A. Hardwood Plywood: HPVA HP-1, either veneer core or particleboard core unless otherwise indicated.
- B. Softwood Plywood: DOC PS 1.
- C. Particleboard: ANSI A208.1, Grade M-2.
- D. Particleboard: Straw-based particleboard complying with ANSI A208.1, Grade M-2, except for density.
- E. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Formica Corporation.
 - b. Nevamar Company, LLC; Decorative Products Div.
 - c. Wilsonart International; Div. of Premark International, Inc.
- F. Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 1 mm thick elsewhere.

2.3 CABINET MATERIALS

- A. Exposed Cabinet Materials:
 - 1. Plastic Laminate: Grade VGS.
 - 2. Unless otherwise indicated, provide specified edgebanding on all exposed edges.
- B. Semiexposed Cabinet Materials:
 - 1. Thermoset Decorative Panels: Provide thermoset decorative panels for semiexposed surfaces unless otherwise indicated.
- C. Concealed Cabinet Materials:
 - 1. Plastic Laminate: Grade BKL.

2.4 DESIGN, COLOR, AND FINISH

- A. Thermoset Decorative Panel Colors, Patterns, and Finishes: As indicated by manufacturer's designations.
- B. Plastic-Laminate Colors, Patterns, and Finishes:

1. PL-1: Formica; Citadel Warp 5882-58.
 2. pl-2: Formica; Sarum Twill 8827-58.
- C. PVC Edgebanding Color: As selected from casework manufacturer's full range.

2.5 CABINET FABRICATION

- A. Plastic-Laminate-Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:
1. Bottoms and Ends of Cabinets, and Tops of Wall Cabinets and Tall Cabinets: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semiexposed surfaces.
 2. Shelves: 3/4-inch particleboard, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semiexposed surfaces.
 3. Backs of Cabinets: 1/2-inch particleboard, plastic-laminate faced on exposed surfaces, thermoset decorative panels on semiexposed surfaces.
 4. Drawer Fronts: 3/4-inch particleboard, plastic-laminate faced.
 5. Drawer Sides and Backs: 1/2-inch thermoset decorative panels, with glued dovetail or multiple-dowel joints.
 6. Drawer Bottoms: 1/4-inch thermoset decorative panels glued and dadoed into front, back, and sides of drawers. Use 1/2-inch material for drawers more than 24 inches wide.
 7. Doors: 3/4-inch particleboard or MDF, plastic-laminate faced.
- B. Leg Shoes: Vinyl or rubber, black, open-bottom type.
- C. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.

2.6 CASEWORK HARDWARE AND ACCESSORIES

- A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.
1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.
- B. Butt Hinges: Chrome-plated, semiconcealed, 5-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 hinges for doors less than 48 inches high and 3 hinges for doors more than 48 inches high.
- C. Pulls: Solid chrome-plated brass wire pulls, fastened from back with two screws. For sliding doors, provide recessed chrome-plated flush pulls. Provide 2 pulls for drawers more than 24 inches wide.

- D. Door Catches: Powder-coated, dual, self-aligning, permanent magnet catch. Provide 2 catches on doors more than 48 inches high.
- E. Drawer Slides: BHMA A156.9, Type B05091.
 - 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated, steel ball-bearing slides.
 - 2. Box Drawer Slides: Grade 1HD-100, for drawers not more than 6 inches high and 24 inches wide.
 - 3. File Drawer Slides: Grade 1HD-100, for drawers more than 6 inches high or 24 inches wide.
- F. Drawer and Hinged Door Locks: Cylindrical (cam) type, 5-pin tumbler, brass with chrome-plated finish, and complying with BHMA A156.11, Grade 1.
 - 1. Provide a minimum of two keys per lock and six master keys.
 - 2. Provide locks on all doors and drawers.
- G. Adjustable Shelf Supports: 2-pin locking plastic shelf rests complying with BHMA A156.9, Type B04013.
- H. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

2.7 COUNTERTOPS

- A. Countertops, General: Provide smooth, clean exposed tops and edges in uniform plane free of defects. Provide front and end overhang of 1 inch over base cabinets.
- B. Plastic-Laminate Tops: Plastic-laminate sheet, shop bonded to both sides of 1-1/8-inch plywood or particleboard. Sand surfaces to which plastic laminate is to be bonded.
 - 1. Plastic Laminate for Flat Tops: Grade HGS.
 - 2. Plastic Laminate for Backing: Grade BKL.
 - 3. Provide 3-mm PVC edging on front edge of top, on top edges of backsplashes and end splashes, and on ends of tops and splashes.
 - 4. Use exterior plywood or exterior glue particleboard for countertops containing sinks.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of manufactured wood casework.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CASEWORK INSTALLATION

- A. Install level, plumb, and true; shim as required, using concealed shims. Where manufactured wood casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Fasten cabinets to masonry or framing, wood blocking, or reinforcements in walls and partitions with fasteners spaced 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
 - 1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with fasteners spaced 16 inches o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than two fasteners.
- C. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, or framing, blocking, or reinforcements in walls or partitions. Align similar adjoining doors to a tolerance of 1/16 inch.
 - 1. Fasten through back, near top and bottom, at ends, and not more than 16 inches o.c.
 - 2. Use toggle bolts at hollow masonry.
 - 3. Use expansion anchors at solid masonry.
 - 4. Use No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish at metal-framed partitions.
- D. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.
- E. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF TOPS

- A. Field Jointing: Where possible make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
 - 1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

- B. Secure tops to cabinets with Z- or L-type fasteners or equivalent, using two or more fasteners at each front, end, and back.
- C. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
- D. Secure backsplashes and end splashes to tops with concealed metal brackets at 16 inches o.c. and walls with adhesive.
- E. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.4 CLEANING AND PROTECTING

- A. Repair or remove and replace defective work as directed on completion of installation.
- B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.
- C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 123200

SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- B. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.
- C. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:

- a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
- b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
- c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge .
- d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
- e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
- f. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge .
- g. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge .

3.2 FIELD QUALITY CONTROL

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 220518

SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Bronze ball valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 Annex G and NSF 372.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and soldered ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

1.6 QUALITY ASSURANCE

- A. Standardize on same manufacturers for the entire project.
 - 1. Provide the same manufacturer throughout the project for ball valves.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 3. ASME B16.18 for solder-joint connections.
 - 4. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Handlever: For quarter-turn valves smaller than 2 inches.
- H. Valves in Insulated Piping:
 - 1. Include 2-inch stem extensions.
 - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRONZE BALL VALVES

- A. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Crane; Crane Energy Flow Solutions.
 - c. Hammond Valve.
 - d. Milwaukee Valve Company.
 - e. NIBCO INC.
 - f. Watts; a Watts Water Technologies company.
2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. Body Design: Two piece.
 - d. Body Material: Bronze.
 - e. Ends: Threaded and soldered.
 - f. Seats: PTFE.
 - g. Stem: Bronze or brass.
 - h. Ball: Chrome-plated brass.
 - i. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Two-piece, bronze ball valves with full port and bronze or brass trim.

END OF SECTION 220523.12

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Metal pipe hangers and supports.
 - 2. Thermal-hanger shield inserts.
 - 3. Fastener systems.
 - 4. Pipe stands.
 - 5. Pipe positioning systems.

- B. Related Sections:

- 1. Section 055000 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.4 PIPE STANDS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Miro Industries.
- B. General Requirements for Pipe Stands: Shop- fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- C. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- D. Low-Type, Single-Pipe Stand: One-piece plastic base unit with plastic roller, for roof installation without membrane penetration.

2.5 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- C. Fastener System Installation:
 1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- D. Pipe Stand Installation:
 1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
- E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 METAL FABRICATIONS

- A. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- B. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in .
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.5 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports and attachments for general service applications.
- F. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.

- G. Use padded hangers for piping that is subject to scratching.
- H. Use thermal-hanger shield inserts for insulated piping and tubing.
- I. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 - 4. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
- J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 2. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
- K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 5. C-Clamps (MSS Type 23): For structural shapes.
 - 6. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 - 7. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 - 8. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 - 9. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with

- insulation that matches adjoining insulation.
- 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
- 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- M. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- N. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Pipe labels.
 - 3. Valve tags.
 - 4. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data with Equipment Label Schedule, Valve Schedule and Valve Numbering Scheme:
 - 1. Product Data: For each type of product indicated.
 - 2. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
 - 3. Valve numbering scheme.
 - 4. Valve Schedules: For each piping system to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Metal Labels for Equipment:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Brimar Industries, Inc.
 - c. Carlton Industries, LP.
 - d. Champion America.
 - e. Craftmark Identification Systems.

- f. emedco.
 - g. Kolbi Pipe Marker Co.
 - h. LEM Products Inc.
 - i. Marking Services Inc.
 - j. Seton Identification Products.
 - 2. Material and Thickness: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 3. Letter Color: Black.
 - 4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 - 5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 - 6. Fasteners: Stainless-steel rivets or self-tapping screws.
 - 7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. Actioncraft Products, Inc.
 - 2. Brady Corporation.
 - 3. Brimar Industries, Inc.
 - 4. Carlton Industries, LP.
 - 5. Champion America.
 - 6. Craftmark Identification Systems.
 - 7. emedco.
 - 8. Kolbi Pipe Marker Co.
 - 9. LEM Products Inc.
 - 10. Marking Services Inc.
 - 11. Seton Identification Products.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering

indicating service, and showing flow direction.

- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

2.3 VALVE TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Actioncraft Products, Inc.
 - 2. Brady Corporation.
 - 3. Brimar Industries, Inc.
 - 4. Carlton Industries, LP.
 - 5. Champion America.
 - 6. Craftmark Identification Systems.
 - 7. emedco.
 - 8. Kolbi Pipe Marker Co.
 - 9. LEM Products Inc.
 - 10. Marking Services Inc.
 - 11. Seton Identification Products.
- B. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link chain.
- C. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

2.4 WARNING TAGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Brady Corporation.
 - 2. Brimar Industries, Inc.
 - 3. Carlton Industries, LP.
 - 4. Champion America.
 - 5. Craftmark Identification Systems.
 - 6. emedco.
 - 7. Kolbi Pipe Marker Co.
 - 8. LEM Products Inc.
 - 9. Marking Services Inc.
 - 10. Seton Identification Products.
- B. Description: Preprinted or partially preprinted accident-prevention tags of plasticized card stock with matte finish suitable for writing.
 - 1. Size: Approximately 4 by 7 inches.
 - 2. Fasteners: Reinforced grommet and wire or string.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Safety yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.4 PIPE LABEL INSTALLATION

- A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Directional Flow Arrows: Arrows shall be used to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.
- C. Pipe Label Color Schedule:
 - 1. Domestic Water Piping
 - a. Background: Safety green.
 - b. Letter Colors: White.
 - 2. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Safety black.
 - b. Letter Color: White.

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves, valves within factory-fabricated equipment units, shutoff valves, faucets, convenience and lawn-watering hose connections, and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:
 - a. Cold Water: 2 inches, round.
 - b. Hot Water: 2 inches, round.
2. Valve-Tag Colors:
 - a. Cold Water: Natural.
 - b. Hot Water: Natural.
3. Letter Colors:
 - a. Cold Water: Black.
 - b. Hot Water: Black.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Waste piping receiving condensate or water cooler discharge.
 - 3. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

- A. Product Data with Shop Drawings:
 - 1. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed

index of 50 or less.

- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.
- C. Standardize on same manufacturers for the entire project.
 - 1. Provide the same manufacturer throughout the project for pipe insulation.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in the following articles for where insulating materials shall be applied:
 - 1. "Piping Insulation Schedule, General"
 - 2. "Indoor Piping Insulation Schedule"
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
- G. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000-Degree Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, . Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Ramco Insulation, Inc.; Super-Stik.
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Ramco Insulation, Inc.; Thermokote V.
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aeroseal.
 - b. Armacell LLC; Armaflex 520 Adhesive.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
 - d. K-Flex USA; R-373 Contact Adhesive.
 - 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
 - d. Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 739, Dow Silicone.
 - b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
 - c. P.I.C. Plastics, Inc.; Welding Adhesive.
 - d. Speedline Corporation; Polyco VP Adhesive.
2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass and Phenolic Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Pittsburgh Corning Corporation; Pittseal 444.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when

calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.6 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 370 White PVC tape.
 - b. Compac Corporation; 130.
 - c. Venture Tape; 1506 CW NS.
 2. Width: 2 inches.
 3. Thickness: 6 mils.

4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.8 SECUREMENTS

- A. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.9 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Pipe Covers, :
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. McGuire Manufacturing.
 - b. Plumberex.
 - c. Truebro; a brand of IPS Corporation.
 - d. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
 2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches

similar to butt joints.

N. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated):
Install insulation continuously through walls and partitions.

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Insulate pipe elbows using preformed fitting insulation with PVC jacket, made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
2. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
3. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
4. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
5. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe

- insulation, or one pipe diameter, whichever is thicker.
6. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 7. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.
- 3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION
- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. Install preformed insulation elbows and fittings to a thickness equal to adjoining pipe insulation. Secure insulation materials with wires or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD QUALITY CONTROL

- A. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 1. Drainage piping located in crawl spaces.
 2. Underground piping.
 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
 1. NPS 1 and Smaller: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 2. NPS 1-1/4 and Larger: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

END OF SECTION 220719

SECTION 221116 - DOMESTIC WATER PIPING (BUILDING)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
 - 2. Do not interrupt water service without Owner's written permission.

1.6 QUALITY ASSURANCE

- A. Standardize on the same manufacturer throughout the entire Project.
 - 1. Provide the same manufacturer throughout the Project for domestic water piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- D. Copper Unions:
 - 1. MSS SP-123.
 - 2. Ball-and-socket, metal-to-metal seating surfaces.
 - 3. Solder-joint or threaded ends.
- E. Extruded tee connections used in place of sweat fittings such as manufactured by T-Drill are not allowed.
- F. Copper Pressure-Seal-Joint Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Elkhart Products Corporation.
 - b. NIBCO Inc.
 - c. Viega LLC.
 - 2. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
 - 3. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

2.4 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Capitol Manufacturing Company.
 - c. Central Plastics Company.
 - d. Hart Industries International, Inc.
 - e. Jomar Valve.
 - f. Matco-Norca.
 - g. Watts; a Watts Water Technologies company.
 - h. Wilkins.

2. Standard: ASSE 1079.
3. Pressure Rating: 150 psig.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. Matco-Norca.
 - d. Watts; a Watts Water Technologies company.
 - e. Wilkins.
2. Standard: ASSE 1079.
3. Factory-fabricated, bolted, companion-flange assembly.
4. Pressure Rating: 150 psig.
5. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Grinnell Mechanical Products.
 - b. Matco-Norca.
 - c. Precision Plumbing Products, Inc.
 - d. Victaulic Company.
2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."
- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install domestic water piping level with 0.25 percent slope downward toward drain valve or plumbing fixture.
- F. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- J. Install piping to permit valve servicing.
- K. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- L. Install piping free of sags and bends.
- M. Install fittings for changes in direction and branch connections.
- N. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

- O. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- D. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- E. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- F. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.

3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples nipples unions.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 6. NPS 6: 10 feet with 5/8-inch rod.
 7. NPS 8: 10 feet with 3/4-inch rod.
- E. Install supports for vertical copper tubing every 10 feet.
- F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.

3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

- B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:

- 1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

- 2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

- B. Domestic water piping will be considered defective if it does not pass tests and inspections.

- C. Prepare test and inspection reports.

3.10 ADJUSTING

- A. Perform the following adjustments before operation:
1. Open shutoff valves to fully open position.
 2. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 3. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Remove all faucet aerators and purge new piping and parts of existing piping that have been altered, extended, or repaired before using. Thoroughly flush system free of construction debris. Remove and clean all flush valves free of construction debris.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Repeat procedures if biological examination shows contamination.
 - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of

water-sample approvals from authorities having jurisdiction.

- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
 - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller.
 - 2. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 221116

SECTION 221316 - SANITARY WASTE AND VENT PIPING (BUILDING)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.
- B. Related Sections:
 - 1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- C. Standardize on same manufacturers for the entire project.
 - 1. Provide the same manufacturer throughout the project for: Sanitary, Waste and Vent Pipe, Fittings, etc.

1.5 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
 - 2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. Heavy-Duty, Hubless-Piping Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ANACO-Husky.
 - b. Charlotte Pipe HD-4000.
 - c. Mission Rubber Company; a division of MCP Industries, Inc.
 - 2. Standards: ASTM C 1277 and ASTM C 1540.
 - 3. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.3 COPPER TUBE AND FITTINGS

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
- B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

- C. Hard Copper Tube: ASTM B 88, Type L and Type M, water tube, drawn temper.
- D. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
 - 1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - 2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- E. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.

2.4 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- C. Adhesive Primer: ASTM F 656.
- D. Solvent Cement: ASTM D 2564.

2.5 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 - 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 - 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 - 3. Shielded, Nonpressure Transition Couplings:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) ANACO-Husky.
 - 2) Charlotte Pipe HD-4000.
 - 3) Mission Rubber Company; a division of MCP Industries, Inc.
 - b. Standard: ASTM C 1460.
 - c. Description: Elastomeric or rubber sleeve with full-length, heavy duty corrosion-resistant outer shield and corrosion-resistant-metal tension bands and tightening mechanism on each end.

B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Capitol Manufacturing Company.
 - 2) Hart Industries International, Inc.
 - 3) Jomar International Ltd.
 - 4) Matco-Norca, Inc.
 - 5) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 6) Wilkins; a Zurn company.
 - b. Description:
 - 1) Standard: ASSE 1079.
 - 2) Pressure Rating: 125 psig minimum at 180 deg F.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
3. Dielectric Flanges:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Capitol Manufacturing Company.
 - 2) Matco-Norca, Inc.
 - 3) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 4) Wilkins; a Zurn company.
 - b. Description:
 - 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.
 - 3) Pressure Rating: 150 psig.
 - 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.
4. Dielectric-Flange Insulating Kits:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Advance Products & Systems, Inc.

- 2) Calpico, Inc.
- 3) Pipeline Seal and Insulator, Inc.

b. Description:

- 1) Nonconducting materials for field assembly of companion flanges.
- 2) Pressure Rating: 150 psig.
- 3) Gasket: Neoprene or phenolic.
- 4) Bolt Sleeves: Phenolic or polyethylene.
- 5) Washers: Phenolic with steel backing washers.

5. Dielectric Nipples:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Elster Perfection.
- 2) Grinnell Mechanical Products.
- 3) Matco-Norca, Inc.
- 4) Precision Plumbing Products, Inc.
- 5) Victaulic Company.

b. Description:

- 1) Standard: IAPMO PS 66
- 2) Electroplated steel nipple.
- 3) Pressure Rating: 300 psig at 225 deg F.
- 4) End Connections: Male threaded or grooved.
- 5) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 1 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- N. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
- O. Install aboveground PVC piping according to ASTM D 2665.
- P. Install underground PVC piping according to ASTM D 2321.

- Q. Install engineered soil and waste drainage and vent piping systems as follows:
1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 2. Solvent Drainage System: Comply with ASSE 1043 and solvent fitting manufacturer's written installation instructions.
 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- R. Plumbing Specialties:
1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
- S. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- C. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.
- D. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.
- E. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent

cements.

2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. In Drainage Piping: Shielded, nonpressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges flange kits nipples.
4. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
3. Vertical Piping: MSS Type 8 or Type 42, clamps.
4. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
6. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.
6. NPS 8: 10 feet with 3/4-inch rod.

I. Install supports for vertical copper tubing every 10 feet.

J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
3. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

C. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

D. Make connections according to the following unless otherwise indicated:

3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 - 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 - 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 - 6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
 - 2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
 - 2. PVC piping is not permitted in return air plenum.
 - 3. Copper DWV tube, copper drainage fittings, and soldered joints.
 - a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:
 - 1. Hubless, cast-iron soil pipe and fittings; heavy-duty hubless-piping couplings; and coupled joints.
 - 2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 - 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Cleanouts.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Standardize on same manufacturers for the entire project.
 - 1. Provide the same manufacturer throughout the project for waste piping specialties.

1.6 COORDINATION

- A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts :

1. ASME A112.36.2M, Cast-Iron Cleanouts:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Josam Company.
 - 2) MIFAB, Inc.
 - 3) Smith, Jay R. Mfg. Co.
 - 4) Tyler Pipe.
 - 5) Watts Drainage Products.
 - 6) Zurn Plumbing Products Group.
2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts :

1. Standard: ASME A112.36.2M for adjustable housing cleanout.
2. Size: Same as connected branch.
3. Type: Adjustable housing.
4. Body or Ferrule: .
5. Clamping Device: Not required.
6. Outlet Connection: Inside calk.
7. Closure: Brass plug with straight threads and gasket .
8. Adjustable Housing Material: Cast iron with set-screws or other device.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy .
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Medium Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
13. Size: Same as connected branch.

EXECUTION

2.2 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following,

unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 2. Locate at each change in direction of piping greater than 45 degrees.
 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
 4. Locate at base of each vertical soil and waste stack.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. Install wood-blocking reinforcement for wall-mounting-type specialties.
- D. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

2.3 CONNECTIONS

- A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

2.4 LABELING AND IDENTIFYING

- A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

2.5 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 224100 - RESIDENTIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Kitchen sinks.
 - 2. Supply fittings.
 - 3. Waste fittings.

1.3 ACTION SUBMITTALS

- A. Product Data with Shop Drawings:
 - 1. Product Data: For each type of product.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
 - b. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted plumbing fixtures.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For plumbing fixtures and faucets to include in emergency, operation, and operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective

covering for storage and identified with labels describing contents.

1. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
3. Flushometer-Tank Repair Kits: Equal to 5 percent of amount of each type installed, but no fewer than two of each type.
4. Toilet Seats: Equal to 5 percent of amount of each type installed.

1.7 QUALITY ASSURANCE

- A. Standardize on same manufacturers for the entire project.
 1. Provide the same manufacturer throughout the project for: Fixtures, equipment, faucets/valves, etc.

PART 2 - PRODUCTS

2.1 KITCHEN SINKS

- A. Kitchen Sinks : One bowl, counter mounted, stainless steel.
 1. Stainless-Steel Kitchen Sinks:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Elkay Manufacturing Co.
 - 2) Just Manufacturing.
 2. Fixture:
 - a. Standard: ASME A112.19.3/CSA B45.4 for stainless-steel kitchen sinks.
 - b. Metal Thickness: 0.050 inch.
 - c. Bowl:
 - 1) Dimensions: See schedule.
 - 2) Drain: 3-1/2-inch crumb cup.
 3. Faucet: See Schedule.
 4. Supply Fittings: Comply with requirements in "Supply Fittings" Article.
 5. Waste Fittings: Comply with requirements in "Waste Fittings" Article, except include continuous waste for multibowl sinks.
 - a. Disposer: Not required.

2.2 SINK FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Sink Faucets : Solid brass, .
 - 1. General-Duty, Solid-Brass Faucets:
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) American Standard America.
 - 2) Chicago Faucets; Geberit Company.
 - 3) T & S Brass and Bronze Works, Inc.
 - 2. Standard: ASME A112.18.1/CSA B125.1.
 - 3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
 - 4. Kitchen Sink Option: Separate hand spray complying with ASSE 1025.
 - 5. Finish: Polished chrome plate .
 - 6. Mixing Valve: Two-lever handle.
 - 7. Centers: 8 inches.
 - 8. Mounting: Deck, concealed.
 - 9. Handle(s): Lever .
 - 10. Spout Type: Swing, round tubular.
 - 11. Spout Outlet: Aerator.

2.3 SUPPLY FITTINGS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Kitchen Sink Supply Fittings:
 - 1. Supply Piping: Chrome-plated-brass pipe or chrome-plated-copper tube matching water-supply piping size. Include chrome-plated wall flange.
 - 2. Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression stop with inlet connection matching water-supply piping type and size.
 - a. Operation: Loose key.
 - 3. Risers:

- a. Size: NPS 3/8 for sinks .
- b. Material: Chrome-plated, soft-copper flexible tube riser.

2.4 WASTE FITTINGS

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/2 straight tailpiece for standard sinks .
- C. Trap:
 - 1. Material: Chrome-plated, two-piece, cast-brass trap and ground-joint swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated-brass or -steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing-fixture installation.
- B. Examine walls, floors, cabinets, and counters for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install plumbing fixtures level and plumb according to roughing-in drawings.
- B. Install counter-mounting fixtures in and attached to casework.
- C. Install pedestal lavatories on pedestals and secured to wood blocking in wall.
- D. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- E. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- F. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes unless otherwise indicated.

- G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- H. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

3.4 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100

SECTION 224233 - WASH FOUNTAINS

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. Linear wash fountains.

1.3 ACTION SUBMITTALS

- A. Product Data with Shop Drawings:
 - 1. Product Data: For each type of product.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wash fountains.
 - b. Include rated capacities, operating characteristics,[electrical characteristics,] and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wash fountains and components to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Faucet Washers and O-Rings: Equal to 10 percent of quantity of each type and size installed.
 - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of quantity of each type and size installed.

1.6 QUALITY ASSURANCE

- A. Standardize on same manufacturers for the entire project.
 - 1. Provide the same manufacturer throughout the project for: Wash Fountains.

PART 2 - PRODUCTS

2.1 STAINLESS-STEEL, LINEAR WASH FOUNTAINS

- A. Wash Fountains : Stainless-steel, linear (side-by-side) receptor.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Acorn Engineering Company.
 - b. Bradley.
 - 2. Standard: IAPMO IGC 156.
 - 3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 4. Bowl(s) and Counter:
 - a. Standard: ASME A112.19.3/CSA B45.4 for stainless-steel bowls.
 - b. Height to Rim: 34 inches above floor.
 - c. Color or Finish: Not applicable.
 - d. Number of Bowls: One.
 - e. Number of Faucets: Three
 - f. Drain: Grid with NPS 1-1/2 tailpiece, each bowl.
 - 5. Pedestal: Required, with access panel.
 - 6. Faucets:
 - a. Standards: ASME A112.18.1/CSA B125.1 and NSF 61 Annex G.
 - b. Type: Manufacturer's standard, chrome-plated solid brass, each bowl.
 - c. Control: Manual, push-button mixing valve with check stops for each user station.
 - d. Sensor: ASME A112.18.1/CSA B125.1 and UL 1951.
 - 7. Liquid-Soap Dispensers: Not required, for each user station.
 - 8. Mounting: Off floor on wall brackets and ASME A112.6.1M, Type II urinal carriers.
 - 9. Supply Fittings:
 - a. Piping: NPS 1/2 copper tubing, each bowl.
 - b. Valves: Shutoff valve on each supply.
 - c. Supply Piping: From wall.

10. Waste Fittings:

- a. Standard: ASME A112.18.2/CSA B125.2.
- b. Trap and Drain Piping: NPS 1-1/2, each bowl.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water-supply, sanitary drainage, and vent piping systems to verify actual locations of piping connections before wash-fountain installation.
- B. Examine walls and floors for suitable conditions where wash fountains will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install wash fountains level and plumb according to roughing-in drawings.
- B. Set freestanding wash fountains on floor.
- C. Install off-floor carrier supports, affixed to building substrate, for wall-mounted wash fountains.
- D. Install accessible, wall-mounted wash fountains at mounting height for handicapped/elderly according to ICC A117.1.
- E. Install water-supply piping with shutoff ball valve on each supply to each wash fountain to be connected to domestic-water distribution piping. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523.12 "Ball Valves for Plumbing Piping."
- F. Install trap and waste piping on each drain outlet of each wash fountain to be connected to sanitary drainage system.
- G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- H. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 CONNECTIONS

- A. Connect wash fountains with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with requirements for water piping specified in Section 221116 "Domestic Water Piping."
- C. Comply with requirements for soil and waste drainage piping and vent piping specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

- A. Operate and adjust wash fountains and controls. Replace damaged and malfunctioning wash fountains, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

- A. After installing wash fountains, inspect and repair damaged finishes.
- B. Clean wash fountains, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed wash fountains and fittings.
- D. Do not allow use of wash fountains for temporary facilities unless approved in writing by Owner.

END OF SECTION 224233

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Piping materials and installation instructions common to most piping systems.
 - 2. Dielectric fittings.
 - 3. Mechanical sleeve seals.
 - 4. Sleeves.
 - 5. Escutcheons.
 - 6. Grout.
 - 7. Equipment installation requirements common to equipment sections.
 - 8. Concrete bases.
 - 9. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 QUALITY ASSURANCE

- A. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- B. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

1.6 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 23 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
 - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 - 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

1. Manufacturers:
 - a. Capitol Manufacturing Co.
 - b. Eclipse, Inc.
 - c. Epco Sales, Inc.
 - d. Hart Industries, International, Inc.
 - e. Watts Industries, Inc.; Water Products Div.
 - f. Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.
 1. Manufacturers:
 - a. Epco Sales, Inc.
 - b. Watts Industries, Inc.; Water Products Div.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Pipeline Seal and Insulator, Inc.
 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.
 1. Manufacturers:
 - a. Calpico, Inc.
 - b. Lochinvar Corp.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.
 1. Manufacturers:
 - a. Perfection Corp.
 - b. Precision Plumbing Products, Inc.
 - c. Sioux Chief Manufacturing Co., Inc.
 - d. Victaulic Co. of America.

2.5 MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
 - 1. Manufacturers:
 - a. Advance Products & Systems, Inc.
 - b. Calpico, Inc.
 - c. Metraflex Co.
 - d. Pipeline Seal and Insulator, Inc.
 - 2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 3. Pressure Plates: Carbon steel. Include two for each sealing element.
 - 4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6 SLEEVES

- A. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

2.7 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.

2.8 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated

- finish.
 - c. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
2. Existing Piping: Use the following:
- a. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - b. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
- M. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.
- 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
 - 3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- O. Verify final equipment locations for roughing-in.
- P. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.3 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
 - 2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
 - 3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
 - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
 - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of the base.
 - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
 - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
 - 7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 05 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

3.7 GROUTING

- A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment

base plates, and anchors.

- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 230500

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections included, but are not limited to, the following:
 - 1. 233423 HVAC Power Ventilators
 - 2. 238223.98 Vertical Unit Ventilator
 - 3.

1.2 SUMMARY

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above

sea level.

- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- E. Temperature Rise: Match insulation rating.
- F. Insulation: Class F.
- G. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- H. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 3. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
 2. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Brass ball valves.
 - 2. Bronze ball valves.
 - 3. Iron, single-flange butterfly valves.
 - 4. Iron, grooved-end butterfly valves.
 - 5. Bronze lift check valves.
 - 6. Bronze swing check valves.
 - 7. Iron swing check valves.
 - 8. Iron, grooved-end swing-check valves.
 - 9. Lubricated plug valves.
- B. Related Sections:
 - 1. Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. RS: Rising stem.
- G. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 2. ASME B31.1 for power piping valves.
 - 3. ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to HVAC valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
 - 2. Handwheel: For valves other than quarter-turn types.
 - 3. Handlever: For quarter-turn valves NPS 6 and smaller.
 - 4. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug-valve head.
- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: With extended neck.
- F. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Grooved: With grooves according to AWWA C606.
 - 3. Solder Joint: With sockets according to ASME B16.18.
 - 4. Threaded: With threads according to ASME B1.20.1.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

- A. Two-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Hammond Valve.
 - d. Jamesbury; a subsidiary of Metso Automation.
 - e. Kitz Corporation.
 - f. Milwaukee Valve Company.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.

- e. Body Material: Forged brass.
- f. Ends: Threaded.
- g. Seats: PTFE or TFE.
- h. Stem: Stainless steel.
- i. Ball: Stainless steel, vented.
- j. Port: Full.

B. Three-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Jomar International, LTD.
 - b. Kitz Corporation.
 - c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Three piece.
 - e. Body Material: Forged brass.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Stainless steel.
 - i. Ball: Stainless steel, vented.
 - j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Hammond Valve.
 - d. Lance Valves; a division of Advanced Thermal Systems, Inc.
 - e. Milwaukee Valve Company.
 - f. NIBCO INC.
 - g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-110.

- b. SWP Rating: 150 psig.
- c. CWP Rating: 600 psig.
- d. Body Design: Two piece.
- e. Body Material: Bronze.
- f. Ends: Threaded.
- g. Seats: PTFE or TFE.
- h. Stem: Stainless steel.
- i. Ball: Stainless steel, vented.
- j. Port: Full.

B. Three-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Hammond Valve.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
- 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Three piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Stainless steel.
 - i. Ball: Stainless steel, vented.
 - j. Port: Full.

2.4 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
 - b. Bray Controls; a division of Bray International.
 - c. Conbraco Industries, Inc.; Apollo Valves.
 - d. Crane Co.; Crane Valve Group; Jenkins Valves.
 - e. Crane Co.; Crane Valve Group; Stockham Division.
 - f. Hammond Valve.
 - g. Kitz Corporation.

- h. Milwaukee Valve Company.
- i. NIBCO INC.
- j. Red-White Valve Corporation.
- k. Spence Strainers International; a division of CIRCOR International.
- l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-67, Type I.
- b. CWP Rating: 150 psig.
- c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
- d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
- e. Seat: EPDM.
- f. Stem: One- or two-piece stainless steel.
- g. Disc: Aluminum bronze.

B. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Crane Co.; Crane Valve Group; Stockham Division.

C. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
- b. Bray Controls; a division of Bray International.
- c. Conbraco Industries, Inc.; Apollo Valves.
- d. Crane Co.; Crane Valve Group; Jenkins Valves.
- e. Crane Co.; Crane Valve Group; Stockham Division.
- f. Hammond Valve.
- g. Kitz Corporation.
- h. Milwaukee Valve Company.
- i. Mueller Steam Specialty; a division of SPX Corporation.
- j. NIBCO INC.
- k. Red-White Valve Corporation.
- l. Spence Strainers International; a division of CIRCOR International.
- m. Sure Flow Equipment Inc.
- n. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-67, Type I.
- b. CWP Rating: 150 psig.

- c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
- d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
- e. Seat: EPDM.
- f. Stem: One- or two-piece stainless steel.
- g. Disc: Stainless steel.

2.5 IRON, GROOVED-END BUTTERFLY VALVES

A. 175 CWP, Iron, Grooved-End Butterfly Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Kennedy Valve; a division of McWane, Inc.
 - b. Victaulic Company.
- 2. Description:
 - a. Standard: MSS SP-67, Type I.
 - b. CWP Rating: 175 psig.
 - c. Body Material: Coated, ductile iron.
 - d. Stem: Two-piece stainless steel.
 - e. Disc: Coated, ductile iron.
 - f. Seal: EPDM.

2.6 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Bronze Disc:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
- 2. Description:
 - a. Standard: MSS SP-80, Type 1.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Vertical flow.
 - d. Body Material: ASTM B 61 or ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.

2.7 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Crane Co.; Crane Valve Group; Crane Valves.
 - c. Crane Co.; Crane Valve Group; Jenkins Valves.
 - d. Crane Co.; Crane Valve Group; Stockham Division.
 - e. Hammond Valve.
 - f. Kitz Corporation.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.
 - k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
 - a. Standard: MSS SP-80, Type 3.
 - b. CWP Rating: 200 psig.
 - c. Body Design: Horizontal flow.
 - d. Body Material: ASTM B 62, bronze.
 - e. Ends: Threaded.
 - f. Disc: Bronze.

2.8 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crane Co.; Crane Valve Group; Crane Valves.
 - b. Crane Co.; Crane Valve Group; Jenkins Valves.
 - c. Crane Co.; Crane Valve Group; Stockham Division.
 - d. Hammond Valve.
 - e. Kitz Corporation.
 - f. Legend Valve.
 - g. Milwaukee Valve Company.
 - h. NIBCO INC.
 - i. Powell Valves.
 - j. Red-White Valve Corporation.

- k. Sure Flow Equipment Inc.
- l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-71, Type I.
- b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
- c. NPS 14 to NPS 24, CWP Rating: 150 psig.
- d. Body Design: Clear or full waterway.
- e. Body Material: ASTM A 126, gray iron with bolted bonnet.
- f. Ends: Flanged.
- g. Trim: Bronze.
- h. Gasket: Asbestos free.

2.9 IRON, GROOVED-END SWING CHECK VALVES

A. 300 CWP, Iron, Grooved-End Swing Check Valves:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International, Inc.
 - b. Shurjoint Piping Products.
 - c. Tyco Fire Products LP; Grinnell Mechanical Products.
 - d. Victaulic Company.
- 2. Description:
 - a. CWP Rating: 300 psig.
 - b. Body Material: ASTM A 536, ductile iron.
 - c. Seal: EPDM.
 - d. Disc: Spring operated, ductile iron or stainless steel.

2.10 LUBRICATED PLUG VALVES

A. Class 125, Regular-Gland, Lubricated Plug Valves with Threaded Ends:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Nordstrom Valves, Inc.
- 2. Description:
 - a. Standard: MSS SP-78, Type II.
 - b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
 - c. NPS 14 to NPS 24, CWP Rating: 150 psig.

- d. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
- e. Pattern: Venturi.
- f. Plug: Cast iron or bronze with sealant groove.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install check valves for proper direction of flow and as follows:
 - 1. Swing Check Valves: In horizontal position with hinge pin level.
 - 2. Check Valves: In horizontal or vertical position, between flanges.
 - 3. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball, butterfly, gate, or plug valves.
 - 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
 - 3. Throttling Service except Steam: , ball, or butterfly valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
 - 4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 5. For Grooved-End Steel Piping except Steam and Steam Condensate Piping: Valve ends may be grooved.

3.5 CHILLED-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Ball Valves: Two Three piece, full port, brass with stainless-steel trim.
 - 3. Bronze Swing Check Valves: Class 125, bronze disc.
- B. Pipe NPS 2-1/2 and Larger:
 - 1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
 - 2. Iron, Grooved-End Butterfly Valves, NPS 2-1/2 to NPS 12: 175 CWP.
 - 3. Iron Swing Check Valves: Class 125, metal seats.
 - 4. Iron, Grooved-End Check Valves, NPS 3 to NPS 12: 300 CWP.
 - 5. Lubricated Plug Valves: Class 125, regular gland, threaded.

3.6 HEATING-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Three piece, full port, brass bronze with stainless-steel trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 14 to NPS 24: 150 CWP, seat, aluminum-bronze stainless-steel disc.
3. Iron, Grooved-End Butterfly Valves, NPS 2-1/2 to NPS 12: 175 CWP.
4. Iron Swing Check Valves: Class 125, metal seats.
5. Iron, Grooved-End Check Valves, NPS 3 to NPS 12: 300 CWP.

END OF SECTION 230523

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following hangers and supports for HVAC system piping and equipment:
 - 1. Steel pipe hangers and supports.
 - 2. Metal framing systems.
 - 3. Thermal-hanger shield inserts.
 - 4. Fastener systems.
 - 5. Pipe stands.
 - 6. Equipment supports.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
 - 2. Division 21 Section "Water-Based Fire-Suppression Systems" for pipe hangers for fire-protection piping.
 - 3. Division 23 Section "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
 - 4. Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

A. Product Data with Shop Drawings:

- 1. Product Data: For the following:
 - a. Steel pipe hangers and supports.
 - b. Thermal-hanger shield inserts.
- 2. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
 - a. Metal framing systems. Include Product Data for components.
 - b. Equipment supports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. 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 one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. Grinnell Corp.
 - 3. National Pipe Hanger Corporation.
- C. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 METAL FRAMING SYSTEMS

- A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
 - 3. Power-Strut Div.; Tyco International, Ltd.
 - 4. Thomas & Betts Corporation.
 - 5. Tolco Inc.
 - 6. Unistrut Corp.; Tyco International, Ltd.
- C. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.

2.4 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig- minimum, compressive-strength insulation insert encased in sheet metal shield.
- B. Manufacturers:
 - 1. PHS Industries, Inc.
 - 2. Pipe Shields, Inc.
 - 3. Value Engineered Products, Inc.
- C. Insulation-Insert Material for Cold Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass with vapor barrier.
- D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.
- E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- G. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:
 - a. B-Line Systems, Inc.; a division of Cooper Industries.
 - b. MKT Fastening, LLC.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30.
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F pipes, NPS 4 to NPS 16, requiring up to 4 inches of insulation.
 3. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20, from single rod if horizontal movement caused by expansion and contraction might occur.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system

Sections, install the following types:

1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction to attach to top flange of structural shape.
 2. C-Clamps (MSS Type 23): For structural shapes.
 3. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 4. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
- L. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- M. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- D. Fastener System Installation:
1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

- G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- H. Install lateral bracing with pipe hangers and supports to prevent swaying.
- I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- J. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- L. Insulated Piping: Comply with the following:
 - 1. Attach clamps and spacers to piping.
 - a. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - b. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
 - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 - 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - 5. Insert Material: Length at least as long as protective shield.
 - 6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

- A. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 230529

SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.
 - 4. Duct labels.
 - 5. Valve tags.
 - 6. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data with Valve Schedules:
 - 1. Product Data: For each type of product indicated.
 - 2. Valve Schedules: For each piping system to include in maintenance manuals.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Yellow.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets.

- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.4 DUCT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Green.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- H. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 inches high.

2.5 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass beaded chain.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 WARNING TAGS

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: Approximately 4 by 7 inches.
 - 2. Fasteners: Brass grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Pipe Label Color Schedule:
 - 1. Heating Water Piping:
 - a. Background Color: Black.
 - b. Letter Color: Yellow.

3.4 DUCT LABEL INSTALLATION

- A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:
 - 1. Blue: For cold-air supply ducts.
 - 2. Yellow: For hot-air supply ducts.
 - 3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
 - 4. ASME A13.1 Colors and Designs: For hazardous material exhaust.
- B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 25 feet in each space where ducts are exposed or concealed by removable ceiling system.

3.5 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and

with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:
 - a. Hot Water: 1-1/2 inches, round.
2. Valve-Tag Color:
 - a. Hot Water: Natural.
3. Letter Color:
 - a. Hot Water: Black.

3.6 WARNING-TAG INSTALLATION

- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - 2. Balancing Hydronic Piping Systems:
 - a. Existing systems.

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

- D. Certified TAB reports.
- E. Sample report forms.
- F. Instrument calibration reports, to include the following:
 - 1. Instrument type and make.
 - 2. Serial number.
 - 3. Application.
 - 4. Dates of use.
 - 5. Dates of calibration.

1.5 QUALITY ASSURANCE

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.
 - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC or NEBB.
 - 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.
- B. TAB Conference: Meet with Architect on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.
 - 1. Agenda Items:
 - a. The Contract Documents examination report.
 - b. The TAB plan.
 - c. Coordination and cooperation of trades and subcontractors.
 - d. Coordination of documentation and communication flow.
- C. Certify TAB field data reports and perform the following:
 - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- D. TAB Report Forms: Use standard TAB contractor's forms approved by Architect.
- E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."
- F. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- G. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

1.6 PROJECT CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

- A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.
- B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 TAB SPECIALISTS

- A. Subject to compliance with requirements, engage one of the following:
 - 1. Total Balance
 - 2. Midwest Balance
 - 3. Bradley J. Williams
 - 4. Synergy Test and Balance
 - 5. Fluid Dynamics

3.2 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions

for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as Unit ventilators , and verify that they are accessible and their controls are connected and functioning.
- K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.
- L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.
- M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.
- N. Examine system pumps to ensure absence of entrained air in the suction piping.
- O. Examine operating safety interlocks and controls on HVAC equipment.
- P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.3 PREPARATION

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.

- B. Complete system-readiness checks and prepare reports. Verify the following:
 - 1. Permanent electrical-power wiring is complete.
 - 2. Hydronic systems are filled, clean, and free of air.
 - 3. Automatic temperature-control systems are operational.
 - 4. Equipment and duct access doors are securely closed.
 - 5. Balance, smoke, and fire dampers are open.
 - 6. Isolating and balancing valves are open and control valves are operational.
 - 7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
 - 8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
 - 1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.

- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.
- K. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.
 - 2. Measure fan static pressures as follows to determine actual static pressure:
 - a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
 - b. Measure static pressure directly at the fan outlet or through the flexible connection.
 - c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
 - d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.
 - 3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.
 - a. Report the cleanliness status of filters and the time static pressures are measured.
 - 4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
 - 5. Review Record Documents to determine variations in design static pressures versus

- actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
 7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.
1. Measure airflow of submain and branch ducts.
 - a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.
 2. Measure static pressure at a point downstream from the balancing damper, and adjust volume dampers until the proper static pressure is achieved.
 3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.
- C. Measure air outlets and inlets without making adjustments.
1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.
- D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.
1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
 2. Adjust patterns of adjustable outlets for proper distribution without drafts.

3.7 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:
1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
 - a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Architect and comply with requirements in Section 232123 "Hydronic Pumps."
 2. Check system resistance. With all valves open, read pressure differential across the

- pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
- a. Monitor motor performance during procedures and do not operate motors in overload conditions.
 3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
 4. Report flow rates that are not within plus or minus 10 percent of design.
- B. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.
- C. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.

3.8 PROCEDURES FOR MOTORS

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:
1. Manufacturer's name, model number, and serial number.
 2. Motor horsepower rating.
 3. Motor rpm.
 4. Efficiency rating.
 5. Nameplate and measured voltage, each phase.
 6. Nameplate and measured amperage, each phase.
 7. Starter thermal-protection-element rating.
- B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.9 PROCEDURES FOR HEAT-TRANSFER COILS

- A. Measure, adjust, and record the following data for each water coil:
1. Entering- and leaving-water temperature.
 2. Water flow rate.
 3. Water pressure drop.
 4. Dry-bulb temperature of entering and leaving air.
 5. Wet-bulb temperature of entering and leaving air for cooling coils.
 6. Airflow.
 7. Air pressure drop.
- B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
 2. Airflow.
 3. Entering- and leaving-air temperature at full load.
 4. Voltage and amperage input of each phase at full load and at each incremental stage.
 5. Calculated kilowatt at full load.
 6. Fuse or circuit-breaker rating for overload protection.
- C. Measure, adjust, and record the following data for each steam coil:
1. Dry-bulb temperature of entering and leaving air.
 2. Airflow.
 3. Air pressure drop.
 4. Inlet steam pressure.
- D. Measure, adjust, and record the following data for each refrigerant coil:
1. Dry-bulb temperature of entering and leaving air.
 2. Wet-bulb temperature of entering and leaving air.
 3. Airflow.
 4. Air pressure drop.
 5. Refrigerant suction pressure and temperature.

3.10 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

- A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.
1. Measure and record the operating speed, airflow, and static pressure of each fan.
 2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
 3. Check the refrigerant charge.
 4. Check the condition of filters.
 5. Check the condition of coils.
 6. Check the operation of the drain pan and condensate-drain trap.
 7. Check bearings and other lubricated parts for proper lubrication.
 8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.
- B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:
1. New filters are installed.
 2. Coils are clean and fins combed.
 3. Drain pans are clean.
 4. Fans are clean.
 5. Bearings and other parts are properly lubricated.
 6. Deficiencies noted in the preconstruction report are corrected.
- C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.
1. Compare the indicated airflow of the renovated work to the measured fan airflows, and

- determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.11 TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 2. Air Outlets and Inlets: Plus or minus 10 percent.
 3. Heating-Water Flow Rate: Plus or minus 10 percent.
 4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.12 REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.13 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 1. Fan curves.
 2. Manufacturers' test data.
 3. Field test reports prepared by system and equipment installers.
 4. Other information relative to equipment performance; do not include Shop Drawings

and product data.

- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB contractor.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Water and steam flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 - 5.
 6. Balancing stations.
 7. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.

- d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 - 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - 3. Test Data (Indicated and Actual Values):
 - a. Total air flow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.
 - i. Outdoor airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
 - m. Vortex damper position.
- F. Apparatus-Coil Test Reports:
- 1. Coil Data:
 - a. System identification.
 - b. Location.
 - c. Coil type.
 - d. Number of rows.
 - e. Fin spacing in fins per inch o.c.
 - f. Make and model number.
 - g. Face area in sq. ft..
 - h. Tube size in NPS.
 - i. Tube and fin materials.
 - j. Circuiting arrangement.
 - 2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Average face velocity in fpm.
 - c. Air pressure drop in inches wg.
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F.

- e. Return-air, wet- and dry-bulb temperatures in deg F.
 - f. Entering-air, wet- and dry-bulb temperatures in deg F.
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F.
 - h. Water flow rate in gpm.
 - i. Water pressure differential in feet of head or psig.
 - j. Entering-water temperature in deg F.
 - k. Leaving-water temperature in deg F.
 - l. Refrigerant expansion valve and refrigerant types.
 - m. Refrigerant suction pressure in psig.
 - n. Refrigerant suction temperature in deg F.
 - o. Inlet steam pressure in psig.
- G. Fan Test Reports: For supply, return, and exhaust fans, include the following:
- 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 - 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.
- H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
- 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft..
 - g. Indicated air flow rate in cfm.

- h. Indicated velocity in fpm.
 - i. Actual air flow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.
- I. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:
- 1. Unit Data:
 - a. System and air-handling-unit identification.
 - b. Location and zone.
 - c. Room or riser served.
 - d. Coil make and size.
 - e. Flowmeter type.
 - 2. Test Data (Indicated and Actual Values):
 - a. Air flow rate in cfm.
 - b. Entering-water temperature in deg F.
 - c. Leaving-water temperature in deg F.
 - d. Water pressure drop in feet of head or psig.
 - e. Entering-air temperature in deg F.
 - f. Leaving-air temperature in deg F.

3.14 INSPECTIONS

- A. Initial Inspection:
- 1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
 - 2. Check the following for each system:
 - a. Measure airflow of at least 10 percent of air outlets.
 - b. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
 - c. Verify that balancing devices are marked with final balance position.
 - d. Note deviations from the Contract Documents in the final report.
- B. Final Inspection:
- 1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect .
 - 2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Architect.
 - 3. Architect shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.
 - 4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:
 1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.
- D. Prepare test and inspection reports.

3.15 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, exposed supply and outdoor air.
 - 3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 4. Indoor, exposed exhaust between isolation damper and penetration of building exterior.
 - 5. Outdoor, exposed supply and return.
- B. Related Sections:
 - 1. Section 230719 "HVAC Piping Insulation."
 - 2. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

- A. Product Data:
 - 1. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
 - 2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - a. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - b. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 - c. Detail application of field-applied jackets.
 - d. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- E. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-SheetK-FLEX LS.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; SoftTouch Duct Wrap.
 - b. Johns Manville; a Berkshire Hathaway company; Microlite.

- c. Knauf Insulation; Friendly Feel Duct Wrap with ECOSE Technology.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.
- G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; Commercial Board.
 - b. Johns Manville; a Berkshire Hathaway company; 800 Series Spin-Glas.
 - c. Knauf Insulation; Insulation Board with ECOSE Technology.
 - d. Manson Insulation Inc.; AK Board.
 - e. Owens Corning; Fiberglas 700 Series.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aeroseal.
 - b. Armacell LLC; Armaflex 520 Adhesive.
 - c. Foster Brand; H. B. Fuller Construction Products; 85-75 Drion Contact Cement.
 - d. K-Flex USA; Insul-SheetK-Flex 373 Contact AdhesiveK-Flex 620 Contact AdhesiveK-FLEX Duct Liner Gray.
 - 2. Adhesives shall have a VOC content of 50 g/L or less.
 - 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-127.
 - b. Eagle Bridges - Marathon Industries; CP-127.Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand; H. B. Fuller Construction Products; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.

2. Fiberglass adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-82.
 - b. Eagle Bridges - Marathon Industries; Insert product designation.
 - c. Foster Brand; H. B. Fuller Construction Products; 85-50.
 - d. Mon-Eco Industries, Inc.; 22-25.
 2. Adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. VOC Content: 300 g/L or less.
 2. Low-Emitting Materials: Mastic coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand; H. B. Fuller Construction Products; 30-80/30-90.
 - b. Knauf Insulation; EXPERT Mastics - KI-900 ASJEXPERT Mastics - KI-905 ASJ+.
 - c. Vimasco Corporation; .
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-30.
 - b. Eagle Bridges - Marathon Industries; .
 - c. Foster Brand; H. B. Fuller Construction Products; 30-35.
 - d. Mon-Eco Industries, Inc.; 55-10.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; Encacel.
 - b. Eagle Bridges - Marathon Industries; .
 - c. Foster Brand; H. B. Fuller Construction Products; 60-95/60-96.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F.
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-10.
 - b. Eagle Bridges - Marathon Industries; .
 - c. Foster Brand; H. B. Fuller Construction Products; 46-50.
 - d. Knauf Insulation; EXPERT Mastics - KI-700 ASJEXPERT Mastics - KI-705 ASJ+.
 - e. Mon-Eco Industries, Inc.; 55-50.
 - f. Vimasco Corporation; WC-1/WC-5.
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; .
 - b. Foster Brand; H. B. Fuller Construction Products; .
 - c. Vimasco Corporation; 713 and 714.
2. Adhesives shall have a VOC content of 50 g/L or less.
3. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
4. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
5. Service Temperature Range: 0 to plus 180 deg F.
6. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-76.
 - b. Eagle Bridges - Marathon Industries; CP-76. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand; H. B. Fuller Construction Products; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. Sealant shall have a VOC content of 420 g/L or less.
7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.

5. Color: White.
6. Sealant shall have a VOC content of 420 g/L or less.
7. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Glass-Fiber Fabric: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. in. for covering ducts.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; Chil-Glas No. 5.
- B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. , in a Leno weave, for ducts.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand; H. B. Fuller Construction Products; Mast-A-Fab.
 - b. Vimasco Corporation; Elastafab 894.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - b. Compac Corporation; 104 and 105.
 - c. Ideal Tape Co., Inc.; an American Biltrite company; 428 AWF ASJ.

- d. Knauf Insulation; EXPERT Tapes - ASJ Tape
 - e. EXPERT Tapes - ASJ+ Tape.
 - e. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 - 2. Width: 3 inches .
 - 3. Thickness: 11.5 mils .
 - 4. Adhesion: 90 ounces force/inch in width.
 - 5. Elongation: 2 percent.
 - 6. Tensile Strength: 40 lbf/inch in width.
 - 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - b. Compac Corporation; 110 and 111.
 - c. Ideal Tape Co., Inc.; an American Biltrite company; 491 AWF FSK.
 - d. Knauf Insulation; EXPERT Tapes - FSK Tape.
 - e. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
 - 2. Width: 3 inches .
 - 3. Thickness: 6.5 mils .
 - 4. Adhesion: 90 ounces force/inch in width.
 - 5. Elongation: 2 percent.
 - 6. Tensile Strength: 40 lbf/inch in width.
 - 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - b. Compac Corporation; .
 - c. Ideal Tape Co., Inc.; an American Biltrite company; 488 AWF.
 - d. Knauf Insulation; EXPERT Tapes - 2 Mil Foil Tape.
 - e. Venture Tape; 3520 CW.
 - 2. Width: 2 inches .
 - 3. Thickness: 3.7 mils .
 - 4. Adhesion: 100 ounces force/inch in width.
 - 5. Elongation: 5 percent.
 - 6. Tensile Strength: 34 lbf/inch in width.

2.9 SECUREMENTS

- A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ITW Insulation Systems; Illinois Tool Works, Inc.; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- 0.135-inch- diameter shank, length to suit depth of insulation indicated.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) AGM Industries, Inc; CWP-1.
 - 2) Gemco; CD.
 - 3) Hardcast, Inc.; .
 - 4) Midwest Fasteners, Inc; CD.
 - 5) Nelson Stud Welding; TPA, TPC, and TPS.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) AGM Industries, Inc; CHP-1.
 - 2) CL WARD & Family Inc.; CL WARD Weld Pins.
 - 3) Gemco; Cupped Head Weld Pin.
 - 4) Hardcast, Inc.; .
 - 5) Midwest Fasteners, Inc; Cupped Head.
 - 6) Nelson Stud Welding; CHP.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) AGM Industries, Inc; Tactoo Perforated Base Insul-Hangers.
 - 2) Gemco; Perforated Base.
 - 3) Midwest Fasteners, Inc; Spindle.
 - b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - c. Spindle: Copper- or zinc-coated, low-carbon steel Aluminum Stainless steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation

- indicated.
- d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Gemco; Nylon Hangers.
 - 2) Midwest Fasteners, Inc; Nylon Insulation Hangers.
 - b. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
 - c. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches .
 - d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
 5. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) AGM Industries, Inc; Tactoo Self-Adhering Insul-Hangers.
 - 2) Gemco; Peel & Press.
 - 3) Hardcast, Inc.; Insert product designation.
 - 4) Midwest Fasteners, Inc; Self Stick.
 - b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - c. Spindle: Copper- or zinc-coated, low-carbon steel Aluminum Stainless steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - d. Adhesive-backed base with a peel-off protective cover.
 6. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick, galvanized-steel aluminum stainless-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) AGM Industries, Inc; RC-150.
 - 2) Gemco; R-150.
 - 3) Hardcast, Inc.; .

- 4) Midwest Fasteners, Inc; WA-150.
- 5) Nelson Stud Welding; Speed Clips.

- b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy 0.062-inch soft-annealed, stainless steel 0.062-inch soft-annealed, galvanized steel.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. C & F Wire.

2.10 CORNER ANGLES

- A. Aluminum Corner Angles: 0.040 inch Insert dimension thick, minimum 1 by 1 inch , aluminum according to ASTM B 209 , Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches . Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches .
 - 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches .
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping."
- E. Insulation Installation at Floor Penetrations:
 - 1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches .

2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
 1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped

pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches .

5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
 6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
 7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
- B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches , space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
 4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped

pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches .

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 DUCT INSULATION SCHEDULE, GENERAL

- A. Refer to Duct Insulation Schedule at end of section.

END OF SECTION 230713

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following HVAC piping systems:

- 1. Condensate drain piping, indoors.
- 2. Heating hot-water piping, indoors.

- B. Related Sections:

- 1. Section 230713 "Duct Insulation."

1.3 ACTION SUBMITTALS

- A. Product Data,:

- 1. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).
- 2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - a. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - b. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," article for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- D. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. K-Flex USA; Insul-LockInsul-TubeK-Fit Elbow, Tee, and P-Trap.
- E. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Johns Manville; a Berkshire Hathaway company; Micro-Lok.
 - b. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation with ECOSE TechnologyEarthwool Redi-Klad 1000 Degree Pipe Insulation with ECOSE Technology.
 - c. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aero seal.
 - b. Armacell LLC; Armaflex 520 Adhesive.
 - c. Foster Brand; H. B. Fuller Construction Products; 85-75.
 - d. K-Flex USA; K-Flex 320 Contact AdhesiveK-FLEX 373 Contact Adhesive.
 2. Adhesives shall have a VOC content of 50 g/L or less.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-127.
 - b. Eagle Bridges - Marathon Industries; .
 - c. Foster Brand; H. B. Fuller Construction Products; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
 2. Fiberglass adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-82.
 - b. Eagle Bridges - Marathon Industries; .
 - c. Mon-Eco Industries, Inc.; 22-25.
 2. Adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 739, Dow Silicone.
 - b. Johns Manville; a Berkshire Hathaway company; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
 - c. P.I.C. Plastics, Inc.; Welding Adhesive.
 - d. Speedline Corporation; Polyco VP Adhesive.
 2. Adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. VOC Content: 300 g/L or less.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand; H. B. Fuller Construction Products; 30-80/30-90.
 - b. Knauf Insulation; EXPERT Mastics - KI-900 ASJEXPERT Mastics - KI-905 ASJ+.
 - c. Vimasco Corporation; .
 - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 - 5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-30.
 - b. Eagle Bridges - Marathon Industries; .
 - c. Foster Brand; H. B. Fuller Construction Products; .
 - d. Mon-Eco Industries, Inc.; 55-10.
 - 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 - 3. Service Temperature Range: 0 to 180 deg F.
 - 4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 - 5. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; Encacel.
 - b. Eagle Bridges - Marathon Industries; .
 - c. Foster Brand; H. B. Fuller Construction Products; 60-95/60-96.
 - 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 - 3. Service Temperature Range: Minus 50 to plus 220 deg F.
 - 4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 - 5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-10.
 - b. Eagle Bridges - Marathon Industries; .
 - c. Foster Brand; H. B. Fuller Construction Products; 46-50.
 - d. Knauf Insulation; EXPERT Mastics - KI-700 ASJEXPERT Mastics - KI-705 ASJ+.
 - e. Mon-Eco Industries, Inc.; 55-50.
 - f. Vimasco Corporation; WC-1/WC-5.
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.4 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-76.
 - b. Eagle Bridges - Marathon Industries; .
 - c. Foster Brand; H. B. Fuller Construction Products; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. Sealant shall have a VOC content of 420 g/L or less.

B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

2.6 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. Metal Jacket:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products; Metal Jacketing Systems.
 - b. ITW Insulation Systems; Illinois Tool Works, Inc.; Aluminum and Stainless Steel Jacketing.
 - c. RPR Products, Inc.; Insul-Mate.

2.7 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - b. Compac Corporation; 104 and 105.
 - c. Ideal Tape Co., Inc.; an American Biltrite company; 428 AWF ASJ Ideal Tape 428 ASJ Ideal Tape Cold Seal 728 ASJ.
 - d. Knauf Insulation; EXPERT Tapes - ASJ Tape EXPERT Tapes - ASJ+ Tape.
 - e. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 2. Width: 3 inches .

3. Thickness: 11.5 mils .
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - b. Compac Corporation; 110 and 111.
 - c. Ideal Tape Co., Inc.,; an American Biltrite company; 491 AWF FSK Ideal Tape Cold Seal 791 FSK.
 - d. Knauf Insulation; EXPERT Tapes - FSK Tape.
 - e. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
 2. Width: 3 inches .
 3. Thickness: 6.5 mils .
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

2.8 SECUREMENTS

- A. Bands:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ITW Insulation Systems; Illinois Tool Works, Inc.; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
 2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 Type 316; 0.015 inch thick, 1/2 inch 3/4 inch wide with wing seal closed seal.
 3. Aluminum: ASTM B 209 , Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch 3/4 inch wide with wing seal closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy 0.062-inch soft-annealed, stainless steel 0.062-inch soft-annealed, galvanized steel.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. C & F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 1. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.

- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches . Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches .
 - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation

continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.

2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

- A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Refer to Piping Insulation Schedule at end of Section.
- B. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- C. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

END OF SECTION 230719

SECTION 232113 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:
 - 1. Copper tube and fittings.
 - 2. Steel pipe and fittings.
 - 3. Joining materials.
 - 4. Transition fittings.
 - 5. Dielectric fittings.

1.3 ACTION SUBMITTALS

- A. Delegated-Design Submittal:
 - 1. Product Data: For each type of the following:
 - a. Fittings.
 - b. Joining materials.
 - 2. Delegated-Design Submittal:
 - a. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
 - b. Locations of pipe anchors and alignment guides and expansion joints and loops.
 - c. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
 - d. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Welding certificates.
- C. Field quality-control reports.
- D. Preconstruction Test Reports:
 - 1. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: [Owner will engage] [Engage] a qualified testing agency to perform preconstruction testing on water quality.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Hot-Water Heating Piping: 150 psig at 200 deg F.
 - 2. Condensate-Drain Piping: 150 deg F.

2.2 COPPER TUBE AND FITTINGS

- A. Drawn-Temper Copper Tubing: ASTM B 88, Type L ASTM B 88, Type M.
- B. Annealed-Temper Copper Tubing: ASTM B 88, Type K.
- C. DWV Copper Tubing: ASTM B 306, Type DWV.

- D. Wrought-Copper Unions: ASME B16.22.

2.3 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.
- B. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.
- C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.
- D. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.
- E. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 - 1. Material Group: 1.1.
 - 2. End Connections: Butt welding.
 - 3. Facings: Raised face.
- F. Grooved Mechanical-Joint Fittings and Couplings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International.
 - b. Grinnell Mechanical Products.
 - c. Nexus Valve, Inc..
 - d. Victaulic Company.
 - 2. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106/A 106M, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - 3. Couplings: Ductile- or malleable-iron housing and EPDM or nitrile gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
- G. Steel Pressure-Seal Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Anvil International Gruvlok.
 - b. Grinnell.
 - c. Victaulic Company.
 - 2. Housing: Steel.
 - 3. O-Rings and Pipe Stop: EPDM.
 - 4. Tools: Manufacturer's special tool.
 - 5. Minimum 300-psig working-pressure rating at 230 deg F.
- H. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.4 JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
- 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless otherwise indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- E. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. A.Y. McDonald Mfg. Co..
- b. Capitol Manufacturing Company.
- c. Central Plastics Company.
- d. HART Industrial Unions, LLC.
- e. Jomar Valve.
- f. Matco-Norca.
- g. Watts; a Watts Water Technologies company.
- h. Wilkins.
- i. Zurn Industries, LLC.

2. Description:

- a. Standard: ASSE 1079.
- b. Pressure Rating: 125 psig minimum at 180 deg F 250 psig.
- c. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Capitol Manufacturing Company.
- b. Central Plastics Company.
- c. Matco-Norca.
- d. Watts; a Watts Water Technologies company.
- e. Wilkins.
- f. Zurn Industries, LLC.

2. Description:

- a. Standard: ASSE 1079.
- b. Factory-fabricated, bolted, companion-flange assembly.
- c. Pressure Rating: 150 psig.
- d. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Elster Perfection Corporation.
- b. Grinnell Mechanical Products.
- c. Matco-Norca.
- d. Precision Plumbing Products.
- e. Victaulic Company.

2. Description:

- a. Standard: IAPMO PS 66.
- b. Electroplated steel nipple, complying with ASTM F 1545.
- c. Pressure Rating: 300 psig at 225 deg F.
- d. End Connections: Male threaded or grooved.
- e. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
 - 2. Schedule 40, Grade B steel pipe; Class 125, cast-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- B. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
 - 1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
 - 2. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 - 3. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- C. Condensate-Drain Piping: Type M or Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to the following:
 - 1. Section 230523.11 "Globe Valves for HVAC Piping."
 - 2. Section 230523.12 "Ball Valves for HVAC Piping."
 - 3. Section 230523.13 "Butterfly Valves for HVAC Piping."
 - 4. Section 230523.14 "Check Valves for HVAC Piping."
- Q. Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.
- S. Install shutoff valve immediately upstream of each dielectric fitting.
- T. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.
- U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.

- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges nipples.
- D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 7 feet.
 - 2. NPS 1: Maximum span, 7 feet.
 - 3. NPS 1-1/2: Maximum span, 9 feet.
 - 4. NPS 2: Maximum span, 10 feet.
 - 5. NPS 2-1/2: Maximum span, 11 feet.
 - 6. NPS 3 and Larger: Maximum span, 12 feet.

- D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.

3.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- F. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
- G. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

3.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

- B. Install control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 - 3. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 - 4. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
 - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 - 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 - 3. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 - 4. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 - 5. Prepare written report of testing.
- C. Perform the following before operating the system:
 - 1. Open manual valves fully.
 - 2. Set makeup pressure-reducing valves for required system pressure.
 - 3. Inspect air vents at high points of system and determine if all are installed and operating

- freely (automatic type), or bleed air completely (manual type).
- 4. Set temperature controls so all coils are calling for full flow.
- 5. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Double-wall rectangular ducts and fittings.
3. Single-wall round and flat-oval ducts and fittings.
4. Double-wall round and flat-oval ducts and fittings.
5. Sheet metal materials.
6. Duct liner.
7. Sealant and gaskets.
8. Hangers and supports.

- B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and

1.4 ACTION SUBMITTALS

A. Product Data, Delegated Design Submittal:

1. Product Data: For each type of the following products:
 - a. Liners and adhesives.
 - b. Sealants and gaskets.
2. Shop Drawings:
 - a. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
 - b. Factory- and shop-fabricated ducts and fittings.
 - c. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
 - d. Elevation of top of ducts.
 - e. Dimensions of main duct runs from building grid lines.
 - f. Fittings.
 - g. Reinforcement and spacing.
 - h. Seam and joint construction.
 - i. Penetrations through fire-rated and other partitions.
 - j. Equipment installation based on equipment being used on Project.
 - k. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
 - l. Hangers and supports, including methods for duct and building attachment and vibration isolation.
3. Delegated-Design Submittal:
 - a. Sheet metal thicknesses.
 - b. Joint and seam construction and sealing.
 - c. Reinforcement details and spacing.
 - d. Materials, fabrication, assembly, and spacing of hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 DOUBLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. McGill AirFlow LLC.
 2. MKT Metal Manufacturing.
 3. Sheet Metal Connectors, Inc.
- B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct.
- C. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

- D. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- E. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- F. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B.
 - 1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
- G. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch- diameter perforations, with overall open area of 23 percent.
- H. Formed-on Transverse Joints (Flanges): Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- I. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ductmate Industries, Inc.
 - b. Lindab Inc.
 - c. McGill AirFlow LLC.
 - d. MKT Metal Manufacturing.

- e. SEMCO LLC.
 - f. Sheet Metal Connectors, Inc.
 - g. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.4 DOUBLE-WALL ROUND DUCTS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 1. Lindab Inc.
 - 2. McGill AirFlow LLC.
 - 3. MKT Metal Manufacturing.
 - 4. SEMCO LLC.
 - 5. Sheet Metal Connectors, Inc.
 - 6. Insert manufacturer's name.
- B. Outer Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on static-pressure class unless otherwise indicated.
- 1. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved,

- duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
3. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch- diameter perforations, with overall open area of 23 percent.
 - D. Interstitial Insulation: Flexible elastomeric duct liner complying with ASTM C 534, Type II for sheet materials, and with NFPA 90A or NFPA 90B.
 1. Maximum Thermal Conductivity: 0.25 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.

2.5 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 1. Galvanized Coating Designation: G60 .
 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. PVC-Coated, Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 1. Galvanized Coating Designation: G60 .
- D. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.
- E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.
- F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch

minimum diameter for lengths longer than 36 inches .

2.6 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg , positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. Type: S.
 - 3. Grade: NS.
 - 4. Class: 25.
 - 5. Use: O.
 - 6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- E. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 - 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 - 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.7 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 , "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch , plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches .
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

3.5 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

3.7 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.

3. Test for leaks before applying external insulation.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

- D. Duct system will be considered defective if it does not pass tests and inspections.

3.8 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.

- B. Use service openings for entry and inspection.

- C. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Vertical unit ventilator internal surfaces and components including mixing box, coil section, condensate drain pans, , filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Supply-air ducts, dampers, actuators, and turning vanes.
6. Dedicated exhaust and ventilation components and makeup air systems.

- D. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
4. Provide drainage and cleanup for wash-down procedures.
5. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.9 START UP

- A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

3.10 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:
- B. Supply Ducts:
 - 1. Ducts Connected to vertical unit ventilators :
 - a. Pressure Class: Positive 1-inch wg .
 - b. Minimum SMACNA Seal Class: C.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
 - 2. Ducts Connected to Variable-Air-Volume Air-Handling Units <Insert equipment>:
 - a. Pressure Class: Positive 4-inch wg .
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.
 - 3. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive 2-inch wg .
 - b. Minimum SMACNA Seal Class: B. Portions of duct outdoors or in unconditioned space to be Seal Class A with Rectangular leakage of 6 and Round leakage of 3.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- C. Return Ducts:
 - 1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units <Insert equipment>:
 - a. Pressure Class: Positive or negative 1-inch wg .
 - b. Minimum SMACNA Seal Class: C. Portions of duct outdoors or in unconditioned space to be Seal Class A with Rectangular leakage of 6 and Round leakage of 3.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 1-inch wg .
 - b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure. Portions of duct outdoors or in unconditioned space to be Seal Class A with Rectangular leakage of 6 and Round leakage of 3.
 - c. SMACNA Leakage Class for Rectangular: 24.
 - d. SMACNA Leakage Class for Round and Flat Oval: 12.
- E. Double-Wall Duct Interstitial Insulation:
 1. Supply Air Ducts: 1 inch thick.
- F. Elbow Configuration:
 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - 2) Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
 - 3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - b. Round Elbows, [12 Inches] <Insert dimension> and Smaller in Diameter: Stamped or pleated.
 - c. Round Elbows, [14 Inches] <Insert dimension> and Larger in Diameter: Standing

seam.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Barometric relief dampers.
3. Manual volume dampers.
4. Flange connectors.
5. Duct-mounted access doors.
6. Flexible connectors.
7. Flexible ducts.
8. Duct accessory hardware.

B. Related Sections:

1. Division 23 Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.

1.3 ACTION SUBMITTALS

A. Product Data with Shop Drawings:

1. Product Data: For each type of product indicated.
2. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - a. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - 1) Special fittings.
 - 2) Manual volume damper installations.
 - 3) Wiring Diagrams: For power, signal, and control wiring.

1.4 QUALITY ASSURANCE

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.
- D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.
- E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cesco Products; a division of Mestek, Inc.
 - 2. Greenheck Fan Corporation.
 - 3. Nailor Industries Inc.
 - 4. NCA Manufacturing, Inc.
 - 5. Pottorff; a division of PCI Industries, Inc.
 - 6. Ruskin Company.

- B. Description: Gravity balanced.
- C. Maximum Air Velocity: 2000 fpm.
- D. Maximum System Pressure: 1-inch wg.
- E. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners and mounting flange.
- F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch width, 0.050-inch- thick aluminum sheet with sealed edges.
- G. Blade Action: Parallel.
- H. Blade Seals: Extruded vinyl, mechanically locked.
- I. Blade Axles:
 - 1. Material: Aluminum.
 - 2. Diameter: [0.20 inch] <Insert value>.
- J. Tie Bars and Brackets: Aluminum.
- K. Return Spring: Adjustable tension.
- L. Bearings: Synthetic pivot bushings.
- M. Accessories:
 - 1. Adjustment device to permit setting for varying differential static pressure.
 - 2. Counterweights and spring-assist kits for vertical airflow installations.
 - 3. Screen Mounting: Front mounted in sleeve.
 - a. Sleeve Thickness: 20-gage minimum.
 - b. Sleeve Length: 6 inches minimum.
 - 4. Screen Material: Galvanized steel.
 - 5. Screen Type: Bird.
 - 6. 90-degree stops.

2.3 BAROMETRIC RELIEF DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cesco Products; a division of Mestek, Inc.
 - 2. Greenheck Fan Corporation.
 - 3. Nailor Industries Inc.
 - 4. NCA Manufacturing, Inc.

5. Pottorff; a division of PCI Industries, Inc.
 6. Ruskin Company.
- B. Suitable for horizontal or vertical mounting.
- C. Maximum Air Velocity: 2000 fpm.
- D. Maximum System Pressure: 2-inch wg <Insert value>.
- E. Frame: 0.063-inch- thick extruded aluminum, with welded corners and mounting flange.
- F. Blades:
1. Multiple, 0.050-inch- thick aluminum sheet.
 2. Maximum Width: 6 inches.
 3. Action: Parallel.
 4. Balance: Gravity.
 5. Eccentrically pivoted.
- G. Blade Seals: Vinyl.
- H. Blade Axles: Nonferrous metal.
- I. Tie Bars and Brackets:
1. Material: Aluminum.
 2. Rattle free with 90-degree stop.
- J. Return Spring: Adjustable tension.
- K. Bearings: Synthetic.
- L. Accessories:
1. Flange on intake.
 2. Adjustment device to permit setting for varying differential static pressures.

2.4 MANUAL VOLUME DAMPERS

- A. Low-Leakage, Steel, Manual Volume Dampers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Warming and Ventilating; a division of Mestek, Inc.
 - b. Greenheck Fan Corporation.
 - c. McGill AirFlow LLC.
 - d. METALAIRE, Inc.

- e. Nailor Industries Inc.
 - f. Pottorff; a division of PCI Industries, Inc.
 - g. Ruskin Company.
- 2. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
 - 3. Suitable for horizontal or vertical applications.
 - 4. Frames:
 - a. Hat, U, or Angle shaped.
 - b. Galvanized-steel channels, 0.064 inch thick.
 - c. Mitered and welded corners.
 - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized, roll-formed steel, 0.064 inch thick.
 - 6. Blade Axles: Galvanized steel.
 - 7. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 8. Blade Seals: Vinyl.
 - 9. Jamb Seals: Cambered stainless steel.
 - 10. Tie Bars and Brackets: Galvanized steel.
 - 11. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.
- B. Jackshaft:
- 1. Size: 1-inch diameter.
 - 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 - 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
- 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.

2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.5 FIRE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck Fan Corporation.
 2. McGill AirFlow LLC.
 3. METALAIR, Inc.
 4. Nailor Industries Inc.
 5. Pottorff; a division of PCI Industries, Inc.
 6. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
- F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
1. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
 2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- G. Mounting Orientation: Vertical or horizontal as indicated.
- H. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.
- I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- J. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.6 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cesco Products; a division of Mestek, Inc.

2. Greenheck Fan Corporation.
 3. Nailor Industries Inc.
 4. Portoff.
 5. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch-thick galvanized steel; with mitered and interlocking corners.
- F. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.
- G. Blades: Roll-formed, horizontal, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.
- H. Leakage: Class I.
- I. Rated pressure and velocity to exceed design airflow conditions.
- J. Mounting Sleeve: Factory-installed, 0.052-inch- thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.
- K. Master control panel for use in dynamic smoke-management systems.
- L. Damper Motors: two-position action.
- M. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf and breakaway torque rating of 150 in. x lbf.
 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F.
 6. Nonspring-Return Motors: For dampers larger than 25 sq. ft., size motor for running

torque rating of 150 in. x lbf and breakaway torque rating of 300 in. x lbf.

7. Electrical Connection: 115 V, single phase, 60 Hz.
8. Damper actuator position switched as required to properly display damper positions for auxiliary control panel. Switch positions shall be adjustable. Provide one for open position and one for closed position.

2.7 FLANGE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ductmate Industries, Inc.
 2. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Description: roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.
- C. Material: Galvanized steel.
- D. Gage and Shape: Match connecting ductwork.

2.8 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. American Warming and Ventilating; a division of Mestek, Inc.
 2. Ductmate Industries, Inc.
 3. Greenheck Fan Corporation.
 4. McGill AirFlow LLC.
 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."
 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 3. Number of Hinges and Locks:

- a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
- b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
- c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
- d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.9 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Ductmate Industries, Inc.
 2. Ventfabrics, Inc.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 1. Minimum Weight: 26 oz./sq. yd..
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F.

2.10 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Flexmaster U.S.A., Inc.
 2. McGill AirFlow LLC.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; aluminized vapor-barrier film.
 1. Pressure Rating: 4-inch wg positive and 0.5-inch wg negative.
 2. Maximum Air Velocity: 4000 fpm.
 3. Temperature Range: Minus 20 to plus 175 deg F.
- C. Flexible Duct Connectors:
 1. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. On both sides of duct coils.
 - 2. Upstream and downstream from duct filters.
 - 3. At outdoor-air intakes and mixed-air plenums.
 - 4. At drain pans and seals.
 - 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 - 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 - 7. Upstream and downstream from turning vanes.
 - 8. Control devices requiring inspection.
 - 9. Elsewhere as indicated.

- I. Install access doors with swing against duct static pressure.
- J. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install flexible connectors to connect ducts to equipment.
- L. Connect flexible ducts to metal ducts with draw bands.

END OF SECTION 233300

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Centrifugal roof ventilators.

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on actual Project site elevations sea level.

1.4 ACTION SUBMITTALS

- A. Product Data, Delegated-Design Submittal:
 - 1. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
 - a. Certified fan performance curves with system operating conditions indicated.
 - b. Certified fan sound-power ratings.
 - c. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - d. Material thickness and finishes, including color charts.
 - e. Dampers, including housings, linkages, and operators.
 - f. Roof curbs.
 - g. Fan speed controllers.
 - 2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - a. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - b. Wiring Diagrams: For power, signal, and control wiring.
 - 3. Delegated-Design Submittal: For unit hangars and supports indicated to comply with

performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

- a. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:
 1. Roof framing and support members relative to duct penetrations.
 2. Ceiling suspension assembly members.
 3. Size and location of initial access modules for acoustical tile.
 4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Belts: One set(s) for each belt-driven unit.

1.8 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.9 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Carnes Company.
 - 2. Greenheck Fan Corporation.
 - 3. Loren Cook Company.
 - 4. PennBarry.
 - 5. Twin City.
- B. Housing: Removable, spun-aluminum, dome top and outlet baffle; square, one-piece, aluminum base with venturi inlet cone.
 - 1. Upblast Units: Provide spun-aluminum discharge baffle to direct discharge air upward, with rain and snow drains.
- C. Fan Wheels: Aluminum hub and wheel with backward-inclined blades.
- D. Belt Drives:
 - 1. Resiliently mounted to housing.
 - 2. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 3. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - 4. Pulleys: Cast-iron, adjustable-pitch motor pulley.
 - 5. Fan and motor isolated from exhaust airstream.
- E. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.
 - 3. Bird Screens: Removable, 1/2-inch mesh, aluminum or brass wire.
 - 4. Dampers: Counterbalanced, parallel-blade, backdraft dampers mounted in curb base; factory set to close when fan stops.

- F. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to suit roof opening and fan base.
 - 1. Configuration: Self-flashing without a cant strip, with mounting flange.
 - 2. Overall Height: 24 inches.
 - 3. Sound Curb: Curb with sound-absorbing insulation.
 - 4. Pitch Mounting: Manufacture curb for roof slope.
- G. Capacities and Characteristics: Refer to schedules on drawings.

2.2 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Equipment Mounting:
 - 1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
 - 2. Comply with requirements for vibration isolation devices specified in Section 230548.13

"Vibration Controls for HVAC."

- C. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Section 077200 "Roof Accessories" for installation of roof curbs.
- D. Install units with clearances for service and maintenance.
- E. Label units according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Section 233300 "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 - 5. Adjust belt tension.
 - 6. Adjust damper linkages for proper damper operation.
 - 7. Verify lubrication for bearings and other moving parts.
 - 8. Verify that manual and automatic volume control and fire and smoke dampers in

connected ductwork systems are in fully open position.

9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Replace fan and motor pulleys as required to achieve design airflow.
- E. Lubricate bearings.

END OF SECTION 233423

SECTION 233713.99 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include, but are not limited to, the following:
 - 1. 233113 Metal Ducts
 - 2. 233300 Air Duct Accessories

1.2 SUMMARY

- A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.
- B. Related Sections include the following:
 - 1. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

- A. Product Data with Grille Schedule:
 - 1. Product Data: For each product indicated, include the following:
 - a. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GRILLES AND REGISTERS

A. Egg Crate Grille (EC):

1. Manufacturers:
 - a. Kreuger.
 - b. Metalaire.
 - c. Nailor Industries of Texas Inc.
 - d. Price Industries. 80
 - e. Titus.
 - f. Tuttle & Bailey.
2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Arrangement: 1/2-inch X 1/2-inch X 1/2-inch grid core.
5. Frame: 1-1/4 inches wide.
6. Mounting: As required by ceiling plan.

B. Spiral Duct Grille (SDG):

1. Manufacturers:
 - a. Kreuger.
 - b. Metalaire.
 - c. Nailor Industries of Texas Inc.
 - d. Price Industries. SDGE
 - e. Titus.
 - f. Tuttle & Bailey.
2. Material: Extruded aluminum.
3. Finish: Clear anodized.
4. Face Arrangement: Double deflection core with individually adjustable blades, 3/4" blade spacing.
5. Mounting: Curved flange with countersunk holes for surface mounting.

2.3 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.99

SECTION 233723 - HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Sections include, but are not limited to, the following:
 - 1. 230553 Identification for equipment
 - 2. 233113 Metal Ducts

1.2 SUMMARY

- A. Section Includes:
 - 1. Louvered-penthouse ventilators.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Ventilators shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of ventilator components, noise or metal fatigue caused by ventilator 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: Determine loads based on pressures as indicated on Drawings.
- B. 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.
- C. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

1.4 ACTION SUBMITTALS

- A. Product Data, Delegated Design Submittal:
 - 1. Product Data: For each type of product indicated. For louvered-penthouse ventilators specified to bear AMCA seal, include printed catalog pages showing specified models

with appropriate AMCA Certified Ratings Seals.

2. Shop Drawings: For gravity ventilators. Include plans, elevations, sections, details, ventilator attachments to curbs, and curb attachments to roof structure.

- a. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.

- B. Samples: For each exposed product and for each color and texture specified.

- C. Samples for Initial Selection: For units with factory-applied color finishes.

- D. Samples for Verification: For each type of louvered-penthouse ventilator indicated, in manufacturer's standard size.

1.5 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-52.
- 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. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 zinc coating, mill phosphatized.
- D. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.
 1. Use types and sizes to suit unit installation conditions.
 2. Use hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

- A. Factory or shop fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.

- B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.
- D. Fabricate supports, anchorages, and accessories required for complete assembly.
- E. Perform shop welding by AWS-certified procedures and personnel.

2.3 LOUVERED-PENTHOUSE VENTILATORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acme Engineering & Mfg. Corporation.
 - 2. Carnes.
 - 3. Greenheck Fan Corporation.
 - 4. Loren Cook Company.
 - 5. PennBarry.
 - 6. Twin City Fan Company.
- B. Construction: All-welded assembly with 6-inch-deep louvers, mitered corners, and aluminum sheet roof.
- C. Frame and Blade Material and Nominal Thickness: Extruded aluminum, of thickness required to comply with structural performance requirements, but not less than 0.080 inch for frames and 0.060 inch for blades with condensate deflectors.
 - 1. AMCA Seal: Mark units with the AMCA Certified Ratings Seal.
 - 2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
- D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.
 - 1. Configuration: Built-in raised cant and mounting flange.
 - 2. Overall Height: 18 inches.
- E. Bird Screening: Galvanized-steel, 1/2-inch- square mesh, 0.041-inch wire.
- F. Accessories:
 - 1. Dampers:

- a. Location: Penthouse neck.
- b. Control: Motorized.
- c. Provide Gravity Backdraft Damper.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.
- B. Install gravity ventilators with clearances for service and maintenance.
- C. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- D. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Section 079200 "Joint Sealants" for sealants applied during installation.
- E. Label gravity ventilators according to requirements specified in Section 230553 "Identification for HVAC Piping and Equipment."
- F. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- G. 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.

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in Section 233113 "Metal Ducts" and Section 233116 "Nonmetal Ducts." Drawings indicate general arrangement of ducts and duct accessories.

3.3 ADJUSTING

- A. Adjust damper linkages for proper damper operation.

END OF SECTION 233723

SECTION 238223.98 - VERTICAL UNIT VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

- A. The supplier shall provide a vertical up flow unit ventilator. Exterior wall mounted unit will not be acceptable.
- B. Manufacturer: Subject to compliance with requirements, provide vertical up flow unit ventilators of one of the following:
 - 1. Temspec Inc.
 - 2. Change Air

1.3 CERTIFICATION

- A. UNITS shall be CSA (C & US) certified and labeled indicating that the equipment has been independently tested and meets the applicable safety standards required both in the United States and Canada. Units shall be manufactured in an ISO 9001 registered facility or by a company manufacturing ventilation equipment for at least ten years.

1.4 CABINET CONSTRUCTION

- A. The outer cabinet will be made of 14-gauge steel with a powder coat baked enamel-textured finish to an appliance standard. The unit cabinet shall be 14ga, formed unibody construction for rigidity.
- B. Cabinet construction should be such that internal 16-gauge frame supports all internal metal pans and components. Exterior panels should not support any internal components.
- C. The cabinet front shall incorporate two fully insulated full sized hinged panels held closed by two fast lead captive screws.
- D. Cabinet panels shall be thermally/acoustically insulated with 1" (2.54 cm) thick flexible elastomeric closed cell insulation, covered in the air stream with a black coated mat. All exposed edges to be sealed. Density to be a minimum of 3 lb./ft³.

- E. The chilled water coil section and hot water coil section shall have a double wall liner for Indoor Air Quality. Fiberglass insulation covered with a black coated mat is not acceptable in the air stream.

1.5 AIR DISTRIBUTION

- A. Ducting and ceiling diffusers should be sized to operate with the units at .25" ESP. All external ductwork and diffusers must be correctly sized, fabricated, and supplied by installer.
- B. The unit shall be supplied with a matching color airfoil double deflective face grille for the return air.

PART 2 - PRODUCTS

2.1 FILTRATION, COIL DATA AND AIR MIXING

- A. Filters
 - 1. Each unit shall be equipped with a 2" pleated Merv 13 disposable filter. The location of the filter shall provide 100% filtration of both re-circulated and outside fresh air.
- B. Hot Water Coils
 - 1. The unit shall be supplied with a hot water coil consisting of 1/2" copper tubing with corrugated rippled aluminum fins bonded to the tubes preventing electrolytic action. The coil shall be sized to provide the required heating capacity as shown in the schedule. Supply and return connections (3/4" Nominal Tubing) stubbed out the top right side of the unit. Hot water coil shall be in the re-heat position. See drawing to see exact position of the connections.
- C. Outside Air, Return Air, and Face and Bypass Dampers and Damper Actuators
 - 1. The fresh air damper shall be a low leakage parallel blade design with less than 2cfm/sq.ft at 4" WC. The frame and blades shall be constructed of extruded aluminum with blade design being streamline or airfoil construction, operated by zero maintenance, concealed linkage, 1/2" axles bolted to the blades shall operate on bronze oilite bearings. Both blade edge and jamb seals shall be of the pressure sensitive type for low leakage. The return air damper shall be a single insulated galvanized steel blade operated by zero maintenance linkage, 1/2" axles bolted to the blades shall operate on bronze bushings.

2.2 QUIET FANS AND MOTORS

- A. Quiet Fans and Motors

1. Supply Motor and Fan Assembly shall consist of one fan to supply the specified cfm. Each Fan shall be a double inlet centrifugal type blower. An electrically commutated motor (ECM) programmed to deliver the specified airflow at the nominal .25" esp. will drive the fan. Standard permanent split capacitor (PSC) motors will not be acceptable.
2. The supply fan shall be orientated in a design position such that the mixed air will be drawn through both the heating and cooling coils before reaching the supply fan.

2.3 ACCESSORIES

A. 4" Rear Plenum (Optional)

1. A rear plenum shall be included with each unit ventilator. The plenum shall be constructed of heavy 18 gauge steel with 1" (2.54 cm) flange for unit mount and painted in textured powder coat finished to match cabinet color. The plenum is factory insulated with 1" (2.54 cm) acoustic material and includes a full un-insulated back. The standoff is supplied assembled with field mounting to the unit required.

B. Factory installed Controls

1. Control items shall be furnished by the controls contractor for factory mounting and shall function as described in the controls specifications. Controls are to arrive at the factory well before scheduled production and are to be freight, duty and customs pre-paid by the controls contractor. Components supplied by others for factory mounting must be UL or CAS listed devices in the country intended for use and approved by factory for fit and form prior to arrival.

C. 100% Power Exhaust

1. A powered exhaust module with damper, direct drive fan and ECM motor shall be incorporated and shall operate in tandem with the outdoor air damper to be able to provide up to 100% power exhaust.

D. 100% Economizer

1. Separate outside air damper assembly to provide an economizer function which brings up to 100% outside air.

E. Condensate Pump

1. A condensate pump shall be factory installed within the unit. The head capacity of the pump shall be a minimum of 20'.

F. Piping Options

1. Piping options shall be fitted inside the unit by the factory and easily accessible from the front of the unit. May include one or all of the following:

- a. Automatic flow control valve with P/T ports and ball valve (shut off)
- b. Strainer with P/T ports, blow down valve and ball valve (shut off)
- c. Flexible, stainless steel braided hose kit with 1" pipe connections.

G. Top Extension (optional):

- 1. The unit manufacturer shall provide a color matched top extension for the cabinet, size to suit the ceiling height.

H. Top acoustical plenum/elbow for ducted applications (optional).

- 1. The unit manufacturer shall provide a color matched top plenum extension for the unit, sized to suite the ceiling height. The plenum shall have an internal perforated elbow and shall be acoustical lined.

I. Side Pipe Cover (optional):

- 1. The unit manufacturer shall provide a pipe cover assembly, color matched to the unit. The cover shall be the depth of the unit, height to suit. The unit manufacturer shall provide a pipe cover assembly, color matched to the unit. The cover shall be the depth of the unit, height to suit.

J. Replacement Filters (optional):

- 1. One set of replacement filters shall be supplied for each unit.

PART 3 - EXECUTION

3.1 ELECTRICAL SPECIFICATIONS

- A. The main power supply shall connect to the unit through a wire race way directly to an un-fused disconnect provided by the unit manufacturer. Standard electrical supply voltage shall be 460 VAC 3 phase 60 Hz. Or 208 VAC 3 phase 60 HZ as specified.

3.2 SERVICE DISCONNECT

- A. Each unit shall be supplied with a line voltage service disconnect and a door switch for control voltage interrupt to disable the mechanical components when the service panel is removed.

3.3 CONTROLS

- A. Controls contractor shall ship there controller and end devices to the unit manufacturers for factory installation.

- B. All temperature controls work shall be the responsibility of the Temperature Controls Contractor.

3.4 INSTALLATION, START-UP, ON-SITE TESTING, DEMONSTRATIONS

- A. Installation shall be in full accordance to the manufacturer's instructions, generally accepted practice and all applicable codes. The manufacturer shall not be responsible for improper application or installation, which may invalidate the warranty. Some models and installations may require the contractor to fabricate or extend a wall sleeve, check drawings and equipment specifications. Contractors are responsible for protecting the units from damage during construction. Contractor shall clean or replace filters prior to turning the building over to the owner. UNITS ARE NOT CERTIFIED AS CONSTRUCTION HEATERS, USING THEM IN THIS MANNER MAY VOID WARRANTY.
- B. The manufacturer's agent that supplies the equipment shall be responsible for overseeing or reviewing the installation at the initial start-up or soon thereafter. The agent will also demonstrate to the building maintenance personnel the operation of the unit(s) and explain warranty procedures.

3.5 MANUALS

- A. At completion of the installation the manufacturer will provide the owner with 5 sets of installation, operation and service manuals with shop drawings and electrical diagrams.

3.6 WARRANTIES

- A. The manufacturer shall supply a limited one year warranty on all parts.

END OF SECTION 238223.98

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

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. Electrical equipment coordination and installation.
 - 2. Codes and standards.
 - 3. Work and workmanship.
 - 4. Drawings and minor deviations.
 - 5. Continuous operations.
 - 6. Common electrical installation requirements.
 - 7. Miscellaneous work.
 - 8. Protection and treatment of property.
 - 9. Electrical connections to equipment.
 - 10. Temporary lighting and power.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.

1.4 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom, unless specific mounting heights that reduce headroom are indicated.
 - 2. To provide for ease of disconnecting equipment with minimum interference to other installations.
 - 3. To allow right of way for piping and conduit installed at required slope.
 - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

- C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Rough-in: Verify exact location of rough-in prior to installation, checking mounting heights with equipment manufacturers or casework suppliers.
- E. Each Contractor and subcontractor shall study all Drawings applicable to this work so complete coordination between trades will be effected. Special attention shall be given to points where ducts cross and where pipes, ducts, and conduit pass through walls.
- F. It is responsibility of each Contractor and Subcontractor to leave necessary room for other trades. No extra compensation will be allowed to cover cost of removing piping, conduit, ducts or equipment found encroaching on space required by others.

1.5 CODES AND STANDARDS

- A. All materials and workmanship shall comply with all applicable Codes, Specifications, local ordinances, industry standards, and utility company regulations.
- B. In case of difference between building codes, specifications, state laws, local ordinances, industry standards, utility company regulations, and Contract Documents, most stringent shall govern. Contractor shall promptly notify Architect/Engineer in writing of such difference.
- C. Non-Compliance: Should Contractor perform Work that does not comply with requirements of applicable building codes, state laws, local ordinances, industry standards, and utility company regulations, Contractor shall bear all costs related to correcting deficiencies.
- D. Applicable codes and standards shall include all state laws, local ordinances, utility company regulations and applicable requirements of following nationally accepted codes and standards.
- E. Building codes (with all state and local amendments) shall include, but not be limited to following:
 - 1. National Electrical Code.
 - 2. International Building Code.
 - 3. Indiana Accessibility Code.
 - 4. International Fire Code.
 - 5. International Mechanical Code.
 - 6. International Plumbing Code.
 - 7. Indiana Accessibility Code.
- F. These requirements shall be considered minimum and shall be exceeded when so indicated on Drawings or herein specified.
- G. Permits: Contractor shall pay for all building permits required by the Work, permits for

opening streets, and for connection to various utilities, including fees for electric meter installation and other requirements necessary to carry out the Work.

H. Industry Standards, Codes and Specifications

1. IEEE: Institute of Electrical and Electronic Engineers.
2. ASA: American Standards Association.
3. ASTM: American Society of Testing Materials.
4. IPCEA: Insulated Power Cable Engineers Association.
5. NBS: National Bureau of Standards.
6. NEMA: National Electric Manufacturers Association.
7. NFPA: National Fire Protection Association.
8. UL: Underwriters Laboratories.
9. NECA: National Electrical Contractors Association.
10. OSHA: Occupational Safety and Health Act.

I. Occupancy Safety and Health Standards

1. All Work shall comply with current requirements of U.S. Department of Labor Occupational Safety and Health Administration, entitles Occupational Safety and Health Standards; National Consensus Standards and Established Federal Standards.

J. Work and Workmanship

1. Provide all required labor, materials, equipment and Contractor's services necessary for complete installation of systems required in full conformity with requirements of authorities having jurisdiction; all as indicated on Drawings and herein specified.
2. Finished job shall be functional and complete in every detail including all such items required for complete system, whether or not these items are specified or shown on Drawings.
3. Special attention shall be given to accessibility of working and controlling parts. Adjustable parts shall be within easy reach. Removable parts shall have space for removal.
4. Each Contractor shall become fully acquainted with details of all Work to be performed by other trades and take necessary steps to integrate and coordinate its work with other trades.
5. Wherever tables or schedules show quantities of materials, they shall not be used as a final count. These figures are provided only as a guide to Contractor. Each Contractor shall be responsible for furnishing all materials on Drawings or as specified.
6. Owner and Architect/Engineer have full power to reject Work, materials, or equipment not in accordance with these Specifications and Drawings or are not in compliance with manufacturer's specifications or drawings which are approved by Owner or Architect/Engineer.
7. Work or equipment that is rejected shall be removed and replaced to satisfaction of Owner, at Contractor's expense. Work or equipment that is rejected shall be so stated in writing by Owner or Architect/Engineer.
8. Decisions that Owner or Architect/Engineer may make with respect to questions concerning quality, fitness of materials, equipment, and workmanship shall be binding

upon parties and entities involved in that Work.

K. Drawings and Minor Deviations

1. Electrical Drawings show general arrangement of all raceways, equipment, and appurtenances. They shall be followed as closely as actual building construction and Work of other trades will permit. Electrical Work shall conform to requirements shown on all Drawings. Because of small scale of Electrical Drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Contractor shall investigate structural and finish conditions affecting Work and shall arrange its Work accordingly, providing such fittings and accessories as may be required to meet such conditions.
2. In event of conflict of requirements detailed in Drawings, General Conditions, these General Provisions and subsequent sections of these Specifications, Bidder shall inform Architect/Engineer of such conflict in writing not later than 5 days before bids are due. If such notification is not provided, Contractor shall accept Architect/Engineer's decision to resolve such conflict without further compensation.
3. For purpose of clarity and legibility, Drawings are essentially diagrammatic, although size and location of equipment and piping are drawn to scale wherever possible. Verify Contract Documents information at Site.
4. Drawings indicate required sizes and points of termination of conduits and ducts and suggest routes. It is not intention of Drawings to indicate all necessary offsets. Install work in manner to conform to structure, avoid obstructions, preserve headroom, and keep openings and passageways clear. Do not scale from Drawings.

L. Continuous Operations

1. All Work shall be performed in a manner that allows Owner to operate existing facility on continuous basis. Temporary feeders or branch circuits shall be provided as required to maintain continuous operation of Owner's facility.
2. Should an outage be required, Contractor shall submit work procedure 5 working days before outage. Work procedure shall indicate step by step procedure which Contractor expects to follow to perform its work. Each shall indicate condition of power source, commercial or diesel, calendar day and time of day from commencement to completion of work. All outages shall be scheduled at Owner's convenience. Contractor shall include all overtime pay for workmen in its Bid.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.

- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.

3.2 MISCELLANEOUS WORK

- A. Painting
 - 1. Touch-up existing equipment where finishes are marred or damaged due to construction Work.
- B. Special Coatings
 - 1. Equipment furnished with factory-applied finish shall be protected from damage by installing Contractor. Damaged surface shall be repaired by installing Contractor to match original finish or shall be replaced with new before final acceptance.
- C. Floor and Wall Openings
 - 1. Floor and wall openings for electrical Work shall be provided by Electrical Contractor.
 - 2. Final sizes and exact locations of electrical penetrations in floor and wall openings are responsibility of Electrical Contractor.
- D. Roof Openings
 - 1. Roof openings for electrical Work shall be provided by General Contractor, if shown on Architectural or Structural Drawings. Openings not shown on Architectural Drawings shall be provided by Electrical Contractor.
 - 2. Final sizes and exact locations of electrical penetrations through roof structure are responsibility of Electrical Contractor.
 - 3. Roof flashing and equipment counterflashing shall be provided by Electrical Contractor.
- E. Platforms and Supports
 - 1. Platforms and supporting stands shall be provided by Electrical Contractor for their respective equipment.
 - 2. Each piece of equipment or apparatus suspended from ceiling or mounted above floor level shall be provided with suitable structural support, platform, or carrier in

accordance with best recognized practice.

3. Contractors shall exercise extreme care that structural members of building are not overloaded by such equipment. In all cases, details of such hangers, platforms and supports together with total weights of mounted equipment shall be approved by Structural Engineer.
4. Provide all structural supports for proper attachment of electrical equipment supplied and also for equipment such as motor controllers, supplied as Work of other Divisions or by Owner for mounting connection and installation in this Division.
5. Concrete pads shall comply with requirements specified in Division 26 Section "Hangers and Supports for Electrical Systems."

F. Access Doors

1. Electrical Contractor shall provide all access doors required for access to electrical equipment. Access doors shall comply with requirements specified in Division 8 Section "Access Doors and Frames."

G. Cutting and Patching

1. Electrical Contractor shall provide all cutting and patching required for installation of new conduit and wiring. Cutting and patching shall comply with requirements of Division 1 Section "Cutting and Patching."

H. Excavation and Backfilling

1. Electrical Contractor shall provide all excavation and backfilling required for installation of new electrical equipment. Excavation and backfilling shall comply with requirements of Division 31.

I. Dust Protection

1. Temporary partitions or barriers required to protect existing building or facilities shall be provided by General Contractor. General Contractor shall coordinate necessity and location of such protection with Owner. Electrical Contractor shall maintain clean work area with daily sweeping.
2. Electrical Contractor shall provide dust protection for operations requiring same which are in addition to those shown on Drawings. Dust partitions or barriers are required to protect existing equipment. Contractor's operations which could cause dust shall be performed with dust barriers erected.

3.3 PROTECTION AND TREATMENT OF PROPERTY

- A. Repair and replace with new all property damaged in installation of underground lines to meet approval of Owner and authorities having jurisdiction.
- B. Replace base and wearing surfaces of streets with same kind and thickness of material as existing. Replace brick, concrete, and asphalt surface to width 6 inches wider than disturbed area. Replace entire surface, if more than 30% has been disturbed.

- C. Replace sidewalks, curbs, gutters, and driveways with same kind of thickness of materials. Replace entire section of concrete walks or driveways.
- D. Regrade and replant lawn areas.
- E. Protect existing utilities. Cap existing utilities that are abandoned.

3.4 ELECTRICAL CONNECTIONS TO EQUIPMENT

- A. In event that supplier of equipment requires a larger starter or disconnect than those indicated in Documents, that supplier shall reimburse Contractor difference in cost for supplying these items.
- B. Connections and wiring diagrams shown on Drawings or described in Specifications are typical and are for bidding purposes only. Detailed diagrams and instructions shall be provided by Contractor supplying equipment, if connections are different from those shown on Drawings.
- C. Additional relays, switches, contactors, etc. which may be required for control purposes in addition to those specified for and indicated on Drawings shall be provided by Mechanical Contractor and its subcontractors. These devices shall be mounted by supplier within 5 feet of apparatus to be installed. Electrical Contractor shall provide all additional conduit, wire, and electrical connections without additional charge to Owner.
- D. Wiring diagrams shall be specially drawn so they will specifically apply to this Project. "Typical" wiring diagrams will not be acceptable for installation purposes. In event that several pieces of mechanical equipment from different suppliers are combined into one system, Mechanical Contractor shall furnish complete wiring and control diagram to enable Electrical Contractor to make proper connection. Diagrams shall be submitted to Architect/Engineer for approval before actual wiring.
- E. Mechanical Contractor shall furnish to Electrical Contractor written notice of approval and acceptance of all control wiring installed for mechanical system by Electrical Contractor. Such approval shall be given within 30 days of completion of all such control wiring. Two copies of letter shall be sent to Architect/Engineer.

3.5 TEMPORARY LIGHTING AND POWER

- A. Electrical Contractor shall arrange for and provide a temporary electrical service for Project as indicated in Division 01.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Copper building wire rated 600 V or less.
 - 2. Metal-clad cable, Type MC, rated 600 V or less.
 - 3. Connectors, splices, and terminations rated 600 V and less.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cerro Wire LLC.
 - 2. Encore Wire Corporation.
 - 3. General Cable Technologies Corporation.
 - 4. Southwire Company.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. RoHS compliant.

3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
 - D. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
 - E. Conductor Insulation:
 1. Type THHN and Type THWN-2: Comply with UL 83.
- 2.2 METAL-CLAD CABLE, TYPE MC
- A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.
 - B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AFC Cable Systems
 2. Encore Wire Corporation.
 3. Southwire Company.
 - C. Standards:
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 2. Comply with UL 1569.
 3. RoHS compliant.
 4. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
 - D. Circuits:
 1. Single circuit.
 - E. Conductors: Copper, complying with ASTM B 3 for bare annealed copper and with ASTM B 8 for stranded conductors.
 - F. Ground Conductor: Insulated.
 - G. Conductor Insulation:
 1. Type THHN/THWN-2: Comply with UL 83 (Copper branch circuits and feeders).
 - H. Armor: Aluminum, interlocked.

2.3 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems; a part of Atkore International.
 - 2. Ideal Industries, Inc.
 - 3. ILSCO.
 - 4. NSi Industries LLC.
 - 5. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 6. Thomas & Betts Corporation; A Member of the ABB Group.
- C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.
- D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.
 - 1. Material: Bronze.
 - 2. Type: One hole with standard barrels.
 - 3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- C. Provide stranded conductors for motors and locations where vibration or movement is present.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Copper - Type THHN/THWN-2, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Copper - Type THHN/THWN-2, single conductors in raceway.

- C. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway, Metal-clad cable, Type MC.
- E. Branch Circuits Concealed below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."
- G. Voltage Drop
 - 1. Voltage drop shall not exceed 3% from branch panelboard to last outlet.
- H. Provide separate, individual neutral conductors for all single phase, 120 volt and 277 volt branch circuits. Do not combine neutrals for these circuits.
- I. Do not splice feeders without prior approval from the Engineer.
- J. Metal-Clad Cable Installation (Branch Circuits):
 - 1. Install metal-clad cable for all branch circuits within the building envelope from the last branch circuit panelboard to the last device.
 - 2. Do not use metal-clad cable in the following circumstances:

- a. Areas where there is no ceiling, except where cable is exiting panelboards in electrical rooms.
- b. Do not use for branch circuits to and from dimming racks.
- c. Do not use for branch circuits to sound system equipment.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.

2. Perform each of the following visual and electrical tests:
 - a. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
 - b. Test bolted connections for high resistance using one of the following:
 - 1) A low-resistance ohmmeter.
 - 2) Calibrated torque wrench.
 - 3) Thermographic survey.
 - c. Inspect compression-applied connectors for correct cable match and indentation.
 - d. Inspect for correct identification.
 - e. Inspect cable jacket and condition.
 - f. Continuity test on each conductor and cable.
 - g. Uniform resistance of parallel conductors.
- B. Cables will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports to record the following:
 1. Procedures used.
 2. Results that comply with requirements.
 3. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes grounding and bonding systems and equipment.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burndy; Part of Hubbell Electrical Systems.
 - 2. ERICO International Corporation.
 - 3. Fushi Copperweld Inc.
 - 4. Harger Lightning & Grounding.
 - 5. ILSCO.

6. O-Z/Gedney; a brand of Emerson Industrial Automation.
7. Thomas & Betts Corporation; A Member of the ABB Group.

2.3 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 1. Solid Conductors: ASTM B 3.
 2. Stranded Conductors: ASTM B 8.
 3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
 4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Lead Content: Less than 300 parts per million.

2.4 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- D. Bus-Bar Connectors: Compression type, copper or copper alloy, with two wire terminals.
- E. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- F. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- G. Conduit Hubs: Mechanical type, terminal with threaded hub.
- H. Lay-in Lug Connector: Mechanical type, copper rated for direct burial terminal with set screw.
- I. Straps: Solid copper, cast-bronze clamp copper lugs. Rated for 600 A.
- J. U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

- K. Lead Content: Less than 300 parts per million.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

- C. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel slotted support systems.
 - 2. Conduit and cable support devices.
 - 3. Support for conductors in vertical conduit.
 - 4. Structural steel for fabricated supports and restraints.
 - 5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

1.3 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M.
 - 2. AWS D1.2/D1.2M.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

2.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- diameter holes at a maximum of 8 inches o.c. in at least one surface.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. B-line, an Eaton business.
 - b. ERICO International Corporation.
 - c. Flex-Strut Inc..
 - d. GS Metals Corp.
 - e. G-Strut.
 - f. Thomas & Betts Corporation; A Member of the ABB Group.
 - g. Unistrut; Part of Atkore International.
 - h. Wesanco, Inc.
 - 2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 3. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - 4. Channel Width: Selected for applicable load criteria.
 - 5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
- B. Conduit and Cable Support Devices: Steel, Steel and malleable-iron, Stainless-steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.
- D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M steel plates, shapes, and bars; black and galvanized.
- E. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- 1) Hilti, Inc..
 - 2) ITW Ramset/Red Head; Illinois Tool Works, Inc..
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc..
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated, stainless steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) B-line, an Eaton business.
 - 2) Empire Tool and Manufacturing Co., Inc..
 - 3) Hilti, Inc..
 - 4) ITW Ramset/Red Head; Illinois Tool Works, Inc..
 - 5) MKT Fastening, LLC.
3. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All Stainless-steel springhead type.
7. Hanger Rods: Threaded steel.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 1. NECA 1.
 2. NECA 101
- B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, and GRC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps.
- F. Obtain approval from Architect/Engineer before cutting or welding to structural members, or before hanging heavy equipment.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT and GRC may be supported by openings through structure members, according to NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To New Concrete: Bolt to concrete inserts.
 - 2. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 3. To Existing Concrete: Expansion anchor fasteners.
 - 4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69, Spring-tension clamps.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

- 3.3 Use 4000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Section 033000 "Cast-in-Place Concrete." PAINTING
- A. Touchup: Comply with requirements in Section 099600 "High-Performance Coatings" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
 - B. All panelboards, cabinets, switchboards, motor controllers, control panels and other enclosures shall be cleaned and paint touched-up as necessary to duplicate factory-finished appearance. Touch-up paint shall exactly match color, composition, and quality of factory-applied finish.
 - C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Metal conduits and fittings.
 - 2. Nonmetallic conduits and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Boxes, enclosures, and cabinets.

- B. Related Requirements:

- 1. Section 078413 "Penetration Firestopping" for firestopping at conduit and box entrances.
 - 2. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for locations where metal-clad cable may be allowed in lieu of conduit/conductors.

1.3 DEFINITIONS

- A. GRC: Galvanized rigid steel conduit.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Metal Conduit:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFC Cable Systems; a part of Atkore International.
 - b. Allied Tube & Conduit; a part of Atkore International.
 - c. Anamet Electrical, Inc.
 - d. Calconduit.

- e. Electri-Flex Company.
 - f. Picoma Industries, Inc.
 - g. Republic Conduit.
 - h. Southwire Company.
 - i. Thomas & Betts Corporation; A Member of the ABB Group.
 - j. Western Tube and Conduit Corporation.
 - k. Wheatland Tube Company.
- 2. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 3. GRC: Comply with ANSI C80.1 and UL 6.
 - 4. EMT: Comply with ANSI C80.3 and UL 797.
 - 5. FMC: Comply with UL 1; zinc-coated steel.
 - 6. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- B. Metal Fittings:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. AFC Cable Systems; a part of Atkore International.
 - b. Anamet Electrical, Inc.
 - c. Calconduit.
 - d. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - e. Thomas & Betts Corporation; A Member of the ABB Group.
 - 2. Comply with NEMA FB 1 and UL 514B.
 - 3. Listing and Labeling: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 4. Fittings, General: Listed and labeled for type of conduit, location, and use.
 - 5. Fittings for EMT:
 - a. Material: Steel.
 - b. Type: Setscrew.
 - 6. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
- C. Joint Compound for GRC,: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

A. Nonmetallic Conduit:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CANTEX INC.
 - b. Thomas & Betts Corporation; A Member of the ABB Group.
2. Listing and Labeling: Nonmetallic conduit shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
3. RNC: Type EPC-40-PVC, unless otherwise indicated, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

B. Nonmetallic Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CANTEX INC.
 - b. Kraloy.
 - c. Lamson & Sessions.
 - d. Thomas & Betts Corporation; A Member of the ABB Group.
 - e. Topaz Electric; a division of Topaz Lighting Corp.
2. Fittings, General: Listed and labeled for type of conduit, location, and use.
3. Fittings for RNC: Comply with NEMA TC 3; match to conduit or type and material.
4. Solvents and Adhesives: As recommended by conduit manufacturer.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. B-line, an Eaton business.
 2. Hoffman; a brand of Pentair Equipment Protection.
 3. MonoSystems, Inc.
 4. Square D.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required

for complete system.

- D. Wireway Covers: Screw-cover type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Adalet.
 - 2. Crouse-Hinds, an Eaton business.
 - 3. EGS/Appleton Electric.
 - 4. Erickson Electrical Equipment Company.
 - 5. FSR Inc.
 - 6. Hoffman; a brand of Pentair Equipment Protection.
 - 7. Hubbell Incorporated.
 - 8. Hubbell Incorporated; Wiring Device-Kellems.
 - 9. Kraloy.
 - 10. Milbank Manufacturing Co.
 - 11. MonoSystems, Inc.
 - 12. Oldcastle Enclosure Solutions.
 - 13. O-Z/Gedney; a brand of Emerson Industrial Automation.
 - 14. RACO; Hubbell.
 - 15. Spring City Electrical Manufacturing Company.
 - 16. Thomas & Betts Corporation; A Member of the ABB Group.
 - 17. Topaz Electric; a division of Topaz Lighting Corp.
 - 18. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

- H. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- I. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- J. Gangable boxes are prohibited.
- K. No through-wall boxes or utility handy boxes will be accepted.
- L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- M. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: GRC.
 - 2. Concealed Conduit, Aboveground: GRC.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, .
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.

4. Install all branch circuit conduits above floor slab.
 5. Feeder conduits may be installed below floor slab in RNC, Type EPC 40 PVC.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. GRC: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Do not install nonmetallic conduit above slab or grade unless noted otherwise.

3.2 INSTALLATION

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- B. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- C. Do not install raceways or electrical items on rotating equipment.
- D. Do not fasten conduits onto the bottom side of a metal deck roof. Support conduits only from building structure.
- E. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- F. Complete raceway installation before starting conductor installation.
- G. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- H. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- I. Make bends in raceway using large-radius preformed ells. Field bending shall be according to NFPA 70 minimum radii requirements. Use only equipment specifically designed for material and size involved.
- J. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install

conduits parallel or perpendicular to building lines.

- K. Support conduit within 12 inches of enclosures to which attached.
- L. Do not embed raceways in slabs.
- M. Transition all underground/underslab conduits below grade to a galvanized rigid conduit elbow prior to turning up through and above floor/grade.
- N. Stub-Ups to Above Recessed Ceilings:
 - 1. Use EMT or GRC for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- O. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- P. Do not support cables, raceway, etc., from ceiling support wires.
- Q. In general, conduit routing is not shown on Drawings. Circuit numbers are indicated by each device. Contractor is responsible for providing conduit installation required to connect all devices shown on Drawings. No more than three (3) circuits are allowed in a conduit run, unless wiring is increased in size in accordance with National Electrical Code.
- R. Conduits to be supported by wall brackets shall have their supports spaced not more than 4'-6" inches on center.
- S. Raceways and boxes shall be supported directly from structural system, not from ceiling suspensions system or roof deck. Additional support shall be provided at junction or pull boxes.
- T. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- U. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- V. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- W. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

- X. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- Y. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- Z. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- AA. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Conduit extending from interior to exterior of building.
 - 4. Conduit extending into pressurized duct and equipment.
 - 5. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
 - 6. Where otherwise required by NFPA 70.
- BB. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- CC. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground GRC conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of

- length of straight run per deg F of temperature change for metal conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- DD. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC in damp or wet locations not subject to severe physical damage.
- EE. Set metal floor boxes level and flush with finished floor surface.
- FF. Protect conduits during construction with temporary plugs or caps. All conduit shall be securely capped until wire or cable is installed therein.
- GG. Convenience outlets, switches, or other devices located on walls shall be serviced from ceiling, unless otherwise indicated.

3.3 OUTLET BOX INSTALLATION

- A. Outlet and device boxes shall be installed flush and shall be properly centered in ceiling tiles, wall finishes, or casework elements. Heights as indicated by Contract Documents are approximate and may be shifted slightly to match nearest block course, wainscots, and architectural details. Verify cabinet details, wall elevations, reflected ceiling plans, equipment rough-in locations, and door swings with Architectural, Mechanical, and Equipment Drawings prior to box or outlet rough-in.
- B. Light switches shall be roughed-in adjacent to door openings on strike side of door. Verify location with Architect/Engineer's Drawings. Switch shall clear door frame by 6 inches.
- C. Outlet boxes shall be of a type appropriate for use and location. Adjacent devices shall be ganged in multiple gang boxes under a common finish plate.
- D. Outlet Boxes shall be securely and rigidly attached on both sides and supported plumb, level, and true to building lines using any of following methods:
 1. Telescoping screw gun box bracket (Caddy TSG16).
 2. Rigid box support (Caddy RBS16).
- E. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

- F. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- G. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- H. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- I. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- J. Finish plates shall not span different types of wall finishes either vertically or horizontally. Plates shall cover mortar joints and cut-openings completely.
- K. Outlet, junction, and pull boxes and their covers shall have corrosion protection suitable for atmosphere in which they are installed. Provide gaskets for all boxes installed outside and other wet or damp locations (tunnels, crawl spaces, pits, etc.).
- L. Outlet boxes shall be protected to prevent entrance of plaster, and debris shall be thoroughly cleaned from box before installation of conductors.

3.4 JUNCTION BOX INSTALLATION

- A. Junction boxes shall be installed as indicated by Contract Documents and required for proper installation. Boxes shall be installed in accessible spaces or behind access panels. Boxes located above "snap-in" or "lay-in" removable ceilings will be considered accessible.
- B. Junction boxes shall be used where necessary to facilitate installation of raceways and pulling of wire or cable. Boxes shall be sized in accordance with NEC and installed such that conduit entry will permit longest radius for conductors contained therein.
- C. Support all boxes in accordance with National Electrical Code.

3.5 MOUNTING HEIGHTS

- A. Distance from finished floor to center of device, unless otherwise specified as follows:
 - 1. Receptacles 18 inches.
 - 2. Switches and dimmers 46 inches.
 - 3. Receptacles or switch above countertop 2 inches above backsplash to bottom.
 - 4. Fire alarm pull station 46 inches.
 - 5. Fire alarm signal device 80 inches to bottom of device housing.

- B. Exceptions:

1. At junction of different materials in wall finishes.
2. Where outlets occur in moldings, break in wall surface or unsuitable location in tile, wood or similar finish.
3. Where outlets conflict with locations of wall-mounted equipment such as radiators, convectors, unit heaters, etc.
4. As noted otherwise.

3.6 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."
4. Install manufactured galvanized steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
 - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
 - b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

3.7 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- #### A.
- Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.8 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.9 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Grout.
 - 4. Silicone sealants.
- B. Related Requirements:
 - 1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
 - 2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
- B. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.
 - 2. Minimum Metal Thickness:

- a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
- b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 3. Pressure Plates: Stainless steel.
 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.4 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete Floors:
 - 1. Interior Penetrations of Non-Fire-Rated Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
- C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- E. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Color and legend requirements for conductors, and warning labels and signs.
 - 2. Labels.
 - 3. Tapes.
 - 4. Tags.
 - 5. Signs.
 - 6. Cable ties.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with ASME A13.1 and IEEE C2.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COLOR AND LEGEND REQUIREMENTS

- A. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded conductors.
 - 1. Color shall be factory applied.
 - 2. Colors for 208Y/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Color for Neutral:
 - a. 208Y/120-V - White.
 - 4. Color for Equipment Grounds: Green.
- B. Warning Label Colors:
 - 1. Identify system voltage with black letters on an orange background.
- C. Warning labels and signs shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
- D. Equipment Identification Labels:
 - 1. Normal Power: Black letters on a white field.

2.3 LABELS

- A. Self-Adhesive Wraparound Labels: Write-on, 3-mil- thick, flexible label with acrylic pressure-sensitive adhesive.

2.4 TAPES

- A. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils thick by 1 to 2 inches wide; compounded for outdoor use.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.

- b. Carlton Industries, LP.
- c. emedco.
- d. Marking Services, Inc.

B. Underground-Line Warning Tape:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Ideal Industries, Inc.
 - c. LEM Products Inc.
 - d. Marking Services, Inc.
 - e. Reef Industries, Inc.
 - f. Seton Identification Products.
2. Tape:
 - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
 - b. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - c. Tape material and ink shall be chemically inert and not subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.
3. Color and Printing:
 - a. Comply with ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, and ANSI Z535.5.
 - b. Inscriptions for Red-Colored Tapes: "ELECTRIC LINE, HIGH VOLTAGE" .

- C. Stenciled Legend: In nonfading, waterproof, ink or paint. Minimum letter height shall be 1 inch.

2.5 TAGS

- A. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.

- d. Grafoplast Wire Markers.
- e. LEM Products Inc.
- f. Marking Services, Inc.
- g. Panduit Corp.
- h. Seton Identification Products.

B. Write-on Tags:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Carlton Industries, LP.
 - b. LEM Products Inc.
 - c. Seton Identification Products.
2. Polyester Tags: 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment.
3. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.6 SIGNS

A. Laminated Acrylic or Melamine Plastic Signs:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Brady Corporation.
 - b. Carlton Industries, LP.
 - c. emedco.
 - d. Marking Services, Inc.
2. Engraved legend.
3. Thickness:
 - a. For signs up to 20 sq. in., minimum 1/16 inch thick.
 - b. For signs larger than 20 sq. in., 1/8 inch thick.
 - c. Engraved legend with black letters on white face.
 - d. Self-adhesive.

2.7 CABLE TIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. HellermannTyton.

2. Ideal Industries, Inc.
 3. Marking Services, Inc.
 4. Panduit Corp.
- B. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black, except where used for color-coding.
- C. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black.
- D. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.
1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 Deg F according to ASTM D 638: 7000 psi.
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F.
 5. Color: Black.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.

- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from the floor.
- H. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- I. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
- J. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.
 - 2. Limit use of underground-line warning tape to direct-buried cables.
 - 3. Install underground-line warning tape for direct-buried cables and cables in raceways.
- K. Nonmetallic Preprinted Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using general-purpose, UV-stabilized, plenum-rated cable ties.
- L. Write-on Tags:
 - 1. Place in a location with high visibility and accessibility.
 - 2. Secure using general-purpose, UV-stabilized, plenum-rated cable ties.
- M. Laminated Acrylic or Melamine Plastic Signs:
 - 1. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high sign; where two lines of text are required, use labels 2 inches high.
- N. Cable Ties: General purpose, for attaching tags, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.3 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with indelible marker containing the wiring system legend, system voltage, and circuit number. System legends shall be as follows:
 - 1. "RECEPTACLE."
 - 2. "LIGHTING."
 - 3. "FIRE ALARM."
- D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive wraparound labels self-adhesive vinyl tape to identify the phase.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- E. Power-Circuit Conductor Identification, More Than 600 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use write-on tags.
- F. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags with the conductor or cable designation, origin, and destination.
- G. Control-Circuit Conductor Termination Identification: For identification at terminations, provide with the conductor designation.
- H. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.
- I. Instructional Signs: Self-adhesive labels, including the color code for grounded and ungrounded conductors.
- J. Operating Instruction Signs: Laminated acrylic or melamine plastic signs.
- K. Fire Alarm System:
 - 1. Provide self-adhesive, engraved, laminate acrylic or melamine label for panels, boxes enclosures, etc. identifying name and circuit number.

2. Label with indelible marker all junction boxes, pull boxes, etc. associated with the fire alarm system with "FIRE ALARM".

L. Equipment Identification Labels:

1. Indoor Equipment: Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or self-adhesive melamine sign.
3. Include on all equipment labels the following: Equipment name, voltage, amperage (for switchboards and panelboards) and source fed from. Example: PANEL A, 480Y/277V, 400A, FED FROM DP-1.
4. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Enclosures and electrical cabinets.
 - b. Access doors and panels for concealed electrical items.
 - c. Enclosed switches (include equipment fed).
 - d. Enclosed controllers (include equipment fed).
 - e. Variable-speed controllers (include equipment fed).
 - f. Other similar equipment designated by Owner's representative, architect or engineer.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Indoor occupancy and vacancy sensors.
 - 2. Switchbox-mounted occupancy sensors.
 - 3. Wall-box dimmers.
- B. Related Requirements:
 - 1. Section 262726 "Wiring Devices" for manual light switches, and wall plates.

1.3 ACTION SUBMITTALS

- 1. Product Data with Shop Drawings:
 - a. Product Data: For each type of product.
 - b. Shop Drawings:
 - 1) Show installation details for the following:
 - a) Occupancy sensors.
 - b) Vacancy sensors.
 - 2) Interconnection diagrams showing field-installed wiring.
 - 3) Include diagrams for power, signal, and control wiring.
 - 4) Provide floor plan drawings indicating device locations and sensor coverage patterns.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control devices.
 - 2. Warranty Period: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. Manufacturers:
 - 1. Eaton Corporation, Cooper Industries, Inc.
 - 2. Hubbell Building Automation, Inc.
 - 3. Leviton Manufacturing Co., Inc.
 - 4. Sensor Switch; Acuity Brands Lighting, Inc.
 - 5. Watt Stopper.
- B. General Requirements for Sensors:
 - 1. Wall, Ceiling-mounted, solid-state indoor occupancy sensors.
 - 2. Dual technology.
 - 3. Separate power pack.
 - 4. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 5. Operation:
 - a. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
 - 6. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A Sensor is powered from the power pack.
 - 7. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70. Provide (1) additional relay on each power pack for interconnection to BMS for control of HVAC equipment.
 - 8. Mounting:

- a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 9. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
 10. Bypass Switch: Override the "on" function in case of sensor failure.
 11. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.
- C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
1. Sensitivity Adjustment: Separate for each sensing technology.
 2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches.
 3. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 500 sq. ft. when mounted on a 96-inch- high ceiling.
 4. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
 5. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.
 6. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot- high ceiling in a corridor not wider than 14 feet.

2.2 WALL-BOX DIMMERS

- A. Manufacturers:
1. Lutron; Diva.
 2. Eaton; WSBD Decorator.
 3. Leviton; Decora.
- B. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
- C. Control: Continuously adjustable dimming slider, paddle switch with manual "ON-OFF"; with single-pole or three-way switching. Comply with UL 1472.
- D. LED Lamp Dimmer Switches: Modular; compatible with LED lamps; trim potentiometer to

adjust low-end dimming; capable of consistent dimming with low end not greater than 10 percent of full brightness.

- E. Match dimmer with load being controlled. Confirm circuit load with dimmer rating.
- F. Heat Sinks: Dimmer shall not have heat sinks forcing the dimmer to protrude from the wall.
- G. Wall Plate: Snap-on wall plates are not acceptable. Attach Decora-style wall plate to dimmer with (2) screws.

2.3 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

- A. Comply with NECA 1.
- B. Device locations are indicated on Contract Documents for purpose of indicating spaces requiring devices. Contractor and manufacturer shall verify, prior to Bid, exact quantity of sensors and optimal location required in each space, and adjust quantities as required for Bidding.

- C. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- D. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3 WALL-BOX DIMMER INSTALLATION

- A. Install dimmers within terms of their listing.
- B. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

3.4 WIRING INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing sensors, and after electrical circuitry has been

- energized, start units to confirm proper unit operation.
- 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Branch-circuit panelboards.

1.3 DEFINITIONS

- A. Inominal: Nominal discharge current.
- B. MCOV: Maximum continuous operating voltage.
- C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.
- D. MOV: Metal-oxide varistor; an electrical component with a significant non-ohmic current-voltage characteristic.
- E. OCPD: Overcurrent protective device.
- F. SCCR: Short-circuit current rating.
- G. SPD: Surge protective device.
- H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

- A. Product Data with Shop Drawings:
 - 1. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
 - a. Include rated capacities, operating characteristics, electrical characteristics, and

furnished specialties and accessories.

- b. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

2. Shop Drawings: For each panelboard and related equipment.

- a. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
- b. Detail enclosure types and details for types other than NEMA 250, Type 1.
- c. Detail bus configuration, current, and voltage ratings.
- d. Short-circuit current rating of panelboards and overcurrent protective devices.
- e. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
- f. Include wiring diagrams for power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.7 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: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Handle and prepare panelboards for installation according to NEMA PB 1.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.

- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.

- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Construction Manager's written permission.
3. Comply with NFPA 70E.

1.10 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.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace surge protection devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Surface -mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Front: For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
 - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 4. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
 - 5. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
 - 6. In locations with multiple sections, provide each section identical in all dimensions.
- B. Incoming Mains Location: Top.
- C. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 - 3. In each panelboard section, provide complete top to bottom vertical bussing, rated at

same ampacity as main device or main lugs.

- D. Conductor Connectors: Suitable for use with conductor material and sizes.
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - 2. Main and Neutral Lugs: Mechanical type.
 - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
 - 5. Provide proper quantity/size of lugs as required for conductors indicated.
 - 6. Add 8" to the tub width when exceeding 54 circuits.
- E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit; PRL1/PRL2/PRL3 Series.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution; AQ/AE/AS Series.
 - 3. Siemens Energy & Automation, Inc.; P1/P2/P3 Series.
 - 4. Square D; a brand of Schneider Electric; NF/NQ Series.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.
- B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Circuit Breaker Trip Rating 225 amps and below: Thermal-magnetic circuit breakers; Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits.
 2. Circuit Breaker Trip Rating 250 amps and above: Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following adjustable settings:
 - a. Instantaneous trip.
 - b. Long- and short-time pickup levels.
 - c. Long- and short-time time adjustments.
 3. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
 4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and

temporary blocking of moving parts from panelboards.

- C. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
- D. For branch-circuit panelboards, mount top of trim 72 inches above finished floor unless otherwise indicated.
- E. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- F. Install overcurrent protective devices and controllers not already factory installed.
 - 1. Set field-adjustable, circuit-breaker trip ranges.
- G. Install filler plates in unused spaces.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- I. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to

inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Straight-blade convenience, hospital-grade, isolated-ground, and tamper-resistant receptacles.
 - 2. GFCI receptacles.
 - 3. Toggle switches.
 - 4. Wall plates.
 - 5. Cord reels.
- B. Related Requirements:
 - 1. Section 260923 "Lighting Control Devices" for occupancy / vacancy sensor for control of plug load controlled receptacles.

1.3 DEFINITIONS

- A. Abbreviations of Manufacturers' Names:
 - 1. Eaton: Eaton Wiring Devices; Division of Cooper Industries, Inc.
 - 2. Hubbell: Hubbell Incorporated: Wiring Devices-Kellems.
 - 3. Leviton: Leviton Mfg. Company, Inc.
 - 4. Pass & Seymour: Pass& Seymour/Legrand.
- B. EMI: Electromagnetic interference.
- C. GFCI: Ground-fault circuit interrupter.

1.4 ACTION SUBMITTALS

- A. Product Data with Shop Drawings:
 - 1. Product Data: For each type of product.
 - 2. Shop Drawings: List of legends and description of materials and process used for

premarking wall plates.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

1.7 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace wiring devices that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 STRAIGHT-BLADE RECEPTACLES

- A. Single and Duplex Convenience Receptacles: 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Manufacturers:
 - a. Eaton; 5361 (single), AH5362 (duplex).
 - b. Hubbell; HBL5361 (single), HBL5362 (duplex).
 - c. Leviton; 5361 (single), 5362 (duplex).
 - d. Pass & Seymour; 5361 (single), 5362A (duplex).

2.3 GFCI RECEPTACLES

A. General Description:

1. 125 V, 20 A, straight blade, feed -through type.
2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, UL 943 Class A, and FS W-C-596.
3. Self-testing with indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles (Dry Locations):

1. Manufacturers:
 - a. Eaton; SGF20.
 - b. Hubbell; GFRST20.
 - c. Leviton; GFNT2
 - d. Pass & Seymour; 2097.

2.4 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Single Pole:
 - a. Manufacturers:
 - 1) Eaton; AH1221.
 - 2) Hubbell; HBL1221.
 - 3) Leviton; 1221-2.
 - 4) Pass & Seymour; PS20AC1.
2. Three Way:
 - a. Manufacturers:
 - 1) Eaton; AH1223.
 - 2) Hubbell; HBL1223.
 - 3) Leviton; 1223-2.
 - 4) Pass & Seymour; PS20AC3.

2.5 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish. Provide (2) screws for each plate.
 - 2. Material for Finished Spaces: 0.035-inch- thick, satin-finished, Type 302 stainless steel.

2.6 CORD REELS

- A. Weatherproof cord reel, 20 feet, 3#12 AWG type SOW cable, with ratchet lock, (2) duplex Nema 5-20 receptacles in outlet box at end of cable, 10 feet power feed cable and 340 degree pivot base and beam clamp with safety chain to mount to roof structure. Adjustable device on load cable to lock in maximum height of receptacle when cable is not in use. Provide strain relief on the cable at the outlet box.
- B. Manufacturers:
 - 1. Hubbell; HBL501.

2.7 FINISHES

- A. Device Color:
 - 1. Wiring Devices Connected to Normal Power System: White unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
 - 1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete,

dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.
- B. Install weatherproof GFCI receptacles in all damp and wet locations.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

- A. Test Instruments: Use instruments that comply with UL 1436.
- B. Perform the following tests and inspections:
 - 1. Test Instruments: Use instruments that comply with UL 1436.
- C. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- D. Wiring device will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Cartridge fuses rated 600 V ac and less for use in the following:
 - a. Control circuits.
 - b. Enclosed controllers.
 - c. Enclosed switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 3. Current-limitation curves for fuses with current-limiting characteristics.
 - 4. Coordination charts and tables and related data.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017700 "Closeout Procedures,"

Section 017823 "Operation and Maintenance Data," include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse used on the Project. Submit in electronic format suitable for use in coordination software.
4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.6 FIELD CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg For more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Bussmann, an Eaton business.
 2. Littelfuse, Inc.
 3. Mersen USA.
- B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
 1. Type RK-1: 250 -V, zero- to 600-A rating, 200 kAIC, time delay.
 2. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, time delay.
 3. Type CD: 600-V, 31- to 60-A rating, 200 kAIC, time delay.

- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.
- E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
 - 1. Motor Branch Circuits: Class RK1, time delay.
 - 2. Other Branch Circuits: Class RK1, time delay.
 - 3. Control Transformer Circuits: Class CC or CD, time delay, control transformer duty.
 - 4. Provide open-fuse indicator fuses or fuse covers with open fuse indication.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.

1.4 ACTION SUBMITTALS

- A. Product Data with Shop Drawings:
 - 1. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Current and voltage ratings.
 - c. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - d. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 2. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - a. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- C. Manufacturer's field service report.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 - 2. Altitude: Not exceeding 6600 feet.
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of electric service.
 - 2. Indicate method of providing temporary electric service.
 - 3. Do not proceed with interruption of electric service without Construction Manager's written permission.
 - 4. Comply with NFPA 70E.

1.10 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit; DH Series.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution; TH series.
 - 3. Siemens Energy & Automation, Inc.; HF Series.

4. Square D; a brand of Schneider Electric.; H Series.
- B. Type HD, Heavy Duty, Single Throw, 240 -V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 4. Fuse Puller Kit: Provide fuse puller for each fuse.
 5. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 6. Lugs: Mechanical type, suitable for number, size, and conductor material.
 7. Accessory Control Power Voltage: Remote mounted and powered. .

2.2 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 2. Outdoor Locations: NEMA 250, Type 3R.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at +72 inches above finished floor unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 3. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as

recommended by manufacturer.

END OF SECTION 262816

SECTION 262913 - ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following enclosed controllers rated 600 V and less:
 - 1. Full-voltage manual.
 - 2. Full-voltage magnetic.
- B. Related Section:
 - 1. Section 262923 "Variable-Frequency Motor Controllers" for general-purpose, ac, adjustable-frequency, pulse-width-modulated controllers for use on variable torque loads in ranges up to 200 hp.

1.3 DEFINITIONS

- A. CPT: Control power transformer.
- B. MCCB: Molded-case circuit breaker.
- C. MCP: Motor circuit protector.
- D. N.C.: Normally closed.
- E. N.O.: Normally open.
- F. OCPD: Overcurrent protective device.
- G. SCR: Silicon-controlled rectifier.

1.4 ACTION SUBMITTALS

- A. Product Data with Shop Drawings:
 - 1. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types

and finishes.

2. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

- a. Show tabulations of the following:

- 1) Each installed unit's type and details.
- 2) Factory-installed devices.
- 3) Nameplate legends.
- 4) Short-circuit current rating of integrated unit.
- 5) Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.

- b. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Field quality-control reports.
- C. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.
- D. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 1. Routine maintenance requirements for enclosed controllers and installed components.
 2. Manufacturer's written instructions for setting field-adjustable overload relays.

1.7 MATERIALS MAINTENANCE SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

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

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NFPA 70.
- D. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 2. Altitude: Not exceeding 6600 feet.
- B. Interruption of Existing Electrical Systems: Do not interrupt electrical systems in facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:
 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of electrical systems.
 2. Indicate method of providing temporary utilities.
 3. Do not proceed with interruption of electrical systems without Construction Manager's

- written permission.
- 4. Comply with NFPA 70E.

1.11 COORDINATION

- A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1 FULL-VOLTAGE CONTROLLERS

- A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.
- B. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit; B230/B330 Series.
 - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution; TC Series.
 - c. Siemens Energy & Automation, Inc.; MMS Series.
 - d. Square D; a brand of Schneider Electric; K Series.
 - 2. Configuration: Nonreversing.
 - 3. Flush/Surface mounting.
 - 4. Red pilot light.
 - 5. Provide enclosure with provisions to lock handle in "OFF" position.
- C. Fractional Horsepower Manual Controllers: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off, on, or tripped.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit; MS Series.
 - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution; CR101 Series.
 - c. Siemens Energy & Automation, Inc.; SMF Series.
 - d. Square D; a brand of Schneider Electric; F Series.

2. Configuration: Nonreversing.
 3. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters matched to nameplate full-load current of actual protected motor; external reset push button; melting alloy type.
 4. Flush/Surface mounting.
 5. Red pilot light.
 6. Provide enclosure with provisions to lock handle in "OFF" position.
- D. Magnetic Controllers: Full voltage, across the line, electrically held.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D; a brand of Schneider Electric.
 2. Configuration: Nonreversing.
 3. Contactor Coils: Pressure-encapsulated type.
 - a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.
 4. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
 5. Control Circuits: 24 -V ac; obtained from integral CPT, with primary and secondary fuses, with CPT of sufficient capacity to operate integral devices and remotely located pilot, indicating, and control devices.
 6. Solid-State Overload Relay:
 - a. Switch or dial selectable for motor running overload protection.
 - b. Sensors in each phase.
 - c. Class 10 tripping characteristic selected to protect motor against voltage and current unbalance and single phasing.
 - d. Class II ground-fault protection, with start and run delays to prevent nuisance trip on starting.
 7. External overload reset push button.
- E. Combination Magnetic Controller: Factory-assembled combination of magnetic controller, OCPD, and disconnecting means.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Eaton Electrical Inc.; Cutler-Hammer Business Unit; EC Series.

- b. General Electric Company; GE Consumer & Industrial - Electrical Distribution; CR Series.
- c. Siemens Energy & Automation, Inc.; 17/18 Series.
- d. Square D; a brand of Schneider Electric; S Series.

2. Fusible Disconnecting Means:

- a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate indicated fuses.
- b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
- c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

ENCLOSURES

- F. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.

- 1. Dry and Clean Indoor Locations: Type 1.
- 2. Outdoor Locations: Type 3R.

2.2 ACCESSORIES

- A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

- 1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty, oiltight type.
 - a. Push Buttons: Unguarded types; - START/STOP
 - b. Pilot Lights: LED types; Red "RUN", Green "OFF".
 - c. Selector Switches: Rotary - Hand-off-Auto.

- B. N.C. N.O. auxiliary contact(s).

- C. Control Relays: Auxiliary and adjustable solid-state time-delay relays for 10 HP or more.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Wall-Mounted Controllers: Install motor starting switches and fractional horsepower manual controllers at toggle switch mounting height. Install combination enclosed controllers on walls with tops +72: above finished floor unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."
- B. Install motor starters/controllers/VFDs furnished as Work of other Sections.
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in each fusible-switch enclosed controller.
- E. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."
- F. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
- G. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.
- H. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved nameplate.
 - 3. Label each enclosure-mounted control and pilot device.
 - 4. Label each enclosure indicating the nature of interlocking when present.

3.4 CONTROL WIRING INSTALLATION

- A. Bundle, train, and support wiring in enclosures.
- B. Connect selector switches and other automatic-control selection devices where applicable.
 - 1. Connect selector switches to bypass only those manual- and automatic-control devices

- that have no safety functions when switch is in manual-control position.
- 2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.
- C. All control wiring between motor starters/controller and the controlled device is installed by the Temperature Control Contractor, unless noted otherwise. Provide raceways as required.

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. Tests and Inspections:
 - 1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
 - 2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
 - 3. Test continuity of each circuit.
 - 4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Construction Manager before starting the motor(s).
 - 5. Test each motor for proper phase rotation.
 - 6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 - 8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Enclosed controllers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6 ADJUSTING

- A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.
- B. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Construction Manager before increasing settings.
- C. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage solid-state controllers.

3.7 PROTECTION

- A. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers, and to use and reprogram microprocessor-based, reduced-voltage solid-state controllers.

END OF SECTION 262913

SECTION 265119 - LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior solid-state luminaires that use LED technology.
 - 2. Lighting fixture supports.
- B. Related Requirements:
 - 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and wallbox controls.
 - 2. Section 265219 "Emergency and Exit Lighting" for emergency LEDpower units.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data, Shop Drawings, Product Schedule:
 - 1. Product Data: For each type of product.

- a. Arrange in order of luminaire designation.
- b. Include data on features, accessories, and finishes.
- c. Include physical description and dimensions of luminaires.
- d. Include emergency lighting units, including batteries and chargers.
- e. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
- f. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project, IES LM-79 and IES LM-80.

- 1) Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

2. Shop Drawings: For nonstandard or custom luminaires.

- a. Include plans, elevations, sections, and mounting and attachment details.
- b. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- c. Include diagrams for power, signal, and control wiring.

3. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1. LED Modules: Ten for every 100 of each type and rating installed. Furnish at least one of each type.

2. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
3. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Provide luminaires from a single manufacturer for each luminaire type.
- C. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components (including but not limited to drivers, LED modules, luminaire housing, etc.) of luminaires that fail in materials or workmanship within specified warranty period.
- B. Warranty Period: Five year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Recessed Fixtures: Comply with NEMA LE 4.
- C. LED Module:
 1. Bulb shape complying with ANSI C79.1.
 2. Lamp base complying with ANSI C81.61.
 3. Comply with IES LM-79: Electrical and Photometric Measurements of Solid-State

Lighting Products.

4. Comply with IES LM-80: Measuring Lumen Maintenance of LED Light Sources.
5. Comply with IES TM-21: Projecting Long Term Lumen Maintenance of LED Light Sources.
6. UL listed.
7. CRI of minimum 80.
8. CCT as indicated in Lighting Fixture Schedule.
9. LEDs shall be binned within a three-step MacAdam Ellipse.
10. L70 lumen maintenance at minimum of 50,000 hours.
11. Lamps dimmable from 100 percent to 0 percent of maximum light output.
12. Modules shall be readily accessible and field replaceable.

D. LED driver:

1. Comply with NEMA SSL 1: "Electronic Drivers for LED Devices, Arrays, or Systems".
2. Comply with FCC Title 47 Part 15: "Radio Frequency Devices"
3. Certified UL Class 2.
4. UL listed dry and damp location.
5. Sound Rating: Class A.
6. THD Rating: Less than 20 percent.
7. Power Factor: 0.90 or higher.
8. Drivers shall be readily accessible and field replaceable.
9. Voltage: Provide multi-voltage drivers in all fixtures.
10. Disconnects: Provide quick disconnect to allow replacement of drivers with circuit energized.
11. Dimming: Provide 0-10 volt dimming for all fixtures unless indicated otherwise.
12. Surge Protection: IEEE C62.41, Category A, 2.5 kV.
13. Drivers shall be readily accessible and field replaceable.
14. Provide a driver in each fixture, master/slave configurations are not acceptable.
15. Compatibility: Certified by manufacturer for use with specific dimming control system and module indicated.
16. Control: Coordinate wiring from driver to control device to ensure that driver, controller, and connecting wiring are compatible.

2.2 EMERGENCY LED POWER UNIT

- A. Refer to Section 265219 "Emergency and Exit Lighting".
- B. Refer to Lighting Fixture Schedule on Drawings for fixtures requiring emergency LED power units.

2.3 MATERIALS

- A. Metal Parts:

1. Free of burrs and sharp corners and edges.
 2. Sheet metal components shall be steel unless otherwise indicated.
 3. Form and support to prevent warping and sagging.
- B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- C. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
1. Label shall include the following lamp characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter, shape, size, wattage, and coating.
 - c. CCT and CRI for all luminaires.

2.4 METAL FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.
- B. Paint after fabrication.

2.5 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting and install new lamps.

3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Fixture Locations: Do not scale electrical Drawings for exact location of lighting fixtures. In general, Architectural reflected ceiling Drawings indicate proper locations of lighting fixtures.
- C. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- D. Install lamps in each luminaire.
- E. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Able to maintain luminaire position after cleaning and relamping.
 - 3. Provide support for luminaire without causing deflection of ceiling or wall.
 - 4. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- F. Flush-Mounted Luminaire Support:
 - 1. Secured to outlet box.
 - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - 3. Trim ring flush with finished surface.

G. Wall-Mounted Luminaire Support:

1. Attached to structural members in walls.
2. Do not attach luminaires directly to gypsum board.

H. Ceiling-Mounted Luminaire Support:

1. Ceiling mount with two, 5/32-inch- diameter aircraft cable supports adjustable to 120 inches in length.

I. Suspended Luminaire Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

J. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

K. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

- C. Prepare test and inspection reports.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
 - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
 - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 265119

SECTION 265213 - EMERGENCY AND EXIT LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Exit signs.
 - 2. Luminaire supports.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Emergency Lighting Unit: A lighting unit with internal or external emergency battery powered supply and the means for controlling and charging the battery and unit operation.
- D. Fixture: See "Luminaire" Paragraph.
- E. Lumen: Measured output of lamp and luminaire, or both.
- F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

- A. Product Data, Shop Drawings, :
 - 1. Product Data: For each type of emergency lighting unit, exit sign, and emergency lighting support.
 - a. Include data on features, accessories, and finishes.
 - b. Include physical description of the unit and dimensions.
 - c. Battery and charger for light units.
 - d. Include life, output of luminaire (lumens, CCT, and CRI), and energy-efficiency data.
 - e. Include photometric data and adjustment factors based on laboratory tests,

complying with IES LM-45, for each luminaire type.

- 1) Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

2. Product Schedule:

- a. For emergency lighting units. Use same designations indicated on Drawings.
- b. For exit signs. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
2. Luminaire-mounted, emergency battery pack: One for every 50 emergency lighting units. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two year(s) from date of Substantial Completion.
- B. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Emergency Power Unit Batteries: Five years from date of Substantial Completion. Full warranty shall apply for the entire warranty period.
 - 2. Warranty Period for Self-Powered Exit Sign Batteries: Five years from date of Substantial Completion. Full warranty shall apply for the entire warranty period.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR EMERGENCY LIGHTING

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. NRTL Compliance: Fabricate and label emergency lighting units, exit signs, and batteries to comply with UL 924.
- C. Comply with NFPA 70 and NFPA 101.
- D. Comply with NEMA LE 4 for recessed luminaires.
- E. Comply with UL 1598 for fluorescent luminaires.
- F. Lamp Base: Comply with ANSI C81.61.
- G. Bulb Shape: Complying with ANSI C79.1.
- H. Provide 90 minutes of light output in the emergency mode
- I. Internal Type Emergency Power Unit: Self-contained, modular, battery-inverter unit, factory mounted within luminaire body and compatible with ballast/driver.
 - 1. Emergency Connection for Linear LED Fixtures: Operate LED module(s) continuously upon loss of normal power at a constant power output of 1200 lumens minimum. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire

- ballast.
2. Emergency Connection for Point Source LED Fixtures: Operate LED module(s) continuously upon loss of normal power at a constant power output of 900 lumens minimum. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
 3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp(s)/module(s) automatically disconnect from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 4. Test Push-Button and Indicator Light: Visible and accessible without opening luminaire or entering ceiling space.
 - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
 5. Battery: Sealed, maintenance-free, nickel-cadmium type.
 6. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
 7. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
- J. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more lamps or modules, remote mounted from luminaire.
1. Emergency Connection for Linear LED Fixtures: Operate LED module(s) continuously upon loss of normal power at a constant power output of 1200 lumens minimum. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
 2. Emergency Connection for Point Source LED Fixtures: Operate LED module(s) continuously upon loss of normal power at a constant power output of 900 lumens minimum. Connect unswitched circuit to battery-inverter unit and switched circuit to luminaire ballast.
 3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp(s)/module(s) automatically disconnect from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 4. Battery: Sealed, maintenance-free, nickel-cadmium type.
 5. Charger: Fully automatic, solid-state, constant-current type.
 6. Housing: NEMA 250, Type 1 enclosure listed for installation inside, on top of, or remote from luminaire. Remote assembly shall be located no less than half the distance

recommended by the , driver manufacturer, whichever is less.

7. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
8. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.2 EMERGENCY LIGHTING

- A. Refer to Lighting Fixture Schedule on Drawings for fixtures requiring emergency fluorescent power units.

2.3 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 1. Operating at nominal voltage: Refer to Lighting Fixture Schedule on Drawings.
 2. Lamps for AC Operation: LEDs; 50,000 hours minimum rated lamp life.
 3. Self-Powered Exit Signs (Battery Type): Internal emergency power unit.
- C. Refer to Lighting Fixture Schedule on Drawings for exit fixtures.

2.4 EMERGENCY SHUNT RELAY

- A. Manufacturers:
 1. Bodine GTD.
 2. Hubbell.
 3. Cooper.
- B. Description: NC, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.
 1. Coil Rating: 120 V.
 2. Contact Rating: 20 amps.
 3. Provide (1) relay per fixture as indicated, unless noted otherwise.

2.5 MATERIALS

A. Metal Parts:

1. Free of burrs and sharp corners and edges.
2. Sheet metal components shall be steel unless otherwise indicated.
3. Form and support to prevent warping and sagging.

B. Doors, Frames, and Other Internal Access:

1. Smooth operating, free of light leakage under operating conditions.
2. Designed to permit relamping without use of tools.
3. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

2.6 METAL FINISHES

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

- B. Paint after fabrication.

2.7 LUMINAIRE SUPPORT COMPONENTS

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Support Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for conditions affecting performance of luminaires.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Examine walls, floors, roofs, and ceilings for suitable conditions where emergency lighting luminaires will be installed.

- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
 - 1. Sized and rated for luminaire and emergency power unit weight.
 - 2. Able to maintain luminaire position when testing emergency power unit.
 - 3. Provide support for luminaire and emergency power unit without causing deflection of ceiling or wall.
 - 4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire and emergency power unit weight and vertical force of 400 percent of luminaire weight.
- E. Wall-Mounted Luminaire Support:
 - 1. Attached to structural members in walls.
 - 2. Do not attach luminaires directly to gypsum board.
- F. Suspended Luminaire Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
 - 4. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- G. Ceiling Grid Mounted Luminaires:
 - 1. Secure to any required outlet box.
 - 2. Secure emergency power unit using approved fasteners in a minimum of four locations, spaced near corners of emergency power unit.
 - 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.5 STARTUP SERVICE

- A. Perform startup service:
 - 1. Charge emergency power units and batteries minimum of one hour and depress switch to conduct short-duration test.
 - 2. Charge emergency power units and batteries minimum of 24 hours and conduct one-hour discharge test.

3.6 ADJUSTING

- A. Adjustments: Within 12 months of date of Substantial Completion, provide on-site visit to do the following:
 - 1. Inspect all luminaires. Replace lamps, emergency power units, batteries, signs, or luminaires that are defective.
 - a. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 2. Conduct short-duration tests on all emergency lighting.

END OF SECTION 265213

SECTION 270528 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal conduits and fittings.
 - 2. Nonmetallic conduits and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Nonmetallic wireways and auxiliary gutters.
 - 5. Surface pathways.
 - 6. Boxes, enclosures, and cabinets.
- B. Related Requirements:
 - 1. Division 27 Section "Communications Horizontal Cabling" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.
- D. Furnish: Supply and deliver to Project site, ready for unloading, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- E. 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.
- F. Provide: Furnish and install, complete and ready for the intended use.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. AFC Cable Systems, Inc.
 2. Allied Tube & Conduit; a Tyco International Ltd. Co.
 3. Alpha Wire Company.
 4. Anamet Electrical, Inc.
 5. Electri-Flex Company.
 6. O-Z/Gedney; a brand of EGS Electrical Group.
 7. Picoma Industries; Subsidiary of Mueller Water Products, Inc.
 8. Republic Conduit.
 9. Robroy Industries.
 10. Southwire Company.
 11. Thomas & Betts Corporation.
 12. Western Tube and Conduit Corporation.
 13. Wheatland Tube Company; a division of John Maneely Company.
- B. General Requirements for Metal Conduits and Fittings:
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Comply with TIA-569-B.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
1. Comply with NEMA RN 1.
 2. Coating Thickness: 0.040 inch, minimum.
- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 2. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Setscrew.
 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

- I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - 3. Anamet Electrical, Inc.
 - 4. Arnco Corporation.
 - 5. CANTEX Inc.
 - 6. CertainTeed Corp.
 - 7. Condux International, Inc.
 - 8. Electri-Flex Company.
 - 9. Kraloy.
 - 10. Lamson & Sessions; Carlon Electrical Products.
 - 11. Niedax-Kleinhuis USA, Inc.
 - 12. RACO; a Hubbell company.
 - 13. Thomas & Betts Corporation.
- B. General Requirements for Nonmetallic Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Comply with TIA-569-B.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. Rigid HDPE: Comply with UL 651A.
- E. Continuous HDPE: Comply with UL 651B.
- F. RTRC: Comply with UL 1684A and NEMA TC 14.
- G. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- H. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- I. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman; a Pentair company.
 - 3. Mono-Systems, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Comply with TIA-569-B.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Hinged type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Allied Moulded Products, Inc.
 - 2. Hoffman; a Pentair company.
 - 3. Lamson & Sessions; Carlon Electrical Products.
 - 4. Niedax-Kleinhuis USA, Inc.
- B. General Requirements for Nonmetallic Wireways and Auxiliary Gutters:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Comply with TIA-569-B.
- C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
- D. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

- E. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.
- F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- G. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 SURFACE PATHWAYS

- A. General Requirements for Surface Pathways:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Comply with TIA-569-B.
- B. Surface Nonmetallic Pathways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC with texture and color selected by Architect from manufacturer's standard colors. Product shall comply with UL-94 V-0 requirements for self-extinguishing characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Hubbell Incorporated; Wiring Device-Kellems Division.
 - b. Lamson & Sessions; Carlon Electrical Products.
 - c. Mono-Systems, Inc.
 - d. Panduit Corp.
 - e. Wiremold / Legrand.

2.6 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Cooper Technologies Company; Cooper Crouse-Hinds.
 - 2. Hoffman; a Pentair company.
 - 3. Hubbell Incorporated; Killark Division.
 - 4. Mono-Systems, Inc.
 - 5. Thomas & Betts Corporation.
 - 6. Wiremold / Legrand.

- B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-B.
 2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy or aluminum, Type FD, with gasketed cover.
- E. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- F. Metal Floor Boxes:
1. Material: Cast metal or sheet metal.
 2. Type: Fully adjustable.
 3. Shape: Rectangular.
 4. Listing and Labeling: Metal floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum or galvanized, cast iron with gasketed cover.
- I. Device Box Dimensions: 4 inches square by 2-1/2 inches deep.
- J. Gangable boxes are allowed.
- K. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- L. Cabinets:
1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

- A. Indoors: Apply pathway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT or RNC.
 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:
 - a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
 - d. Gymnasiums
 4. Concealed in Ceilings and Interior Walls and Partitions: EMT RNC, Type EPC-40-PVC or innerduct.
 5. Damp or Wet Locations: GRC IMC.
 6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, optical-fiber-cable pathway Plenum-type, communications-cable pathway EMT Insert pathway type.
 7. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, optical-fiber-cable pathway Riser-type, communications-cable pathway EMT Insert pathway type.
 8. Pathways for Concealed General-Purpose Distribution of Optical-Fiber or Communications Cable: General-use, optical-fiber-cable pathway Riser-type, optical-fiber-cable pathway Plenum-type, optical-fiber-cable pathway General-use, communications-cable pathway Riser-type, communications-cable pathway Plenum-type, communications-cable pathway EMT.
 9. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 4 stainless steel nonmetallic in institutional and commercial kitchens and damp or wet locations.
- B. Minimum Pathway Size: 3/4-inch trade size. Minimum size for optical-fiber cables is 1 inch.
- C. Pathway Fittings: Compatible with pathways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 3. EMT: Use setscrew, steel or cast-metal fittings. Comply with NEMA FB 2.10.
- D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- E. Install surface pathways only where indicated on Drawings.

- F. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- C. Complete pathway installation before starting conductor installation.
- D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches of changes in direction. Utilize long radius ells for all optical-fiber cables.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for pathways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.
- K. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.
- L. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.
- M. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings

in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

- O. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
- P. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.
- Q. Surface Pathways:
 - 1. Install surface pathway for surface telecommunications outlet boxes only where indicated on Drawings.
 - 2. Install surface pathway with a minimum 2-inch radius control at bend points.
 - 3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- R. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.
- S. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service pathway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.
- T. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.
- U. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F, and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F

- temperature change.
 - d. Attics: 135 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
 - V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
 - W. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
 - X. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
 - Y. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
 - Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
 - AA. Set metal floor boxes level and flush with finished floor surface.
- 3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR COMMUNICATIONS PENETRATIONS
- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 270544 "Sleeves and Sleeve Seals for Communications Pathways and Cabling."
- 3.4 FIRESTOPPING
- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."
- 3.5 PROTECTION
- A. Protect coatings, finishes, and cabinets from damage or deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by
- PATHWAYS FOR COMMUNICATIONS
SYSTEMS

- manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 270528

SECTION 271513 - COMMUNICATIONS COPPER HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Category 6 twisted pair cable.
 - 2. Twisted pair cable hardware, including plugs and jacks.
 - 3. Cabling identification products.
 - 4. Grounding provisions for twisted pair cable.
 - 5. Source quality control requirements for twisted pair cable.

1.3 DEFINITIONS

- A. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- B. EMI: Electromagnetic interference.
- C. FTP: Shielded twisted pair.
- D. F/FTP: Overall foil screened cable with foil screened twisted pair.
- E. F/UTP: Overall foil screened cable with unscreened twisted pair.
- F. IDC: Insulation displacement connector.
- G. LAN: Local area network.
- H. Jack: Also commonly called an "outlet," it is the fixed, female connector.
- I. Plug: Also commonly called a "connector," it is the removable, male telecommunications connector.
- J. RCDD: Registered Communications Distribution Designer.
- K. Screen: A metallic layer, either a foil or braid, placed around a pair or group of conductors.

- L. Shield: A metallic layer, either a foil or braid, placed around a pair or group of conductors.
- M. S/FTP: Overall braid screened cable with foil screened twisted pair.
- N. S/UTP: Overall braid screened cable with unscreened twisted pairs.
- O. UTP: Unscreened (unshielded) twisted pair.

1.4 COPPER HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols. Cabling system consists of horizontal cables, intermediate and main cross-connects, mechanical terminations, and patch cords or jumpers used for horizontal-to-horizontal cross-connection.
 - 1. TIA-568-C.1 requires that a minimum of two equipment outlets be installed for each work area.
 - 2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications equipment outlet.
 - 3. Bridged taps and splices shall not be installed in the horizontal cabling.
- B. A work area is approximately 100 sq. ft., and includes the components that extend from the equipment outlets to the station equipment.
- C. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

1.5 ACTION SUBMITTALS

- A. Product Data:
 - 1. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for equipment racks and cabinets. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Provide as a single complete system submittal with master product list referencing each paragraph in this section specifying product.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For RCDD, installation supervisor, and field inspector.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
 - 1. Contractor responsible for this Section shall have a Registered Communications Distribution Designer (RCDD) on staff who will oversee and be responsible for this Project. RCDD shall have sufficient experience in this type project so as to be able to lend adequate technical support to field forces during installation, warranty period, and extended warranty periods or maintenance contracts.
 - 2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each pair of twisted pair cable for open and short circuits.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.11 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Horizontal cabling system shall comply with transmission standards in

TIA-568-C.1, when tested according to test procedures of this standard.

- B. Telecommunications Pathways and Spaces: Comply with TIA-569-D.
- C. Grounding: Comply with TIA-607-B.

2.2 GENERAL CABLE CHARACTERISTICS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the applicable standard and NFPA 70 for the following types:
 - 1. Communications, Plenum Rated: Type CMP complying with UL 1685 or Type CMP in listed plenum communications raceway.
 - 2. Communications, Plenum Rated: Type CM, Type CMG, Type CMP, Type CMR, or Type CMX in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."
 - 3. Communications, Non-plenum: Type CMR complying with UL 1666.
 - 4. Communications, Non-plenum: Type CMP or Type CMR in listed plenum or riser communications raceway.
 - 5. Communications, Non-plenum: Type CMP or Type CMR in metallic conduit installed according to NFPA 70, Article 300.22, "Wiring in Ducts, Plenums, and Other Air-Handling Spaces."

2.3 CATEGORY 6 TWISTED PAIR CABLE

- A. Description: Four-pair, balanced-twisted pair cable, with internal spline, certified to meet transmission characteristics of Category 6 cable at frequencies up to 250MHz.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden CDT Networking Division/NORDX.
 - 2. Berk-Tek Leviton; a Nexans/Leviton alliance.
 - 3. CommScope, Inc.
 - 4. General Cable; General Cable Corporation.
 - 5. Hubbell Premise Wiring.
 - 6. Mohawk; a division of Belden Networking, Inc.
 - 7. Panduit
 - 8. Superior Essex Inc.
 - 9. SYSTIMAX Solutions; a CommScope Inc. brand.
- C. Standard: Comply with NEMA WC 66/ICEA S-116-732 and TIA-568-C.2 for Category 6 cables.
- D. Conductors: 100-ohm, 23 AWG solid copper.

- E. Shielding/Screening: Unshielded twisted pairs (UTP).
- F. Cable Rating: Plenum.
- G. Jacket: Blue thermoplastic.

2.4 TWISTED PAIR CABLE HARDWARE

- A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Belden CDT Networking Division/NORDX.
 - 2. Berk-Tek Leviton; a Nexans/Leviton alliance.
 - 3. CommScope, Inc.
 - 4. General Cable; General Cable Corporation.
 - 5. Genesis Cable Products; Honeywell International, Inc.
 - 6. Hubbell Premise Wiring.
 - 7. Leviton Manufacturing Co., Inc.
 - 8. Mohawk; a division of Belden Networking, Inc.
 - 9. Panduit Corp.
 - 10. Siemon Co. (The).
 - 11. Superior Essex Inc.
 - 12. SYSTIMAX Solutions; a CommScope Inc. brand.
- C. General Requirements for Twisted Pair Cable Hardware:
 - 1. Comply with the performance requirements of Category 6.
 - 2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
 - 3. Cables shall be terminated with connecting hardware of same category or higher.
- D. Connecting Blocks:
 - 1. 110-style IDC for Category 6.
 - 2. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.
- E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:
 - a. Universal T568A and T568B wiring labels.
 - b. Labeling areas adjacent to conductors.
 - c. Replaceable connectors.
 - d. 24 or 48 ports.
 2. Construction: 16-gauge steel and mountable on 19-inch equipment racks.
 3. Number of Jacks per Field: One for each four-pair cable indicated, plus spares and blank positions adequate to suit specified expansion criteria.
- G. Patch Cords: Factory-made, four-pair cables in 12-inch lengths at the patch panel and 10-foot lengths at the Workstation Outlet; terminated with an eight-position modular plug at each end.
1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords shall have latch guards to protect against snagging.
 2. Patch cords shall have color-coded boots for circuit identification.
 3. Provide (2) per horizontal cable installed; lengths as described above. Excessive slack at the patch panel is not acceptable. Coordinate with Architect/Owner.
- H. Plugs and Plug Assemblies:
1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
 2. Standard: Comply with TIA-568-C.2.
- I. Jacks and Jack Assemblies:
1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair, 100-ohm, unshielded or shielded twisted pair cable.
 2. Designed to snap-in to a patch panel or faceplate.
 3. Standard: Comply with TIA-568-C.2.
- J. Faceplate:
1. Two, Four, or Six port, vertical single gang faceplates designed to mount to single gang wall boxes. Faceplate port quantity determined by the number of cables to be installed per the drawings at each location. Any unused ports to be blanked off.
 2. Eight, Ten, or Twelve port, vertical double gang faceplates designed to mount to double gang wall boxes. Faceplate port quantity determined by the number of cables to be installed per the drawings at each location. Any unused ports to be blanked off.
 3. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
 4. For use with snap-in jacks accommodating any combination of twisted pair, optical fiber, and coaxial work area cords.

- a. Flush mounting jacks, positioning the cord at a 45-degree angle.

K. Legend:

- 1. Machine printed, in the field, using adhesive-tape label.
- 2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.6 GROUNDING

- A. Comply with requirements in Section 270526 "Grounding and Bonding for Communications Systems" for grounding conductors and connectors.
- B. Comply with TIA-607-B.

2.7 SOURCE QUALITY CONTROL

- A. Factory test cables on reels according to TIA-568-C.1.
- B. Factory test twisted pair cables according to TIA-568-C.2.
- C. Cable will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Wiring Method: Install cables in raceways and cable trays, except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces, attics, and gypsum board partitions where unenclosed wiring method may be used. Conceal raceway and cables, except in unfinished spaces.
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Comply with requirements for raceways and boxes specified in Section 270528 "Pathways for Communications Systems."
- B. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where

possible.

- C. Wiring within Enclosures: Bundle, lace, and train cables within enclosures. Connect to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools. Install conductors parallel with or at right angles to sides and back of enclosure.

3.2 INSTALLATION OF PATHWAYS

- A. Comply with requirements for demarcation point, cabinets, and racks specified in Section 271100 "Communications Equipment Room Fittings."
- B. Comply with Section 270528 "Pathways for Communications Systems."
- C. Comply with Section 270528.29 "Hangers and Supports for Communications Systems."
- D. Comply with Section 270536 "Cable Trays for Communications Systems."

3.3 INSTALLATION OF TWISTED-PAIR HORIZONTAL CABLES

- A. Comply with NECA 1 and NECA/BICSI 568.
- B. General Requirements for Cabling:
 - 1. Comply with TIA-568-C.0, TIA-568-C.1, and TIA-568-C.2.
 - 2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section.
 - 3. Install 110-style IDC termination hardware unless otherwise indicated.
 - 4. Do not untwist twisted pair cables more than 1/2 inch from the point of termination to maintain cable geometry.
 - 5. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 - 6. MUTOA shall not be used as a cross-connect point.
 - 7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 8. Install lacing bars to restrain cables, prevent straining connections, and prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - 9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Cable Termination Practices" Section. Use lacing bars and distribution spools.
 - 10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation, and replace it with new cable.

11. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
12. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
13. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems," "Pulling and Installing Cable" Section. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend twisted pair cabling, not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Group connecting hardware for cables into separate logical fields.

E. Separation from EMI Sources:

1. Comply with recommendations from BICSI's "Telecommunications Distribution Methods Manual" and TIA-569-D for separating unshielded copper communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways, power lines, and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5

inches.

3.4 FIRESTOPPING

- A. Comply with requirements in Section 078413 "Penetration Firestopping."
- B. Comply with TIA-569-D, Annex A, "Firestopping."
- C. Comply with "Firestopping Systems" Article in BICSI's "Telecommunications Distribution Methods Manual."

3.5 GROUNDING

- A. Install grounding according to the "Grounding, Bonding, and Electrical Protection" chapter in BICSI's "Telecommunications Distribution Methods Manual."
- B. Comply with TIA-607-B and NECA/BICSI-607.
- C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall, allowing at least a 2-inch clearance behind the grounding bus bar. Connect grounding bus bar to suitable electrical building ground, using a minimum No. 4 AWG grounding electrode conductor.
- D. Bond metallic equipment to the grounding bus bar, using not smaller than a No. 6 AWG equipment grounding conductor.

3.6 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA-606-B. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
 - 1. Administration Class: Class 2.
 - 2. Color-code cross-connect fields and apply colors to voice and data service backboards, connections, covers, and labels.
- B. Paint and label colors for equipment identification shall comply with TIA-606-B for Class 2 level of administration, including optional identification requirements of this standard.
- C. Cable Schedule: Install in a prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cabling administration-point

labeling. Identify labeling convention and show labels for telecommunications closets, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors.

E. Cable and Wire Identification:

1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
2. Each wire connected to building-mounted devices is not required to be numbered at the device if wire color is consistent with associated wire connected and numbered within panel or cabinet.
3. Label each terminal strip, and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group, extended from a panel or cabinet to a building-mounted device, with the name and number of a particular device.
 - b. Label each unit and field within distribution racks and frames.
4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and -connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

F. Labels shall be preprinted or computer-printed type, with a printing area and font color that contrast with cable jacket color but still comply with TIA-606-B requirements for the following:

1. Cables use flexible vinyl or polyester that flexes as cables are bent.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect twisted pair cabling jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test twisted pair cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test

Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

- C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similarly to Table 10.1 in BICSI's "Telecommunications Distribution Methods Manual," or shall be transferred from the instrument to the computer, saved as text files, printed, and submitted.
- D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.
- E. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION 271513

SECTION 284621 - ADDRESSABLE FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Notification appliances.
 - 2. Fire alarm wire and cable.

1.3 DEFINITIONS

- A. EMT: Electrical Metallic Tubing.
- B. FACP: Fire Alarm Control Panel.
- C. NICET: National Institute for Certification in Engineering Technologies.

1.4 ACTION SUBMITTALS

- A. Product Data, Shop Drawings, General Submittal Requirements, :
 - 1. Product Data: For each type of product, including furnished options and accessories.
 - a. Include construction details, material descriptions, dimensions, profiles, and finishes.
 - b. Include rated capacities, operating characteristics, and electrical characteristics.
 - 2. Shop Drawings: For fire-alarm system.
 - a. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - b. Include plans, elevations, sections, details, and attachments to other work.
 - c. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
 - d. Detail assembly and support requirements.

- e. Include light output settings for visual notification appliances.
- f. Include voltage drop calculations for notification-appliance circuits.
- g. Include battery-size calculations.
- h. Include input/output matrix.
- i. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
- j. Include performance parameters and installation details for each detector.
- k. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.

- l. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.

3. General Submittal Requirements:

- a. Shop Drawings shall be prepared by persons with the following qualifications:
 - 1) Trained and certified by manufacturer in fire-alarm system design.
 - 2) NICET-certified, fire-alarm technician; Level III minimum.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
 - 1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
 - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - b. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
 - c. Riser diagram.
 - d. Device addresses.
 - e. Record copy of site-specific software.
 - f. Provide "Inspection and Testing Form" according to the "Inspection, Testing and

Maintenance" chapter in NFPA 72, and include the following:

- 1) Equipment tested.
- 2) Frequency of testing of installed components.
- 3) Frequency of inspection of installed components.
- 4) Requirements and recommendations related to results of maintenance.
- 5) Manufacturer's user training manuals.

- g. Manufacturer's required maintenance related to system warranty requirements.
- h. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.7 MAINTENANCE MATERIAL SUBMITTALS

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

1. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
2. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
3. Keys and Tools: One extra set for access to locked or tamperproofed components.
4. Audible and Visual Notification Appliances: One of each type installed.
5. Fuses: Two of each type installed in the system. Provide in a box or cabinet with compartments marked with fuse types and sizes.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

B. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.9 PROJECT CONDITIONS

A. Perform a full test of the existing system prior to starting work. Document any equipment or

components not functioning as designed.

- B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
 - 1. Notify Construction Manager no fewer than seven days in advance of proposed interruption of fire-alarm service.
 - 2. Do not proceed with interruption of fire-alarm service without Construction Manager's written permission.
- C. Use of Devices during Construction: Protect devices during construction unless devices are placed in service to protect the facility during construction.

1.10 SEQUENCING AND SCHEDULING

- A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Source Limitations for Fire-Alarm System and Components: Components shall be compatible with, and operate as an extension of, existing system; Pyrotronics PXL. Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.
- B. All components provided shall be listed for use with the selected system.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances:

1. Horns may be individually addressable connected to a signaling-line circuit, or may be non-addressable connected to a notification-appliance signal circuit.
2. Horns shall be equipped for mounting as indicated, and with screw terminals for system connections.
3. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

C. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1. Rated Light Output:

- a. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

2.3 FIRE ALARM WIRE AND CABLE

A. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

B. Power-Limited Circuits: Solid-copper conductors with 300-V rated, 75 deg C, red color-coded, plenum-rated PVC insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Signal Line Circuits (SLC): Shielded No. 18-2 AWG, minimum.
2. Initiating Device Circuits (IDC): Shielded NO. 18-2 AWG, minimum.
3. Notification Appliance Circuit (NAC): Stranded No. 14-2 AWG, minimum (strobes).

Twisted-shielded No. 18-2 AWG, minimum (audible).

- C. Wiring installed underground shall have insulation rated for wet locations.
- D. Coordinate with fire alarm system manufacturer for recommended wire size and type.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
 - 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
 - 1. Devices placed in service before all other trades have completed cleanup shall be replaced.
 - 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
 - 1. Connect new equipment to existing control panel in existing part of the building.
 - 2. Connect new equipment to existing monitoring equipment at the supervising station.
 - 3. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.

- D. Audible/visible and visible-only devices: Install at +80" above finished floor to bottom of device housing. Install on flush-mounted boxes unless noted otherwise.
- E. Provide 120 volt power to all fire alarm control panels and notification appliance circuit panels as required.

3.3 FIRE ALARM WIRING INSTALLATION

A. General

- 1. Comply with NECA 1 and NFPA 72.
- 2. Cable and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
- 3. Where conduit is required, fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
- 4. Where raceways are required for the installation of fire alarm cables, use EMT. Install raceways according to Section 260533 "Raceways and Boxes for Electrical Systems."
- 5. Exposed EMT and junction shall be painted red enamel.
- 6. Fire-Rated Cables: Use of two-hour, fire-rated fire alarm cables, NFPA 70. Types MI and CI, is not permitted.

B. Wiring Method

- 1. Install all fire alarm cabling in metal raceways.

C. Wiring Method

- 1. Install plenum rated cable above ceiling only. Install cable parallel and perpendicular to surfaces or structural members, and follow surface contours. Secure and support cables by straps, staples, or similar fittings so designed at intervals not exceeding 48" and not more than 6" from every cabinet, box, or fitting.
- 2. Install cable in raceways when concealed within walls.
- 3. Install cable in raceways in all exposed locations.

- D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

- E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or

equipment enclosures where circuit connections are made.

- F. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.
- G. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.4 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
 - 1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.6 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.7 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by Architect authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 3. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 4. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 5. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- E. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 284621