



PROJECT MANUAL

FOR

CRAWFORD MEMORIAL HOSPITAL ORTHO CLINIC ADDITION AND RENOVATION

Robinson, IL

Project No: 0200707.00.00

January 15, 2021

Owner:

Crawford Memorial Hospital
1000 N Allen Street
Robinson, IL 62454

SECTION 00 0110 - TABLE OF CONTENTS

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00 0107	SEALS PAGE
00 0110	TABLE OF CONTENTS
00 0115	LIST OF DRAWING SHEETS
00 1113	ADVERTISEMENT TO BID
00 2100	INSTRUCTIONS TO BIDDERS
00 4000	PROCUREMENT FORMS AND SUPPLEMENTS
00 4100	BID FORM
00 4105	BID FORM ATTACHMENT A - NON-COLLUSION AFFIDAVIT
00 4105.06	BID FORM ATTACHMENT B - BIDDERS QUALIFICATION
00 4105.22	BID FORM ATTACHMENT C
00 4105.33	BID FORM ATTACHMENT D
00 4105.44	BID FORM ATTACHMENT E
00 4336	PROPOSED SUBCONTRACTORS FORM
00 5000	CONTRACTING FORMS AND SUPPLEMENTS
00 7200	GENERAL CONDITIONS
00 7300	SUPPLEMENTARY CONDITIONS

DIVISION 01 - GENERAL REQUIREMENTS

01 1000	SUMMARY
01 2000	PRICE AND PAYMENT PROCEDURES
01 2300	ALTERNATES
01 2500	SUBSTITUTION PROCEDURES
01 3000	ADMINISTRATIVE REQUIREMENTS
01 3310	CADD WAIVER OF LIABILITY
01 4000	QUALITY REQUIREMENTS
01 5000	TEMPORARY FACILITIES AND CONTROLS
01 6000	PRODUCT REQUIREMENTS
01 7000	EXECUTION AND CLOSEOUT REQUIREMENTS
01 7419	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
01 7800	CLOSEOUT SUBMITTALS
01 7900	DEMONSTRATION AND TRAINING

DIVISION 02 - EXISTING CONDITIONS

02 4100	DEMOLITION
---------	------------

DIVISION 03 - CONCRETE

03 0505	UNDERSLAB VAPOR BARRIER
03 1000	CONCRETE FORMING AND ACCESSORIES
03 2000	CONCRETE REINFORCING
03 3000	CAST-IN-PLACE CONCRETE

DIVISION 04 - MASONRY

04 2000	UNIT MASONRY
---------	--------------

04 7200 CAST STONE MASONRY

DIVISION 05 - METALS

05 1200 STRUCTURAL STEEL FRAMING
05 3100 STEEL DECKING
05 4000 COLD-FORMED METAL FRAMING

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 1000 ROUGH CARPENTRY
06 4100 ARCHITECTURAL WOOD CASEWORK
06 8316 FIBERGLASS REINFORCED PANELING

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 0553 FIRE AND SMOKE ASSEMBLY IDENTIFICATION
07 2100 THERMAL INSULATION
07 2119 FOAMED-IN-PLACE INSULATION
07 2400 EXTERIOR INSULATION AND FINISH SYSTEMS
07 2500 WEATHER BARRIERS
07 4213.23 METAL COMPOSITE MATERIAL WALL PANELS
07 4213.53 METAL SOFFIT PANELS
07 5423 THERMOPLASTIC-POLYOLEFIN ROOFING (TPO) - FIRESTONE
07 6200 SHEET METAL FLASHING AND TRIM
07 7100 ROOF SPECIALTIES
07 7123 MANUFACTURED GUTTERS AND DOWNSPOUTS
07 7200 ROOF ACCESSORIES
07 8100 APPLIED FIRE PROTECTION
07 8123 INTUMESCENT FIRE PROTECTION
07 8400 FIRESTOPPING
07 9200 JOINT SEALANTS
07 9513 EXPANSION JOINT COVER ASSEMBLIES

DIVISION 08 - OPENINGS

08 1113 HOLLOW METAL DOORS AND FRAMES
08 1416 FLUSH WOOD DOORS
08 3100 ACCESS DOORS AND PANELS
08 4229 AUTOMATIC ENTRANCES
08 4313 ALUMINUM-FRAMED STOREFRONTS
08 5659 SERVICE AND TELLER WINDOW UNITS
08 7100 DOOR HARDWARE
08 8000 GLAZING

DIVISION 09 - FINISHES

09 0561 COMMON WORK RESULTS FOR FLOORING PREPARATION
09 2116 GYPSUM BOARD ASSEMBLIES
09 3000 TILING
09 5100 ACOUSTICAL CEILINGS

09 6500	RESILIENT FLOORING
09 6813	TILE CARPETING
09 9113	EXTERIOR PAINTING
09 9123	INTERIOR PAINTING

DIVISION 10 - SPECIALTIES

10 1401	CODE-REQUIRED SIGNAGE
10 2600	WALL AND DOOR PROTECTION
10 2800	TOILET, BATH, AND LAUNDRY ACCESSORIES
10 4400	FIRE PROTECTION SPECIALTIES

DIVISION 12 - FURNISHINGS

12 3600	COUNTERTOPS
---------	-------------

DIVISION 21 - FIRE SUPPRESSION

21 0500	COMMON WORK RESULTS FOR FIRE SUPPRESSION
21 0513	COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT
21 0523	GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING
21 0553	IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT
21 1300	FIRE-SUPPRESSION SPRINKLER SYSTEMS
21 2200	CLEAN-AGENT FIRE-EXTINGUISHING SYSTEM

DIVISION 22 - PLUMBING

22 0519	METERS AND GAUGES FOR PLUMBING PIPING
22 0523	GENERAL-DUTY VALVES FOR PLUMBING PIPING
22 0529	HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
22 0553	IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
22 0719	PLUMBING PIPING INSULATION
22 1005	PLUMBING PIPING
22 1006	PLUMBING PIPING SPECIALTIES
22 4000	PLUMBING FIXTURES

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

23 0517	SLEEVES AND SLEEVE SEALS FOR HVAC PIPING
23 0529	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
23 0553	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
23 0593	TESTING, ADJUSTING, AND BALANCING FOR HVAC
23 0713	DUCT INSULATION
23 0719	HVAC PIPING INSULATION
23 0913	INSTRUMENTATION AND CONTROL DEVICES FOR HVAC
23 0993	SEQUENCE OF OPERATIONS FOR HVAC CONTROLS
23 3100	HVAC DUCTS AND CASINGS
23 3300	AIR DUCT ACCESSORIES
23 3700	AIR OUTLETS AND INLETS
23 8216	AIR COILS

DIVISION 26 - ELECTRICAL

26 0010	BASIC ELECTRICAL REQUIREMENTS
26 0505	SELECTIVE DEMOLITION FOR ELECTRICAL
26 0519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 0526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
26 0529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
26 0533.13	CONDUIT FOR ELECTRICAL SYSTEMS
26 0533.16	BOXES
26 0553	IDENTIFICATION FOR ELECTRICAL SYSTEMS
26 0800	ELECTRICAL COMMISSIONING REQUIREMENTS
26 0923	LIGHTING CONTROL DEVICES
26 2726	WIRING DEVICES
26 5100	INTERIOR LIGHTING

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

28 4600	FIRE DETECTION AND ALARM
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END OF SECTION

Column1	Column2	Column3
SECTION 00 0115 - LIST OF DRAWINGS		
GENERAL		
	G0.1	GENERAL INFORMATION
	LS1.1	FIRST FLOOR LIFE SAFETY PLAN
CIVIL		
	C0.1	GENERAL NOTES AND LEGENDS
	C1.0	EXISTING CONDITIONS & DEMOLITION AND REMOVALS PLAN
	C2.0	SITE PLAN
	C3.0	GRADING AND EROSION CONTROL PLAN
STRUCTURAL		
	S0.1	GENERAL INFORMATION
	S0.2	GENERAL INFORMATION
	S1.1	FOUNDATION PLAN
	S2.1	ROOF FRAMING PLAN
	S3.1	FOUNDATION DETAILS
	S4.1	STEEL FRAMING DETAILS
	S5.1	COLUMN SCHEDULE AND BASE PLATES
ARCHITECTURAL		
	AD1.1	FIRST FLOOR DEMOLITION PLAN
	AD9.1	FIRST FLOOR REFLECTED CEILING DEMOLITION PLAN
	A1.1	FIRST FLOOR PLAN
	A2.1	ROOF PLAN
	A2.2	ROOF DETAILS - PARAPETS
	A2.3	ROOF DETAILS - PARAPETS
	A2.4	ENLARGED VESTIBULE PARAPET SECTIONS & CANOPY DETAILS
	A2.5	TYPICAL MEMBRANE ROOF DETAILS
	A3.1	EXTERIOR ELEVATIONS
	A4.1	BUILDING SECTIONS
	A5.1	WALL SECTIONS
	A5.2	EXTERIOR DETAILS - BRICK/MTL STUD
	A7.1	PARTITION TYPES
	A7.12	INTERIOR DETAIL - COLUMN WRAPS
	A7.13	INTERIOR DETAIL - COLUMN WRAPS
	A7.21	DOOR SCHEDULE, ELEVATIONS AND DETAILS
	A7.22	DOOR DETAILS BRICK/MTL STUD & OPENING DETAILS MASONRY VENEER
	A7.31	WINDOW DETAILS
	A8.21	ENLARGED REGISTRATION, CLERICAL, AND LOUNGE PLANS AND ELEVATIONS
	A8.22	ENLARGED INJECTION, EXAM, AND CAST PLANS AND ELEVATIONS
	A8.23	INTERNAL ELEVATIONS - WAITING ROOM
	A8.33	TYPICAL CASEWORK DETAILS
	A9.1	FIRST FLOOR REFLECTED CEILING PLAN
	A9.2	CEILING DETAILS
	A10.1	VIEWS
INTERIORS		
	I0.1	GENERAL INFORMATION
	I0.2	GENERAL INFORMATION & INTERIOR FINISH DETAILS
	I1.1	FIRST FLOOR FINISH PLAN
	I8.1	ENLARGED FINISH PLANS & INTERIOR FINISH ELEVATIONS

FIRE PROTECTION		
F0.1	GENERAL INFORMATION	
FD1.1	FIRST FLOOR FIRE PROTECTION DEMOLITION PLAN	
F1.1	FIRST FLOOR FIRE PROTECTION PLAN	
PLUMBING		
P0.1	GENERAL INFORMATION	
PD1.0	UNDERSLAB PLUMBING DEMOLITION PLAN	
PD1.1	FIRST FLOOR PLUMBING DEMOLITION PLAN	
P1.0	UNDERSLAB PLUMBING PLAN	
P1.1	FIRST FLOOR PLUMBING PLAN	
P5.1	DIAGRAMS AND SCHEDULES	
MECHANICAL		
M0.1	GENERAL INFORMATION	
MD1.1	FIRST FLOOR MECHANICAL DEMOLITION PLAN	
MD1.2	ROOF MECHANICAL DEMOLITION PLAN	
M1.1	FIRST FLOOR VENTILATION PLAN	
M1.2	ROOF MECHANICAL PLAN	
M2.1	FIRST FLOOR HYDRONIC PLAN	
M3.1	DETAIL VIEWS	
ELECTRICAL		
E0.1	GENERAL INFORMATION	
E0.2	GENERAL INFORMATION	
ED1.1	FIRST FLOOR ELECTRICAL DEMOLITION PLAN	
E1.1	FIRST FLOOR LIGHTING PLAN	
E2.1	FIRST FLOOR POWER PLAN	
E3.1	FIRST FLOOR SYSTEMS PLAN	
E5.1	SCHEDULES	
E6.1	DETAILS	

END OF SECTION

SECTION 00 1113 - ADVERTISEMENT TO BID

Crawford Memorial Hospital Board is inviting sealed Bid Proposals from invited and qualified parties for an Orthopedic Clinic Addition and Renovation project, located at 1000 N. Allen Street, Robinson, Illinois 62454.

This project consists of construction of a new entry and corridor addition of 2,000 building gross square feet, single story, slab on grade as well as associated site development and 6,200 square feet of renovations within the existing hospital building. This work shall include all labor, supervision, materials, transportation and services necessary and required to perform the Health and Education Building project as set forth in the Contract Documents.

Sealed Bids will be received by **Livingston County** until the date and time listed below.

Pre-Bid Date: 01/27/2021 unless determined otherwise; attendance is encouraged but not mandatory.

Pre-Bid Time: 1:00 PM

Pre-Bid Location: Project site

Bid Date: 02-08-2021

Bid Time: 2:00 PM

Bid Location: 1000 N. Allen Street, Robinson, IL

Bid security shall be submitted with each bid in the amount of five (5) percent of the bid amount. No bids may be withdrawn for a period of 60 days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

All requests for information (RFI) shall be submitted to Farnsworth Group in writing. The project team will maintain a record of RFI's. Written response to RFI's will be provided by Farnsworth Group and shared with all plan holders.

Online procurement and contracting documents: documents will be available online through an electronic bid site managed by Farnsworth Group, Inc. Obtain access after 01-18-2021, by visiting www.f-w.com and clicking on the project bid list link at the bottom of the page or by contacting Farnsworth Group, Inc. Online access will be provided to all registered bidders during the bidding process. A separate ftp site will be made available to the successful bidder for the duration of construction.

Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work. A Performance Bond, separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.

The Owner requires all contractors and vendors doing business with the Owner not to discriminate against anyone on the basis of race, age, color, religion, gender, sexual orientation, ancestry, non job-related handicaps or national origin.

Crawford Memorial Hospital reserves the right to accept or reject any and all bids, and to waive any and all informalities in the bidding. After receipt of bids and completion of the review process, Crawford Memorial Hospital may award a contract to the bidder that, in its opinion, will provide a combination of the best services and reasonable cost.

Bids will be held good for a period of sixty (60) calendar days subsequent to the opening of bids.

Bidders are required to submit certifications of compliance with Non-Collusion, Eligibility to Enter into Public Contracts, Sexual Harassment Policy, Drug Free Workplace, Prevailing Wages and Bidder's Qualifications with their bid.

END OF SECTION

SECTION 00 2100 - INSTRUCTIONS TO BIDDERS

1.1. GENERAL

- A. Summary of Work: Type of Bid: Bids shall be on a stipulated sum basis.
- 1) The Crawford Memorial Hospital Board seeks bids for all material, labor and equipment necessary to complete the Work associated with construction of an Orthopedic Clinic Addition and Renovation project and associated site development.
 - a. The Work includes General, MEP and Site trades for new building and site development as shown on the Contract Documents.
- B. Time and Location for Opening of Bids:
- 1) Bid Date and Time: 02-08-2021, 2:00 PM.
 - 2) Bid Location: Crawford Memorial Hospital, CMH Administration, 1000 N. Allen Street, Robinson, IL
- C. Examination and Procurement of Documents: Documents will be available online through an electronic bid site managed by Farnsworth Group, Inc. Obtain access after 01-18-2021, by visiting www.f-w.com and clicking on the Project Bid List Link at the bottom of the page or by contacting Farnsworth Group, Inc. Online access will be provided to all registered bidders during the bidding process. A separate FTP site will be made available to the successful bidder for the duration of construction.
- D. Bidders will be required to provide Bid security in the form of a Bid Bond in the amount of five percent (5%) percent of the Bid.
- E. Bidders will be required to provide a Performance and Payment Bond in the amount of not less than one hundred percent (100%) of the Contract as awarded.
- F. Interpretations of Addenda
- 1) No oral interpretation will be made to any Bidder as to the meaning of the Bidding Documents or any part thereof.
 - 2) Requests for interpretations shall be made in writing to the Architect.
 - 3) Contact : Farnsworth Group, Inc.
 - a. Annapoorna Halepatali ahalepatali@f-w.com, 200 West College Ave, Suite 301 Normal, IL 61761
 - 4) Inquiries received seven (7) or more days or more business days prior to the date fixed for opening of bids will be given consideration.
 - 5) Changes to the Bidding Documents will be in the form of an Addendum to the Bidding Documents, and when issued, will be on file in the office of the Architect upon issuance.
 - 6) Addenda will be distributed to each registered plan holder holding Bidding Documents by means of the electronic bid site maintained by Farnsworth Group, Inc. It shall be the Bidders' responsibility to make inquiry as to the Addenda issued and provide distribution of Addenda to all Subcontractors and Suppliers not registered through the electronic bid site.
 - 7) Addenda shall become part of the Contract and all Bidders shall be bound by such Addenda, whether or not received by the Bidders.

G. Inspection of Site and Documents

- 1) Bidder shall visit the site of the proposed work and fully acquaint himself/herself with the existing conditions there relating to construction and labor, and should fully inform himself/herself as to the facilities involved, the difficulties and restrictions attending the performance of the Contract.
 - 2) The Bidder shall thoroughly examine and familiarize himself/herself with the Drawings, Technical Specifications and all other Bidding Documents.
 - 3) The Contractor by the execution of the Contract shall in no way be relieved of any obligation under it due to his/her failure to receive or examine any form or legal instrument or to visit the site and acquaint himself/herself with the existing conditions, and the Owner will be justified in rejecting any claim based on facts regarding which the contractor should have noticed as a result thereof.
 - 4) A Prebid Meeting is scheduled for 01/27/2021 unless determined otherwise.
- a. The Prebid meeting will be held at the 1:00 PM at Project site.

H. Bids

- 1) Scheduled Completion Dates: Owner has provided the required Substantial Completion Date on the Bid Form. Bidder shall state a stipulated sum amount for performance of the work in accordance with these schedule dates.
- a. Substantial Completion of the project shall be by 07/30/2021.
- 2) Each bidder shall include in his/her bid the following information:
- a. Principals
- 1) Names
- b. Firm
- 1) Name
 - 2) Treasury Number
 - 3) Address (City, State, Zip Code and Telephone Numbers)
- c. Supplementary Information: In addition to Bidder's Qualifications documentation required in this Section, provide information demonstrating compliance with the following:
- 1) Bonding Capacity - The Contractor must be capable of providing bonding for the value of the contract from a bond company licensed in the State of Illinois and having an AM Best Rating of A VII or better..
 - 2) 5 years minimum U.S. experience in building contracts.
 - 3) Contractors bidding the work shall their own place of business, equipment, staff, manpower, etc., required for the type of work they are licensed to perform.
 - 4) Contractors bidding the project shall have successfully completed similar size and scope projects during the last 5 years.
 - 5) A list of references and past projects shall be submitted with the bid.
 - 6) Contractors bidding the work shall be able to meet necessary insurance limits required by the Contract Documents. The insurance company shall be acceptable to the Owner. See Supplementary Conditions section for applicable insurance coverage and required monetary limits. Failure to provide proper Certificate of Insurance will result in a breach of contract and payment for completed work.

- 7) The successful Contractor shall submit to the Owner a list of his subcontractors not listed in Section 00 4336 for review and approval by the Owner within 3 days after being notified that his bid has been accepted.
- 3) Bidder shall attach a preliminary bar chart construction schedule coordinated with time frames indicated on his/her bid form. Include any additional time for construction beyond the date of substantial completion if needed.
- 4) The Owner reserves the right to require all or part of any remaining Work not completed by date designated for Substantial Completion to be performed after normal business hours or on other than normal working days at no "extra" or additional cost to Owner and with no extension of time.
- 5) Bids must be submitted on forms supplied by the Architect. All shall be properly signed and seal affixed. Bids must be regular in every respect and no interlineations, excisions or special conditions shall be made or included in the Bid Form by the Bidder except as stated above. The Contractor shall submit two copies of the completed Bid Form and retain one copy for his/her records.
- 6) Bid Proposal Documents, including the Bid Form, shall be enclosed in an envelope which shall be sealed and clearly labeled with words "0200707.00", name of Bidder, and date and time of Bid Opening.
- 7) Due to current issues with respect to COVID-19, Bidders may submit Bid Proposals in PDF form via email to the Architect, attention David Burnison, dburnison@f-w.com.
- 8) The Owner may consider as irregular any Bid on which there is an alteration of or departure from the Bid Form provided herein, and at his/her option may reject same.
- 9) Corrections, erasures or other changes in the Bid Proposal Documents must be explained or noted over the signature of the Bidder.
- 10) Bids received prior to the advertised hour of opening will be securely kept sealed. The officer whose duty it is to open them will decide when the specified time has arrived. No Bid received thereafter will be considered.
- 11) Opening Of Bids
 - a. At the time and place fixed for the opening of Bids, the Owner will cause to be opened every Bid received within the time set for receiving Bids, irrespective of any irregularities therein.
 - b. The Owner will take the Bids into consideration and will subsequently determine recommendations to the Board for their action.
- 12) Withdrawal Of Bids
 - a. Bids may be withdrawn on written or telegraphic request dispatched by the Bidder in time for delivery in the normal course of business to the time fixed for opening; provided that written confirmation of any telegraphic withdrawal over the signature of the Bidder is placed in the mail and postmarked prior to the time set for Bid opening. The Bid guarantee of any Bidder withdrawing his Bid in accordance with the foregoing conditions will be returned promptly.

I. Substitutions

- 1) Each Bidder represents that his/her Bid is based upon the materials and equipment described in the Bidding Documents.
- 2) No Substitution will be considered unless request has been submitted to the Architect for approval at least seven (7) days prior to the date of receipt of Bids. Substitution requests shall be written and accompanied by adequate technical and cost data.

- 3) Requests shall include a complete description of the proposed Substitution, name of the material or equipment for which it is to be substituted, drawings, cuts, performance and test data, and any other data or information necessary for a complete evaluation by the Architect.
- 4) If the Architect approves any proposed Substitution, such approval will be set forth in an Addendum not less than three (3) days prior to the date for receipt of Bids.

J. Award of Contract: Rejection of Bids

- 1) The Contract, if awarded, will be awarded to the qualified, responsible Bidder submitting the lowest combination of "Base Bid" for the Work; plus any acceptable Alternates, complying with the conditions of the Bidding Documents, within the Owner's Budget.
- 2) The Contract shall be deemed to have been awarded when notice of an award shall have been given to the Bidder by some officer or agent of the Owner. The Bidder to whom the awards are made will be notified at the earliest possible date.
- 3) The Owner reserves the right to consider as unqualified to do the work of general construction any Bidder who does not habitually perform with his own forces the major portions of the work involved in construction of Work involved in this Contract.
- 4) The Owner, however, reserves the right to reject any and all Bids and to waive any informality in Bids received whenever such action(s) will serve the Owner's best interest.

K. Bids for Base Bids will be held good for a period of sixty (60) calendar days days and Alternates will be held good for a period of sixty (60) calendar days days subsequent to the opening of Bids.

L. Use and Clarification of Drawings and Specifications

- 1) All Drawings and Specifications for the work are the property of Owner and are intended solely for use in the work contemplated in such Drawings and Specifications.
- 2) If there are any discrepancies in, or omissions from, the Drawings or Specifications, or if the Bidder is in doubt as to the true meaning of any part of the Bidding Documents, he/she shall request clarification from Architect. Such request must be in writing and shall be made not less than seven (7) or more days working days prior to the time scheduled for the termination of Bidding. Interpretations in response to inquiries from any Bidder, or any clarification or corrections issued, will be mailed to each Bidder. If the Bidder fails to request clarification regarding methods of performing work or the material required, his/her proposal shall be deemed to include the method requiring the greater quantity of work or material or upon the material of greatest cost indicated.

M. Execution of Agreement; Submittal of Performance and Payment Bonds and Certificate of Insurance

- 1) Subsequent to the award and within ten (10) days after the prescribed forms are prepared and presented for signature by the Architect, the successful Contractor shall execute and return to the Architect, an Agreement in the form referenced in the Contract Documents in such number of copies as the Owner may require. The submittal shall include required certificates of insurance forms/insurance policies, performance and payment bonds, and data requested by Owner for Owner's insurance. These submittals shall be complete prior to initiation of on-site work.
- 2) Contractor shall furnish Performance and Payment Bonds in penal sum equal to the contract. The bond premium is to be included in the Stipulated Sum Bid. Contractor represents that this Proposal does include all costs of such bonds.

- 3) Bidders should note that this Project Manual consists of all pages listed in the Table of Contents. Upon notification, the Architect will furnish any pages missing from the Project Manual, or from the Drawings as printed.
- 4) If the Bidder to whom the award is made shall fail to enter into a contract for the performance of the Work or furnish the Performance and Payment Bonds and the required certificates within ten (10) days, he/she shall forfeit his/her claim to the Work and the amount represented by the Bid Security accompanying his/her Proposal shall become the property of the Owner as the agreed and liquidated amount of damages caused by such failure.

N. Pre-Construction Conference

- 1) A "Pre-Construction" Conference will be scheduled shortly after the issuance of the "Notice to Proceed", to establish lines of communication, review schedules, and establish guidelines for execution of the work. This meeting is to be attended by the Contractor, any Subcontractors, the Owner, and the Architect.

O. Bidder's Responsibility for Condition of Work

- 1) The Bidder shall, before submitting his/her Proposal, be held to have examined the premises, so as to compare them with the Drawings and Specifications, and to have satisfied himself/herself as to the existing conditions of the premises and limitations under which the work will have to be executed. No allowance shall subsequently be made on behalf of the Bidder by reason of any error or neglect on his/her part for having failed to follow the instruction here given.
- 2) The Bidder shall be held to have carefully read the Instructions to Bidders, the General Conditions, the Specifications for his/her work and other branches of the work to the end that he/she may be fully informed not only as to the work he/she is to perform, but also know about the work that will be required to be done by all Subcontractors.

P. Contract Information:

- 1) Refer to Item G.1 above for completion date information.
- 2) Bids for Base Bids will be held good for a period of sixty (60) calendar days and Alternates will be held good for a period of sixty (60) calendar days subsequent to the opening of Bids.
- 3) If Contractor does not complete work by date designated Substantial Completion, Owner may require that all or part of any remaining Work to be performed after building leaser's/user's normal business hours or on other than normal working days at no "extra" or additional cost to Owner and with no extension of time.

Q. Sales Tax

- 1) Owner is a tax exempt organization and Contractor will be permitted to use Owner's tax exempt number for this project.

R. Building Permits

- 1) The Owner shall provide the Building and other required Permits for the project as may be required by government and quasi-governmental entities with jurisdiction. Contractor shall obtain the permits.

S. Payment

- 1) Owner will make partial payments as the work progresses, if found satisfactory by Architect. Contractor may submit to Owner, not more than once a month, a partial

payment invoice, using the form designated in Section 00 6100, setting forth the value, based on the prices in this Proposal, of labor, materials and supplies furnished and incorporated in the work to the satisfaction of Owner's Liaison and Architect and of materials suitably stored on the site at the date of such submission.

T. Execution of Agreement: Performance and Payment Bond

- 1) Subsequent to the award and within ten (10) days after the prescribed forms are presented for signature, the successful Bidder shall execute and deliver to the Owner an Agreement in the form included in the Contract Documents in such number of copies as the Owner may require.
- 2) Having satisfied all conditions of award as set forth elsewhere in these documents, the successful Bidder shall, within the period specified in paragraph "a" above, furnish a surety bond in a penal sum not less than the amount of the Contract as awarded, as security for the faithful performance of the Contract, and for the payment of all persons, firms or corporations to whom the Contractor may become legally indebted for labor, materials, tools, equipment, or services of any nature including utility and transportation services, employed or used by him in performing the work. Such bond shall be in the same form as that included in the Contract Documents and shall bear the same date as, or a date subsequent to that of the Agreement. The current power of attorney for the person who signs for any surety company shall be attached to such bond. This bond shall be signed by a guaranty or surety company listed in the latest issue of the U.S. Treasury Circular 570.

U. Non-Collusion Affidavit

- 1) The Contractor is required to execute the Non-Collusion Affidavit included in this package as Bid Form Attachment A. The executed Non-Collusion Affidavit is to be included with the Contractor's bid. Failure to execute and include the Non-Collusion Affidavit with the Contractor's bid may deem the Contractor's proposal non-responsive.

V. Bidder's Qualifications

- 1) Contractors submitting bids for this project are required to execute the Bidder's Qualifications document included in this package as Bid Form Attachment B to document their experience record in constructing the types of additions and renovations as required for this Project. The executed document is to be included with the Contractor's bid. Failure to execute and include the document with the Contractor's bid may deem the Contractor's proposal non-responsive.
- 2) The Owner shall have the right to reject any Bid where an investigation of the available information does not satisfy the Owner that the Bidder is qualified to carry out properly the terms of the Contract.

W. Certificate of Sexual Harassment Policy

- 1) The Contractor is required to execute the Certificate of Sexual Harassment Policy included in this package as Bid Form Attachment C. The executed Certificate is to be included with the Contractor's bid. Failure to execute and include the Certificate with the Contractor's bid may deem the Contractor's proposal non-responsive.

X. Drug Free Workplace Certification

- 1) The Contractor is required to execute the Drug Free Workplace Certification included in this package as Bid Form Attachment D. The executed Certificate is to be included with the Contractor's bid. Failure to execute and include the Certificate with the Contractor's bid may deem the Contractor's proposal non-responsive.

Y. Prevailing Wage Rate Certification

- 1) The Contractor is required to execute the Prevailing Wage Rate Certification included in this package as Bid Form Attachment E. The executed Certificate is to be included with the Contractor's bid. Failure to execute and include the Certificate with the Contractor's bid may deem the Contractor's proposal non-responsive.

Z. Equal Employment Opportunity

- 1) See Section 00 7300.

AA. Insurance Requirements

- 1) See Section 00 7300.

END OF SECTION

SECTION 00 4000 - PROCUREMENT FORMS AND SUPPLEMENTS

PART 1 GENERAL

- 1.1. Contractor is responsible for obtaining a valid license to use all copyrighted documents specified but not included in the Project Manual.
- 1.2. FORMS
 - A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the procurement requirements.
 - B. Instructions to Bidders: Section 002100 - Instructions to Bidders
 - C. Substitution Request Form (During Procurement): CSI Form 1.5C - Substitution Request (During Bidding/Negotiating Stage).
 - D. Bid Form: Section 00 4100 - Bid Form and associated Attachments.
 - E. Procurement Form Supplements:
 - 1) Bid Security Form: AIA A310.
 - 2) Substitution Request Form (for substitutions requested with bid): CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage).
 - 3) Proposed Schedule of Values Form: AIA G703.
 - F. Representations and Certifications:
 - 1) Bidder's Qualifications: AIA A305.
- 1.3. REFERENCE STANDARDS
 - A. AIA A305 - Contractor's Qualification Statement; 1986.
 - B. AIA A310 - Bid Bond; 2010.
 - C. AIA G703 - Continuation Sheet; 1992.
 - D. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 4100 - BID FORM

THE PROJECT AND THE PARTIES

1.1. TO:

- A. Crawford Memorial Hospital (Owner)
1. 1000 N. Allen Street, Robinson, Illinois, 62454

1.2. FOR:

- A. Project: Crawford Memorial Hospital Ortho Clinic Addition and Renovation
1000 N. Allen Street
Robinson, Illinois 62454

1.3. DATE: _____ (Bidder to enter date)

1.4. SUBMITTED BY: (Bidder to enter name and address)

- A. Bidder's Full Name _____
1. Address _____
2. City, State, Zip _____

1.5. OFFER

- A. The Undersigned, having received and examined the Bidding Documents titled, "0200707.00 - Orthopedic Clinic Addition and Renovation" dated 01-18-2021, and having visited the site and examined the conditions affecting the Work, we hereby proposes and agrees to furnish all labor, materials, equipment, appliances and services, and to perform operations necessary to complete the Work as required by said Bidding Documents, for the Work identified below.
- B. Base Bid: _____ dollars
(\$ _____), in lawful money of the United States of America.
- C. Alternate No. 1 Bid: _____ dollars
(\$ _____), in lawful money of the United States of America.
- D. Alternate No. 2 Bid: _____ dollars
(\$ _____), in lawful money of the United States of America.
- E. Alternate No. 3 Bid: _____ dollars
(\$ _____), in lawful money of the United States of America.

1.6. ACKNOWLEDGEMENTS

- A. The Undersigned acknowledges the following:
1. Receipt of complete set of bidding documents and understands the meaning of their content and shall willingly comply with the guidelines set forth in those documents.
 2. Receipt of Addenda numbers _____.
 3. Bid Guarantee/Bond executed by the Bidder, equal to five percent (5%) percent of bid amount, is attached to completed bid form.
 4. Non-Collusion Affidavit (attachment A) is completed and attached to completed bid form.
 5. Bidder's Qualifications (attachment B) is completed and attached to completed bid form.
 6. Certification of compliance with Sexual Harassment Policy (attachment C) is completed and attached to completed bid form.

7. Drug Free Workplace Certification (attachment D) is completed and attached to completed bid form.
8. Certification of compliance with Prevailing Wage Rates (attachment E) is completed and attached to completed bid form.
9. Costs and premiums for all associated bonds Performance Bond and Payment Bond, insurance, all permits and fees are included in the bid amount.
10. Bids for Base Bid will be held good for a period of sixty (60) calendar days and Alternates will be held good for a period of sixty (60) calendar days subsequent to the opening of Bids.
11. The undersigned agrees to comply with Owner's and building leaser's policies:
 - a. Comply with the Illinois Drug Free Workplace Act,
 - b. Comply with the Illinois Prevailing Wage Act, 820 IL CS 130/1 et seq. and use Wage Determination as determined by the Illinois Department of Labor, Conciliation, and Mediation Division,
 - c. Comply with Public Works Employment Discrimination Act (775 ILCS 10/001 and 775 ILCS 5/2-105(A), (1), (2), (3), (4)).

1.7. CONTRACT TIME

- A. If the Undersigned receives written notification of acceptance of this Proposal within fifteen (15) days after the Bid Opening Date he agrees to execute a Contract for the Work described in the Bidding Documents for the compensation identified in the Bidding Documents for the compensation identified in this proposal and to guarantee substantial completion of the Work no later than July 30, 2021.

1.8. BID FORM SIGNATURE(S)

- A. The Corporate Seal of
- B. _____
- C. was hereunto affixed in the presence of:
- D. _____
- E. (Authorized signing officer, Title)
- F. (Seal)
- G. _____
- H. (Authorized signing officer, Title)

END OF BID FORM

SECTION 00 4105 - BID FORM ATTACHMENT A - NON-COLLUSION AFFIDAVIT

(COMPLETE AND SUBMIT WITH BID)

STATE OF _____)

COUNTY OF _____)

_____ being duly sworn, says that he/she is
_____ OF _____,

(Sole owner, member of firm, corporate official)

(Individual, firm or corporate name)

which has by the enactment of this document affirmed that he/she, in the preparation of the bid estimates, has not entered into any verbal and/or written agreement with any of the other bidders or their agents for the specific purpose of fixing bid estimates to benefit him/her-self or the firm he/she represents.

Certification: The Undersigned Bidder certifies that it has not been convicted of bribery or attempting to bribe an officer or employee of the State of Illinois, or any unit of government in the State of Illinois, nor has the Bidder made an admission of guilt of such conduct which is a matter of record, nor has an official, agent, or employee of the Bidder committed bribery or attempted bribery on behalf of the Bidder and pursuant to the direction or authorization of a responsible official of the Bidder. The Undersigned Bidder further certifies that it is not barred from bidding on this contract as a result of a conviction for the violation of state laws prohibiting bid-rigging or bid-rotating.

Signature _____

Subscribed and sworn to me this ____ DAY OF _____ A.D. _____.

_____ (seal)

END OF SECTION

SECTION 00 4105.06 - BID FORM ATTACHMENT B - BIDDERS QUALIFICATION

(COMPLETE AND SUBMIT WITH BID)

1.1. How many years has your organization been in business under its present business name?

1.2. What type of organization is your Company (i.e. corporation, partnership, individually owned)?

1.3. On separate sheet, describe Bidder's experience record in constructing the type of additions and renovations embraced in this contract.

1.4. On separate sheet, describe Bidder's organization and equipment available for the work involved in this contract.

1.5. Supplementary Information: Provide information on 5 most recent projects of similar budget and scope including the following:

A. Project 1:

1. Project Name _____

2. Project Completion Date _____

3. Contract amount at award _____

4. Total Change Order amount _____

5. Owner Contact Information _____

B. Project 2:

1. Project Name _____

2. Project Completion Date _____

3. Contract amount at award _____

4. Total Change Order amount _____

5. Owner Contact Information _____

C. Project 3:

1. Project Name _____

2. Project Completion Date _____

3. Contract amount at award _____

4. Total Change Order amount _____

5. Owner Contact Information _____

D. Project 4:

1. Project Name _____

2. Project Completion Date _____

3. Contract amount at award _____

4. Total Change Order amount _____

5. Owner Contact Information _____

E. Project 5:

-
1. Project Name _____
 2. Project Completion Date _____
 3. Contract amount at award _____
 4. Total Change Order amount _____
 5. Owner Contact Information _____

1.6. Signature _____

END OF SECTION

SECTION 00 4105.22 - BID FORM ATTACHMENT C

CERTIFICATE OF COMPLIANCE WITH SEXUAL HARASSMENT POLICY

(COMPLETE AND SUBMIT WITH BID)

STATE OF _____)

COUNTY OF _____)

_____ being duly sworn, says that
he/she is

_____ OF

(Sole owner, member of firm, corporate official)
name)

(Individual, firm or corporate

Certification: The Undersigned Bidder certifies that this company is in compliance with the County's
Sexual Harassment Policy.

Signature _____

Subscribed and sworn to me this ____ DAY OF _____ A.D. ____.

_____ (seal)

END OF SECTION

SECTION 00 4105.33 - BID FORM ATTACHMENT D

DRUG FREE WORKPLACE CERTIFICATION

(COMPLETE AND SUBMIT WITH BID)

STATE OF _____)

COUNTY OF _____)

_____ being duly sworn, says that
he/she is

_____ OF

Certification: The Undersigned Bidder certifies that his company is in compliance with Drug Free Workplace requirements in the State of Illinois.

Signature _____

Subscribed and sworn to me this ____ DAY OF _____ A.D. ____.

_____ (seal)

END OF SECTION

SECTION 00 4105.44 - BID FORM ATTACHMENT E

CERTIFICATION OF PREVAILING WAGE RATES

(COMPLETE AND SUBMIT WITH BID)

STATE OF _____)

COUNTY OF _____)

_____ being duly sworn, says that
he/she is

_____ OF

(Sole owner, member of firm, corporate official)
name)

(Individual, firm or corporate

Certification: The Undersigned Bidder certifies that his bid complies with Prevailing Wage Rate
requirements for Crawford County, Illinois.

Signature _____

Subscribed and sworn to me this ____ DAY OF _____ A.D. ____.

_____ (seal)

END OF SECTION

SECTION 00 4336 - PROPOSED SUBCONTRACTORS FORM

PARTICULARS

- 1.1. Herewith is the list of Subcontractors referenced in the bid submitted by:
- 1.2. (Bidder) _____
- 1.3. TO (Owner): Crawford Memorial Hospital
- 1.4. Dated _____ and which is an integral part of the Bid Form.
- 1.5. The following work will be performed (or provided) by Subcontractors and coordinated by us:

LIST OF SUBCONTRACTORS

WORK SUBJECT SUBCONTRACTOR NAME

- | | | |
|----|-----------------|-------|
| A. | Concrete | _____ |
| B. | Masonry | _____ |
| C. | Roofing | _____ |
| D. | Fire Protection | _____ |
| E. | Plumbing | _____ |
| F. | HVAC | _____ |
| G. | Electrical | _____ |
| H. | | _____ |
| I. | | _____ |
| J. | | _____ |

END OF SECTION

SECTION 00 5000 - CONTRACTING FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.1. AGREEMENT AND CONDITIONS OF THE CONTRACT

- A. The Agreement is based on AIA A101-2017.
- B. The General Conditions are based on AIA A201-2007.
- C. The General Conditions are based on AIA A201-2017 as modified under Section 00 7300 - Supplementary Conditions.

1.2. FORMS

- A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in Contract Documents.
- B. Bond Forms:
 - 1. Bid Bond Form: AIA A310.
 - 2. Performance and Payment Bond Form: AIA A312.
- C. Post-Award Certificates and Other Forms:
 - 1. Certificate of Insurance Form: ACORD Certificate of Insurance 25.
 - 2. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).
 - 3. Consent of Surety to Reduction of Retainage Form: G707A.
- D. Clarification and Modification Forms:
 - 1. Architect's Supplemental Instructions Form: AIA G710.
 - 2. Construction Change Directive Form: AIA G714.
 - 3. Change Order Form: AIA G701.
- E. Closeout Forms:
 - 1. Certificate of Substantial Completion Form: AIA G704.

1.3. REFERENCE STANDARDS

- A. AIA A101-2017 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum; 2017.
- B. AIA A201 - General Conditions of the Contract for Construction; 2017.
- C. AIA A310 - Bid Bond; 2010.
- D. AIA A312 - Performance Bond and Payment Bond; 2010.
- E. AIA G701 - Change Order; 2001.
- F. AIA G702 - Application and Certificate for Payment; 1992.
- G. AIA G703 - Continuation Sheet; 1992.
- H. AIA G704 - Certificate of Substantial Completion; 2000.
- I. AIA G710 - Architect's Supplemental Instructions; 1992.
- J. AIA G714 - Construction Change Directive; 2007.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 7200 - GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

- 1.1. The General Conditions applicable to this contract is attached following this page.

RELATED REQUIREMENTS

- 2.1. SECTION 00 7300 - Supplementary Conditions.

SUPPLEMENTARY CONDITIONS

- 3.1. REFER TO DOCUMENT 00 7300 - Supplementary Conditions FOR AMENDMENTS TO THESE GENERAL CONDITIONS.

END OF SECTION

SECTION 00 7300 - SUPPLEMENTARY CONDITIONS

PART 1 GENERAL

1.1. SUMMARY

- A. These Supplementary Conditions amend and supplement the General Conditions defined in Document 00 7200 - General Conditions and other provisions of Contract Documents as indicated below. Provisions that are not so amended or supplemented remain in full force and effect.
- B. The terms used in these Supplementary Conditions that are defined in the General Conditions have the meanings assigned to them in the General Conditions.

1.2. MODIFICATIONS TO GENERAL CONDITIONS

A. ARTICLE 2: OWNER

1. Add new Paragraph 2.6 Waivers

The County's waiver of any breach or failure to enforce any of the terms, conditions and specifications of the invitation to bidder, shall not in any way affect, limit or waive the County's right thereafter to enforce and compel strict compliance with every term, condition and specification thereof.

B. ARTICLE 3: CONTRACTOR

1. 3.4 Labor and Materials

a. ADD the following to Paragraph 3.4.1:

3.4.1 "...Should the Contract Documents require work to be performed after regular working hours or should the Contractor elect to perform work after regular working hours, the additional cost of such work shall be borne by the Contractor"

b. Add the following Subparagraph 3.4.2.1 to Paragraph 3.4.2:

"3.4.2.1 After Contract has been executed, Owner and Architect will consider formal requests for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 01 of the Specifications).

By making requests for substitutions based on Subparagraph 3.4.3 above, Contractor:

- .1 represents that Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;
- .2 represents that Contractor will provide the same warranty for the substitution that Contractor would for that specified;
- .3 certifies that the cost data presented is complete and includes all related costs under this Contract except Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and
- .4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects."

2. 3.5 Warranty

a. Add the following Paragraph 3.5.3:

"3.5.3 Contractor makes the following warranties to the Owner that he will, at the date of delivery, have good title to any and all goods supplied in the project and said goods will be free and clear of any and all liens and encumbrances.

- .1 Contractor shall, at his sole cost and expense, promptly repair or replace to the Owner's satisfaction all damaged or defective goods/services received for a period of

one (1) year from date of delivery or date of installation, unless the Project Bid Specifications require a greater warranty period."

3. 3.6 Taxes

a. Add the following Paragraph 3.6.1:

"3.6.1 Owner is a tax exempt organization and Contractor will be permitted to use Owner's tax exempt number for this project for all materials physically incorporated into the project, that become property of Owner.

Items which do not become property of Owner and are not incorporated into real estate are taxable. (Example: fuel oil for machinery, construction stakes, temporary fencing, etc.)

Refer any questions about taxability of specific items to the Illinois Department of Revenue."

4. 3.10 Contractor's Construction Schedules

a. Change Subparagraph 3.10.1 to read as follows:

"3.10.1 The Contractor, promptly after being awarded the contract, shall prepare and submit for the Owner's and Architect's information a contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised only with the Owner's approval as required by conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work."

5. 3.12 Shop Drawings, Product Data and Samples

a. Add Paragraph 3.12.11 to Section 3.12:

3.12.11 Architect's review of Contractor's submittals will be limited to examination of an initial submittal and two (2) resubmittals. Owner is entitled to obtain reimbursement from Contractor for amounts paid to Architect for evaluation of additional resubmittals."

6. 3.13 Use of Site

a. Add the following Paragraph 3.13.1:

3.13.1 The Contractor acknowledges that portions of the property on which the Project and Work are located will be occupied and in use by the Owner during the execution of the Work. The Contractor shall perform and coordinate his work in such a manner that the portions of the property occupied and in use will not be encumbered or the use interfered with or interrupted.

7. Add the following paragraph 3.19:

3.19 Non-Collusion Affidavit State of Illinois

3.19.1 The Contractor is required to execute the Non-Collusion Affidavit included in this package as Bid Form Attachment A. The executed Non-Collusion Affidavit is to be included with the Contractor's bid. Failure to execute and include the Non-Collusion Affidavit with the Contractor's bid may deem the Contractor's proposal non-responsive.

8. Add the following paragraph 3.20:

3.21: Sexual Harassment Policy

3.21.1: The Contractor is required to execute the Certificate of Sexual Harassment Policy included in this package as Bid Form Attachment C. The executed Certificate is to be included with the Contractor's bid. Failure to execute and include

the Certificate with the Contractor's bid may deem the Contractor's proposal non-responsive.

9. Add the following paragraph 3.21:

3.22: Drug Free Workplace Certification

3.22.1: The Contractor is required to execute the Drug Free Workplace Certification included in this package as Bid Form Attachment D. The executed Certificate is to be included with the Contractor's bid. Failure to execute and include the Certificate with the Contractor's bid may deem the Contractor's proposal non-responsive.

10. Add the following paragraph 3.22:

3.23: Certification of Prevailing Wage Rates

3.23.1 The Contractor is required to execute the Prevailing Wage Rate Certification included in this package as Bid Form Attachment E. The executed Certificate is to be included with the Contractor's bid. Failure to execute and include the Certificate with the Contractor's bid may deem the Contractor's proposal non-responsive.

C. ARTICLE 7: CHANGES IN THE WORK

1. 7.1 General

a. Add the following Paragraph 7.1.4 to Section 7.1:

"7.1.4 The Contractor is entitled to add a fixed percentage fee to the actual cost involved for changes in the Work. The combined overhead and profit included in the total cost to Owner for a change in the Work shall be based on the following schedule:

- .1 For Contractor, for Work performed by Contractor's own forces, 10 percent
- .2 For Contractor, for Work performed by Contractor's Subcontractors, 8 percent of the amount due the Subcontractors.
- .3 For each Subcontractor involved, for Work performed by that Subcontractor's own forces, 8 percent of the cost.
- .4 For each Subcontractor involved, for Work performed by the Subcontractor's Sub-subcontractors, 8 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 Section 7.3.4.
- .6 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change involving over \$200.00 be approved without such itemization.

D. ARTICLE 8: TIME

1. 8.1 Definitions

a. Delete Paragraph 8.1.4 and substitute the following:

"8.1.4 The term "day" as used in the Contract Documents shall mean working day, excluding weekends and legal holidays."

2. 8.2 Progress and Completion

a. Add the following Subparagraph 8.2.4:

"8.2.4 Owner reserves the right to require all or part of any remaining work not completed by date designated for Substantial Completion to be performed after normal business hours or on other than normal working days at no "extra" or additional cost to Owner and with no extension of time."

E. ARTICLE 9: PAYMENTS AND COMPLETION

1. 9.3 Applications for Payment

a. Add the following sentence to Paragraph 9.3.1:

"9.3.1 The form of Application for Payment, duly notarized, shall be a current authorized edition of AIA G702-1992, Application and Certificate for Payment, supported by a current authorized edition of AIA G703-1992, Continuation Sheet."

b. Add the following Subparagraph 9.3.1.3 and 9.3.1.4 to Paragraph 9.3.1:

9.3.1.3 Until Substantial Completion, Owner shall pay 90 percent of the amount due the Contractor on account of progress payments.

9.3.1.4 The first payment application shall be accompanied by Contractor's partial waiver for the full amount of the payment. Each subsequent monthly payment application shall be accompanied by the Contractor's partial waiver and the partial waivers of the Subcontractors and Suppliers who were included in the immediately preceding payment application to the extent of that payment. Application for final payment shall be accompanied by final waivers of lien from the Contractor, Subcontractor and Suppliers who have not previously furnished such final waivers.

2. 9.8 Substantial Completion

a. Add the following Subparagraph 9.8.3.1 to Paragraph 9.8.3:

9.8.3.1 Architect will perform no more than one (1) inspection per phase to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. Owner is entitled to reimbursement from the Contractor for amounts paid to Architect for any additional inspections."

3. 9.10 Final Completion and Final Payment

a. Add the following Subparagraph 9.10.1.1 to Paragraph 9.10.1:

9.10.1.1 Architect will perform no more than one (1) inspection to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. Owner is entitled to reimbursement from the Contractor for amounts paid to Architect for any additional inspections."

F. ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

1. 10.1 Safety Precautions and Programs

a. Add the following Paragraphs 10.1.1, 10.1.2 and 10.1.3 to Section 10.1:

10.1.1 The Contractor shall not use asbestos, PCB or any material which contains asbestos or PCB in his work. If requested by Architect, Contractor shall submit a signed statement insuring that no asbestos or PCB has been used on this project."

10.1.2 If reasonable precautions will be inadequate to prevent foreseeable bodily injury of death to persons resulting from a material or substance encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. The Owner, Contractor and Architect shall then proceed in the same manner described in Subparagraph 10.1.3.

10.1.3 The Owner shall be responsible for obtaining the services of a licensed laboratory to verify a presence of the material or substance reported by the Contractor and, in the event such material or substance reported by and, in the event such material or substance is found to be present, to verify that it has been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and the Architect the names and qualifications of persons or entities who are to perform the task of removal or safe containment of such 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 the 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.

G. ARTICLE 11: INSURANCE AND BONDS

1. 11.1 Contractor's Liability Insurance

- a. Add the following Subparagraphs 11.1.2.1 through 11.1.2.6.2 to Paragraph 11.1.2:

"11.1.2.1 The limits for Worker's Compensation and Employers' Liability insurance shall meet statutory limits mandated by State and Federal Laws. If (1) limits in excess of those required by statute are to be provided, (2) the employer is not statutorily bound to obtain such insurance coverage, or (3) additional coverages are required, additional coverages and limits for such insurance shall be as follows:

11.1.2.2 The limits for Commercial General Liability insurance including coverage for Premises-Operations, Independent Contractors' Protective, Products-Completed Operations, Contractual Liability, Personal Injury and Broad Form Property Damage (including coverage for Explosion, Collapse and Underground hazards) shall be as follows:

\$1,000,000 Each Occurrence

\$2,000,000 General Aggregate

\$1,000,000 Personal and Advertising Injury

\$2,000,000 Products-Completed Operations Aggregate

.1 The policy shall be endorsed to have the General Aggregate apply to this Project only.

.2 The Contractual Liability insurance shall include coverage sufficient to meet the obligations in O/C A201™-2007 under Section 3.18.

.3 Products and Completed Operations insurance shall be maintained for a minimum period of at least four (4) year(s) after the expiration of the period for correction of Work.

11.1.2.3 Automobile Liability insurance (owned, non-owned and hired vehicles) for bodily injury and property damage:

\$1,000,000 Each Accident

11.1.2.4 Umbrella or Excess Liability coverage: \$4,000,000.

- b. 11.1.2.5 Contractor shall at Contractor's own expense provide insurance coverage for materials stored off the site after written approval of Owner at the value established in the approval, and also for portions of the Work in transit until such materials are permanently attached to the Work. "

11.1.2.6 Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum.

- .1 Contractor shall deliver the required bonds to Owner not later than three days following the date the Agreement is entered into, or if the Work is to be commenced prior thereto in response to a letter of intent, Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to Owner that such bonds will be furnished.
 - .2 Contractor 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."
 - c. Add the following sentence to Paragraph 11.1.3:

"11.1.3 ...If this insurance is written on a Commercial General Liability policy form, the certificates shall be ACORD form 25-S, completed and supplemented in accordance with AIA G715™-1991, Instruction Sheet and Supplemental Attachment for ACORD Certificate of Insurance 25-S."
 - 2. 11.2 Owner's Insurance
 - a. Add the following Subparagraph 11.2.1.1 to Paragraph 11.2.1:

11.2.1.1 The insurance required by Section 11.2 is not intended to cover machinery, tools or equipment owned or rented by Contractor that are utilized in the performance of the Work but not incorporated into the permanent improvements. Contractor shall, at Contractor's own expense, provide insurance coverage for owned or rented machinery, tools or equipment, which shall be subject to the provisions of Section 11.3."
- H. ARTICLE 13: MISCELLANEOUS PROVISIONS
 - 1. 13.5 Interest
 - a. Delete Paragraph 13.5.
 - b. Add the following Paragraphs 13.5 through 13.7 to Article 13:

13.5 Wage Rates

13.5.1 The Contractor shall comply in all respects with "An Act Regulating Wages of Laborers and Mechanics and other Workmen Employed under Contracts for Public Works" enacted by the 62nd General Assembly, approved on June 26, 1941, as amended and codified as the Illinois Prevailing Wage Act, 820 ILCS 1130/1 et seq, and use the Wage Determination as determined by the Illinois Department of Labor, Conciliation, and Mediation Division current at this project's bid opening date. These wages will remain in effect until superseded by a new determination.

13.5.1.1 The prevailing rates of wages are indicated in the schedule following this section and at the State of Illinois' website = <http://www.state.il.us/agency/idol/rates/rates.HTM><<http://www.state.il.us/agency/idol/rates/rates.HTM>>

13.5.1.2 In case it shall become necessary for the Contractor or any Subcontractor to employ in the Work under this Contract any person in a trade or occupation (except executive, administrative or supervisory workers) for which no wage rates are specified, except in classes of work for which the prevailing rate of wages has been found by the Owner not to be ascertainable, the Contractor shall immediately notify the Owner which will attempt to ascertain and to furnish the Contractor with the general prevailing rate for such trade or occupation. The rate thus furnished shall be applicable for such trade or occupation from the time of initial employment of persons affected and during the continuance of such employment.

13.5.1.3 Prospective Bidders should make an investigation of existing labor conditions and any negotiated labor agreements which may exist or are contemplated at this time.

13.6 Equal Opportunity

13.6.1 The Contractor shall maintain policies of employment as follows:

13.6.1.1 The contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment notices setting forth the policies of non-discrimination.

13.6.1.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

13.7 Smoking, Musical Devices, Language, Dress Code, Noise and Vibration, Employee Background Checks

13.7.1 Owner has certain policies regarding the following:

- .1 Smoking - The Owner prohibits smoking in building and on County property.
- .2 Musical Devices - The Owner has restricted the use of radios, tape players, compact disc players, etc. to the extent that sound generated is not audible in adjacent occupied areas while grounds are in use.
- .3 Dress Code - The Contractor and all employees and subcontractors shall keep shirts on at all times while grounds are in use.
- .4 Noise and Vibration Control - The Contractor shall notify Owner 48 hours in advance of construction activities which might result in excessive noise and/or vibration into the existing grounds while they are in use. Coordinate scheduling of such activities with the Owner to minimize impact on Owner's activities.

I. ARTICLE 15: CLAIMS AND DISPUTES

1. 15.1.6 Claims for Additional Time

a. Add the following Subparagraphs 15.1.6.3 and 15.1.6.4 to Paragraph 15.1.6:

15.1.6.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. Contractor shall provide such supporting documentation as Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

15.1.6.4 Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of Contractor."

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 1000 - SUMMARY

PART 1 GENERAL

1.1. SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Contract description.
 - 3. Work by Owner.
 - 4. Owner occupancy.
 - 5. Contractor use of site and premises.
 - 6. Work restrictions.
 - 7. Existing conditons and measurements.
 - 8. Interim Life Safety Measures.
 - 9. Specification and Drawing conventions.

1.2. PROJECT INFORMATION

- A. Project Name: Crawford Memorial Hospital Ortho Clinic Addition and Renovation
- B. Owner's Name: Crawford Memorial Hospital.
- C. Architect's Name: Farnsworth Group.
- D. The Project consists of the construction of an Orthopedic Clinic addition and renovations to the existing Hospital and associated site development.
 - 1. New construction addition is single story, slab on grade of 2,000 building gross square feet. Space program includes:
 - a. New building entry vestibule and connecting corridor.
 - 2. Renovation includes 6,200 square feet to convert former nursing home space into new use as outpatient Orthopedic clinic.
 - 3. Site work includes but is not limited to new parking lot and driveway paving, utility work and stormwater management.
 - 4. This work shall include all labor, supervision, materials, transportation and services necessary and required to perform the Orthopedic Clinic Addition and Renovation project as set forth in the Contract Documents.

1.3. CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5000 - Contracting Forms and Supplements.

1.4. DESCRIPTION OF ALTERATIONS WORK

- A. Scope of demolition and removal work is indicated on drawings and specified in Section 02 4100.

1.5. WORK BY OWNER

- A. Existing Medical gas Demolition: Owner will self perform demolition of existing medical gas systems as a separate project prior to the onset of this project.
- B. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion. Some items include:
 - 1. Movable cabinets.
 - 2. Furnishings.

3. Small equipment.
- C. Owner will supply and install the following:
- D. Owner will supply the following for installation by Contractor:
 1. Toilet accessories.
- 1.6. OWNER OCCUPANCY
 - A. Owner will utilize the existing Hospital and Med Center building adjacent to this project's site throughout construction.
 - B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
 - C. Schedule the Work to accommodate Owner occupancy.
- 1.7. CONTRACTOR USE OF SITE AND PREMISES
 - A. Construction Operations: Limited to areas noted on Drawings.
 - B. Arrange use of site and premises to allow:
 1. Owner occupancy.
 - a. Owner will occupy the premises during the entire construction period, with the exception of areas under construction. Coordinate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with the Owner's operations. Maintain existing exits unless otherwise indicated.
 2. Use of site by the public.
 - 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. Provide access to and from site as required by law and by Owner:
 1. Emergency building exits from adjacent building during construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
 2. Do not obstruct roadways, sidewalks, or other public ways without permit.
 - a. Do not block public streets at any time.
 - D. Utility Outages and Shutdown:
 1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
 2. Prevent accidental disruption of utility services to other facilities.
 - E. Protect existing site improvements and public access ways to remain. If pavements, curbs, , and other site improvements to remain are damaged or defaced during construction operations, repair and restore all to condition at start of construction or better.
 - F. Keep paved driveways on Owner's property, full project site and public streets, alleys and walkways clear of earth and debris spillage from trucking and traffic involved in construction operations.
- 1.8. WORK RESTRICTIONS
 - A. Work Restrictions, COVID19 Related: Comply with State and Owner's restrictions on access to existing building and safety provisions associated with mitigation of COVID19 risks including but not limited to wearing of face coverings/masks.
 - B. Work Restrictions, General: Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.

2. 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, except as otherwise indicated.
 - a. Weekend Hours: same as workday hours.
 - b. Early Morning Hours: Comply with regulations from authorities having jurisdiction for restrictions on noisy work.
3. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - a. Notify Architect and Owner not less than two business days in advance of proposed utility interruptions.
 - b. Obtain Owner's written permission before proceeding with utility interruptions.
4. Noise, Vibration, Dust and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner.
 - a. Notify Architect and Owner not less than two days in advance of proposed disruptive operations.
 - b. Obtain Owner's Liaison's written permission before proceeding with disruptive operations.
 - c. Comply with applicable noise control laws, ordinances, and regulations. Where field sound measurements exceed allowable limits cease operating such equipment and repair or replace it with equipment that complies with requirements.
 - d. Dust: Take precautions necessary to keep Work under this contract and adjoining properties free from dust. Perform dust control in compliance with authorities having jurisdiction. Follow procedures and protocol to prevent pollution of land, air, and water.
5. Nonsmoking Site and Building: Smoking or use of any tobacco is not permitted within the building or on the site.
6. Controlled Substances: Use controlled substances on the Project site are not permitted. Contractor is responsible for maintaining a drug-free work place.
7. Employee Identification: Provide identification tags for Contractor personnel working on the Project site. Require personnel to utilize identification tags at all times.
8. Patient confidentiality: The Contractor shall instruct all employees and subcontractors that the patient's right to privacy is to be maintained on the job site and off the job.

1.9. EXISTING CONDITIONS AND MEASUREMENTS

- A. Information pertaining to the project site has been obtained through photographs and investigations and is indicated on the Drawings. This information has been gathered with reasonable care, but is of a schematic nature and is not warranted. Verify all dimensions in the field prior to ordering materials or proceeding with construction.
- B. Be alert to any indication or evidence of existing building conditions not indicate on the Contract Documents. Measurements shall be verified form actual observation at the project site. If unexpected existing conditions are encountered, notify the Architect immediately.
- C. Existing Building Considerations:
 1. The buiding's structural system consists of precast concrete plank roof supported by CMU exterior bearing walls and interior steel column and beam framing with 2-hour fire protection.
 2. The existing building is single story, slab on grade and has a very low floor to roof height.
 3. The existing building is fully sprinklered.

1.10. INTERIM LIFE SAFETY MEASURES

- A. It is the intent of the Owner to implement, document and enforce interim life safety measures (ILSM) to temporarily compensate for any hazards caused by construction activities during this project. Contractors and their subcontractors, employees and suppliers shall take every measure required to fully support the Owner in its efforts.
- B. Comply with ILSM measures as follows:
 - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered. All alternative exits are to be clearly marked and personnel are to be instructed about their use. Contractor to maintain safe escape routes for construction workers at all times. These are to be inspected daily.
 - 2. Maintain free and unobstructed access to emergency services and for ambulance, fire, police and other emergency forces.
 - 3. Ensure that fire alarm, detection, and fire suppression systems are maintained in good working order. A temporary but equivalent system shall be provided when any of these systems are impaired. These temporary systems shall be inspected and tested monthly. Any temporary disconnections are to be reported daily to the local fire department and a log of these reports is to be maintained for inspection.
 - 4. Temporary construction partitions or other barriers shall be erected and maintained to separate construction areas from the existing building operations and to protect existing ratings. These shall be smoke tight and built of noncombustible or limited combustible materials that will not contribute to the development or spread of fire.
 - 5. The Owner and the Contractor shall each provide additional fire-fighting equipment, as appropriate to their areas. They will each provide appropriate training in its use. The Contractor shall provide, as a minimum, type 2A:10BC fire extinguishers such that travel distance to one shall not exceed 75 feet in construction areas.
 - 6. The construction site is to be kept clean and free of debris.
 - 7. There shall be a minimum of two fire drills per shift per quarter during the period of construction. The Contractor and his forces shall cooperate and participate in these drills as appropriate.
 - 8. The Owner and its representatives will increase surveillance for hazards in and around buildings, grounds and equipment, during periods of construction. The Contractor and his forces shall watch for possible hazards and shall immediately report same to Safety and Security or fire or police, as appropriate.
 - 9. The Owner and the Contractor shall each train their own personnel to compensate for impaired structural or compartmentalization features of fire safety.
 - 10. The Contractor shall cooperate with the Owner in conducting safety education programs to promote awareness of life safety deficiencies, construction hazards, and interim life safety measures.

1.11. SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. 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 the Drawings are described in detail in the Specifications. One or more of the following are used on the 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 scheduled on Drawings.
 - 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

SECTION 01 2000 - PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Documentation of changes in Contract Sum and Contract Time.
- C. Change procedures.
- D. Correlation of Contractor submittals based on changes.
- E. Procedures for preparation and submittal of application for final payment.

1.2. RELATED REQUIREMENTS

- A. Section 00 5000 - Contracting Forms and Supplements: Forms to be used.
- B. Section 00 5200 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.
- C. Section 00 7200 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.
- D. Section 00 7300 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

1.3. SCHEDULE OF VALUES

- A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Submit Schedule of Values in electronic format within 15 days after date of Owner-Contractor Agreement.
- E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section.
- F. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
- G. Revise schedule to list approved Change Orders, with each Application For Payment.

1.4. APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
- C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- D. Forms filled out by hand will not be accepted.
- E. Execute certification by signature of authorized officer.
- F. Submit one electronic copy of each Application for Payment until Final application. Submit hard-copy of Final Application for Payment.
- G. Include the following with the application:
 - 1. Transmittal letter as specified for submittals in Section 01 3000.
 - 2. Partial release of liens from major subcontractors and vendors.
 - 3. Affidavits attesting to off-site stored products.

- H. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.5. MODIFICATION PROCEDURES

- A. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
- B. For other required changes, Architect will issue a document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
 - 1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
 - 2. Promptly execute the change.
- C. For changes for which advance pricing is desired, Architect will issue a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 14 days.
- D. Contractor may propose a change by submitting a request for change to Architect, describing the proposed change and its full effect on the work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation. Document any requested substitutions in accordance with Section 01 6000.
- E. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
 - 1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
 - 2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
 - 3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
 - 4. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.
- F. Substantiation of Costs: Provide full information required for evaluation.
 - 1. Provide the following data:
 - a. Quantities of products, labor, and equipment.
 - b. Taxes, insurance, and bonds.
 - c. Overhead and profit.
 - d. Justification for any change in Contract Time.
 - e. Credit for deletions from Contract, similarly documented.
 - 2. Support each claim for additional costs with additional information:
 - a. Origin and date of claim.
 - b. Dates and times work was performed, and by whom.
 - c. Time records and wage rates paid.
 - d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
 - 3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.

- G. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- H. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
- I. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- J. Promptly enter changes in Project Record Documents.

1.6. APPLICATION FOR FINAL PAYMENT

- A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- B. Application for Final Payment will not be considered until the following have been accomplished:
 - 1. All closeout procedures specified in Section 01 7000.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2300 - ALTERNATES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Description of Alternates.
- B. Description of acceptance of Alternates.

1.2. ACCEPTANCE OF Alternates

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option.
Accepted Alternates will be identified in the Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.3. SCHEDULE OF Alternates

- A. Alternate No. 1, Deductive - Infill existing windows at exterior court:
 - 1. Base Bid: Remove existing windows and sill and infill exterior wall with brick over metal studs as indicated.
 - 2. Alternate: Existing windows remain.

PART 2 PRODUCTS - NOT USE

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Procedural requirements for proposed substitutions.

1.2. RELATED REQUIREMENTS

- A. Section 00 2100 - Instructions to Bidders: Restrictions on timing of substitution requests.
- B. Section 01 2300 - Alternates, for product alternatives affecting this section.
- C. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.
- D. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.3. DEFINITIONS

- A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.
 - 1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.
 - a. Unavailability.
 - b. Regulatory changes.
 - 2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.
 - a. Substitution requests offering advantages solely to the Contractor will not be considered.

1.4. REFERENCE STANDARDS

- A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage); Current Edition.
- B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase); Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1. GENERAL REQUIREMENTS

- A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
 - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
 - 2. Agrees to provide the same warranty for the substitution as for the specified product.
 - 3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 - 5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
 - 1. Note explicitly any non-compliant characteristics.
- C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.

1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.
- D. Limit each request to a single proposed substitution item.
 1. Submit an electronic document, combining the request form with supporting data into single document.
- 3.2. SUBSTITUTION PROCEDURES DURING PROCUREMENT
 - A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.
 - B. Submittal Form (before award of contract):
 1. Submit substitution requests by completing CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage). See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
 - C. Owner will consider requests for substitutions only if submitted at least 5 days prior to the date for receipt of bids.
- 3.3. SUBSTITUTION PROCEDURES DURING CONSTRUCTION
 - A. Submittal Form (after award of contract):
 1. Submit substitution requests by completing CSI/CSC Form 13.1A - Substitution Request. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.
 - B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 - C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.
 1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
 2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
 3. Bear the costs engendered by proposed substitution of:
 - a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.
 - b. Other construction by Owner.
 - c. Other unanticipated project considerations.
 - D. Substitutions will not be considered under one or more of the following circumstances:
 1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
 2. Without a separate written request.
 3. When acceptance will require revisions to Contract Documents.
- 3.4. RESOLUTION
 - A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.
 - B. Architect will notify Contractor in writing of decision to accept or reject request.

1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.5. ACCEPTANCE

- A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.6. CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SECTION 01 3000 - ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. General administrative requirements.
- B. Electronic document submittal service.
- C. Preconstruction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Construction progress schedule.
- G. Contractor's daily reports.
- H. Progress photographs.
- I. Submittals for review, information, and project closeout.
- J. Number of copies of submittals.
- K. Requests for Information (RFI) procedures.
- L. Submittal procedures.

1.2. RELATED REQUIREMENTS

- A. Section 00 7200 - General Conditions: Dates for applications for payment.
- B. Section 01 6000 - Product Requirements: General product requirements.
- C. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- D. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.
- E. Sections 01 7900 - Demonstration and Training: Additional requirements for demonstration and training to be provided to the Owner.

1.3. REFERENCE STANDARDS

- A. AIA G716 - Request for Information; 2004.
- B. AIA G810 - Transmittal Letter; 2001.

1.4. GENERAL ADMINISTRATIVE REQUIREMENTS

- A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
 - 1. Requests for Information (RFI).
 - 2. Requests for substitution.
 - 3. Shop drawings, product data, and samples.
 - 4. Test and inspection reports.
 - 5. Design data.
 - 6. Manufacturer's instructions and field reports.
 - 7. Applications for payment and change order requests.
 - 8. Progress schedules.
 - 9. Coordination drawings.

10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

1.5. PROJECT COORDINATOR

- A. Project Coordinator: Owner.
- B. During construction, coordinate use of site and facilities through the Project Coordinator.
- C. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities. Responsibility for providing temporary utilities and construction facilities is identified in Section 01 1000 - Summary.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1. ELECTRONIC DOCUMENT SUBMITTAL SERVICE

- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
 1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
 2. Contractor and Architect are required to use this service.
 3. It is Contractor's responsibility to submit documents in allowable format.
 4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
 5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
 6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
 7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.
- B. Submittal Service: The selected service is:
 1. Newforma ConstructEx: www.newforma.com/products/constructex/#sle.
- C. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.2. PRECONSTRUCTION MEETING

- A. Schedule meeting after Notice of Award.
- B. Attendance Required:
 1. Owner.
 2. Architect.
 3. Contractor.
- C. Agenda:

1. Execution of Owner-Contractor Agreement.
 2. Submission of executed bonds and insurance certificates.
 3. Distribution of Contract Documents.
 4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
 5. Submission of initial Submittal schedule.
 6. Designation of personnel representing the parties to Contract, and Architect.
 7. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 8. Scheduling.
 9. Materials staging.
 10. Background checks.
- D. Record minutes and distribute copies within two days after meeting to participants, with electronic copies to Architect, Owner, participants, and those affected by decisions made.
- 3.3. SITE MOBILIZATION MEETING
- A. Schedule meeting at the Project site prior to Contractor occupancy.
- B. Attendance Required:
1. Contractor.
 2. Owner.
 3. Architect.
 4. Contractor's superintendent.
 5. Major subcontractors.
- C. Agenda:
1. Use of premises by Owner and Contractor.
 2. Owner's requirements.
 3. Construction facilities and controls provided by Owner.
 4. Temporary utilities provided by Owner.
 5. Survey and building layout.
 6. Security and housekeeping procedures.
 7. Schedules.
 8. Application for payment procedures.
 9. Procedures for maintaining record documents.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
- 3.4. PROGRESS MEETINGS
- A. Schedule and administer meetings throughout progress of the work at maximum bi-monthly intervals.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required:
1. Contractor.
 2. Owner.
 3. Architect.

4. Contractor's superintendent.
 5. Major subcontractors.
 - D. Agenda:
 1. Review minutes of previous meetings.
 2. Review of work progress.
 3. Field observations, problems, and decisions.
 4. Identification of problems that impede, or will impede, planned progress.
 5. Review of submittals schedule and status of submittals.
 6. Review of RFIs log and status of responses.
 7. Maintenance of progress schedule.
 8. Corrective measures to regain projected schedules.
 9. Planned progress during succeeding work period.
 10. Coordination of projected progress.
 11. Maintenance of quality and work standards.
 12. Effect of proposed changes on progress schedule and coordination.
 13. Other business relating to work.
 - E. Record minutes and distribute copies within two days after meeting to participants, with electronic copies to Architect, Owner, participants, and those affected by decisions made.
- 3.5. CONSTRUCTION PROGRESS SCHEDULE
- A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.
 - B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
 - C. Within 5 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
 - D. Submit updated schedule with each Application for Payment.
- 3.6. DAILY CONSTRUCTION REPORTS
- A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.
 - B. Prepare a daily construction report recording the following information concerning events at Project site and project progress:
 1. Date.
 2. High and low temperatures, and general weather conditions.
 3. List of subcontractors at Project site.
 4. Safety, environmental, or industrial relations incidents.
 5. Meetings and significant decisions.
 6. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.

7. Testing and/or inspections performed.
8. List of verbal instruction given by Owner and/or Architect.
9. Signature of Contractor's authorized representative.

3.7. PROGRESS PHOTOGRAPHS

- A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
- B. Photography Type: Digital; electronic files.
- C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

3.8. REQUESTS FOR INFORMATION (RFI)

- A. Definition: A request seeking one of the following:
 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
 2. A resolution to an issue which has arisen due to field conditions and affects design intent.
- B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.
- C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
 1. Prepare a separate RFI for each specific item.
 - a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
 - b. Do not forward requests which solely require internal coordination between subcontractors.
 2. Prepare using software provided by the Electronic Document Submittal Service.
 3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following:
 - a. Approval of submittals (use procedures specified elsewhere in this section).
 - b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
 - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
 3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
 4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

- a. The Owner reserves the right to assess the Contractor for the costs (on time-and-materials basis) incurred by the Architect, and any of its consultants, due to processing of such RFIs.
- E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
 1. Official Project name and number, and any additional required identifiers established in Contract Documents.
 2. Owner's, Architect's, and Contractor's names.
 3. Discrete and consecutive RFI number, and descriptive subject/title.
 4. Issue date, and requested reply date.
 5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
 6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
 7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
 1. Indicate current status of every RFI. Update log promptly and on a regular basis.
 2. Note dates of when each request is made, and when a response is received.
 3. Highlight items requiring priority or expedited response.
 4. Highlight items for which a timely response has not been received to date.
 5. Identify and include improper or frivolous RFIs.
- H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
 1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
 1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
 2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
 3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
 4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.9. SUBMITTAL SCHEDULE

- A. Submit to Architect for review a schedule for submittals in tabular format.
 - 1. Submit at the same time as the preliminary schedule.
 - 2. Coordinate with Contractor's construction schedule and schedule of values.
 - 3. Format schedule to allow tracking of status of submittals throughout duration of construction.
 - 4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered, and role and name of subcontractor.
 - 5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
 - a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.10. SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 - 1. Product data.
 - 2. Shop drawings.
 - 3. Samples for selection.
 - 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
- C. Samples will be reviewed for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.11. SUBMITTALS FOR INFORMATION

- A. When the following are specified in individual sections, submit them for information:
 - 1. Design data.
 - 2. Certificates.
 - 3. Test reports.
 - 4. Inspection reports.
 - 5. Manufacturer's instructions.
 - 6. Manufacturer's field reports.
 - 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner.

3.12. SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 7800 - Closeout Submittals:
 - 1. Project record documents.
 - 2. Operation and maintenance data.

3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.13. NUMBER OF COPIES OF SUBMITTALS

- A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.
- B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 1. After review, produce duplicates.
 2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14. SUBMITTAL PROCEDURES

- A. General Requirements:
 1. Use a single transmittal for related items.
 2. Transmit using approved form.
 - a. Use form generated by Electronic Document Submittal Service software.
 3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
 4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
 5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
 - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
 6. Schedule submittals to expedite the Project, and coordinate submission of related items.
 - a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
 - b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
 7. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
 8. Provide space for Contractor and Architect review stamps.
 9. When revised for resubmission, identify all changes made since previous submission.
 10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
 11. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
 12. Submittals not requested will be recognized, and will be returned "Not Reviewed",
- B. Product Data Procedures:
 1. Submit only information required by individual specification sections.
 2. Collect required information into a single submittal.

3. Do not submit (Material) Safety Data Sheets for materials or products.
- C. Shop Drawing Procedures:
 1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
 2. Do not reproduce Contract Documents to create shop drawings.
 3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.15. SUBMITTAL REVIEW

- A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
- B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
 1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.
- D. Architect's and consultants' actions on items submitted for review:
 1. Authorizing purchasing, fabrication, delivery, and installation:
 - a. "No Exceptions Taken", or language with same legal meaning.
 - b. "Furnish as Corrected", or language with same legal meaning.
 - 1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
 2. Not Authorizing fabrication, delivery, and installation:
 - a. "Revise and Resubmit".
 - 1) Resubmit revised item, with review notations acknowledged and incorporated.
 - 2) Non-responsive resubmittals may be rejected.
 - b. "Rejected".
 - 1) Submit item complying with requirements of Contract Documents.
- E. Architect's actions on items submitted for information:
 1. Items for which no action was taken:
 - a. "Not Reviewed" - to notify the Contractor that the submittal has been received for record only.
 2. Items for which action was taken:
 - a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 3310 - CADD WAIVER OF LIABILITY

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 CADD waiver form.
 - 1. For the Contractor to request CAD files to assist him/her with Shop Drawings, the CADD Waiver form must be completed and emailed to the Architect/Engineer.
- B. Related Requirements:
 - 1. Division 01 Section "Submittal Procedures" for submittal requirements and procedures.
 - 2. Division 01 Section "Closeout Submittals" for submitting operation and maintenance manuals, record Drawings, record Specifications, and record Product Data.

1.3. SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals. Refer to Division 01 Section 01 3000 "Administrative Requirements" for specific information.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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WAIVER OF LIABILITY AGREEMENT

(1 Page)

This waiver agreement is made between Farnsworth Group, Inc., of Normal, Illinois, and

INSERT COMPANY NAME HERE – WHO IS RECEIVING THE DRAWINGS. Include address & phone contact info.

hereinafter referred to as SUBCONTRACTOR to _____ for the Project.

Specific Intention/Application For Electronic Drawing Request: _____

Subcontractor Purchase Order **-OR-** Check Number: _____

Sheets Requested: _____

Format Requested: PDF _____ **-OR-** AutoCAD Version Requested: _____

Options: 2013

In accepting and utilizing any drawings, reports and data on any form of electronic media generated and furnished by Farnsworth Group, Inc., the SUBCONTRACTOR agrees that all such electronic files are instruments of service of Farnsworth Group, Inc., who shall be deemed the author, and shall retain all common law, statutory law and other rights, without limitation, including copyrights.

The SUBCONTRACTOR, by signing this agreement, acknowledges and shall abide by the following:

- The paper & electronic media provided for the project shall be handled as one package, not to be distributed in part.
- The paper media is an accurate representation of the data furnished within the scope of the named project as of the date shown in the title block of the paper media.
- Farnsworth Group, Inc. does not guarantee the accuracy and does not assume any responsibility or liability for any reproductions produced by the SUBCONTRACTOR or its agents from the Electronic Data of the work.
- Electronic Data is not to be used for purposes other than those associated with the project named below, or outside of its intended scope.
- The SUBCONTRACTOR will at no time make any changes, modifications, deletions, or additions to the Electronic Data provided by Farnsworth Group, Inc. for distribution within or outside of its own organization.
- By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project.
- Farnsworth Group, Inc. makes no representation regarding the accuracy or completeness of the electronic files you receive.
- The Electronic Data provided by Farnsworth Group, Inc. as shown on the paper media is not guaranteed to reproduce on the SUBCONTRACTOR's equipment, either on a computer screen or in a print.
- All reproductions, paper or electronic media, must be obtained from the General Contractor for bidding purposes and Farnsworth Group, Inc. for construction purposes. See information below for Farnsworth Group contact information.
- Subcontractor agrees to pay \$50 per drawing sheet for CADD digital drawing files, payable by check to "Farnsworth Group, Inc." Payment is required prior to release of digital drawing files. Files will be sent to the Subcontractor within 5 business days of payment receipt.

Project: CRAWFORD MEMORIAL HOSPITAL ORTHO CLINIC ADDITION AND RENOVATION
Project Date: January 15, 2021
FGI Project Number: 0200707.00

Farnsworth Group, Inc.

By: Meghan C. Roller, AIA, NCARB
Title: Senior Project Manager

Subcontractor's Signature/Title

Submit completed form by Email (pdf format) attention to:

Meghan C. Roller (email: mroller@f-w.com)

Farnsworth Group, Inc., 200 W. College Ave., Suite 301 Normal, Illinois 61761

Telephone: 309-663-8436

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Contractor's construction-related professional design services.
- F. Contractor's design-related professional design services.
- G. Control of installation.
- H. Mock-ups.
- I. Tolerances.
- J. Manufacturers' field services.
- K. Defect Assessment.

1.2. RELATED REQUIREMENTS

- A. Document 00 7200 - General Conditions: Inspections and approvals required by public authorities.
- B. Section 01 3000 - Administrative Requirements: Submittal procedures.
- C. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.3. REFERENCE STANDARDS

- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).
- B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.
- D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.
- E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2013.
- G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.
- H. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2010.

1.4. DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.

- 1. Design Services Types Required:

- a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
 - b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
 - C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by the Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.
- 1.5. CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES
- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- 1.6. CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES
- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
 - B. Base design on performance and/or design criteria indicated in individual specification sections.
- 1.7. CONFLICTING REQUIREMENTS
- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 - B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
- 1.8. SUBMITTALS
- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
 - B. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
 - C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.
 - 1. Seismic-force resisting system, designated seismic system, or component listed in the designated seismic system quality assurance plan prepared by the Architect.
 - 2. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.
 - D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.
 - 1. Include:
 - a. Date issued.
 - b. Project title and number.
 - c. Name of inspector.
 - d. Date and time of sampling or inspection.

- e. Identification of product and specifications section.
 - f. Location in the Project.
 - g. Type of test/inspection.
 - h. Date of test/inspection.
 - i. Results of test/inspection.
 - j. Compliance with Contract Documents.
 - k. When requested by Architect, provide interpretation of results.
 - 2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 - E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
 - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
 - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
 - F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
 - G. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
 - 1. Submit report in duplicate within 30 days of observation to Architect for information.
 - 2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 - H. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
 - 1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents.
 - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.
- 1.9. Quality Assurance
- A. Testing Agency Qualifications:
 - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
 - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.
 - 3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.
 - B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Contractor's Quality Control (CQC) Plan:

1. 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.
 2. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 3. Project quality-control manager may also serve as Project superintendent .
 4. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
 5. Quality Issue Log: Maintain a project quality issue tracking matrix. This should include quality issues identified by the Owner, Architect/Engineer, Subcontractors, Material supplier/distributor personnel, Authorities having Jurisdiction, utilities, etc. This matrix should continue throughout construction and become the project punchlist. After Final Completion, the log should be maintained for any warranty items that arise.
 6. Testing and Inspection: Include in quality-control plan a comprehensive schedule of Work requiring testing or inspection, including the following:
 - a. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 - b. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 - c. Owner-performed tests and inspections indicated in the Contract Documents.
- D. 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.
- E. 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.

1.10. REFERENCES AND STANDARDS

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from Contract Documents by mention or inference otherwise in any reference document.

1.11. TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Owner will employ and pay for services of an independent testing agency to perform other specified testing.
- B. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.
- C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- D. Contractor Employed Agency:
 - 1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093, and ASTM D3740.
 - 2. Inspection agency: Comply with requirements of ASTM D3740 and ASTM E329.
 - 3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
 - 4. Laboratory: Authorized to operate in the State in which the Project is located.
 - 5. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
 - 6. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1. CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2. MOCK-UPS

- A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.
- B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
- C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

- D. Notify Architect fifteen (15) working days in advance of dates and times when mock-ups will be constructed.
- E. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- F. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- G. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- H. Accepted mock-ups shall be a comparison standard for the remaining Work.
- I. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

3.3. TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

3.4. TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 2. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 3. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 4. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.

- b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
- 5. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
- 6. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- 7. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- 8. Perform field inspections through the duration of installation of roofing, glass/glazing, and exterior skin systems. Field Inspections and associated services shall include the following:
 - a. Monthly field visits to collect data using the established, project specific protocol developed in above.
 - b. Documentation of reasonable compliance with construction documents using project specific inspection guidelines prepared as noted above.
 - c. Provide written reports (including photos) to summarize findings of each inspection and includes discussions with designated project field personnel to assure an understanding of the findings.
 - d. Confirm correction of noted nonconforming items by photographic confirmation by the Contractor.
 - e. Provide a draft summary of the field observations on the day of each inspection to the site representatives.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.5. TEST AND INSPECTION LOG

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

3.6. MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.7. DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.

3.8. REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, 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 Division 01 Section "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.

3.9. PROJECT CLOSEOUT

- A. Warranties: Ensure a Warranty and Maintenance Schedule for distribution to the Project Team and Owner. This Warranty and Maintenance Schedule shall identify warranty periods, maintenance activities and other requirements as recommended by the manufacturer for each major system/material.
 - 1. Facilitate at least one training seminar with the Owner to review the Warranty and Maintenance Schedule. Review the entire building envelope system in an effort to orientate the Owner with their new facility.

END OF SECTION

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Dewatering
- B. Temporary utilities.
- C. Temporary sanitary facilities.
- D. Temporary Controls: Barriers, enclosures, and fencing.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.
- G. Project identification sign.
- H. Field offices.

1.2. RELATED REQUIREMENTS

- A. Section 015001 - Site Temporary Facilities.

1.3. REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

1.4. Dewatering

- A. Provide temporary means and methods for dewatering all temporary facilities and controls.
- B. Maintain temporary facilities in operable condition.

1.5. TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.
- B. Maintain daily in clean and sanitary condition.

1.6. BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.7. EXTERIOR ENCLOSURES

- A. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.8. VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.

- D. Coordinate with Owner for identification of parking areas that can be used for Contractor parking and staging.

1.9. WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.10. PROJECT IDENTIFICATION

- A. Erect on site at location indicated.
- B. Provide project identification sign of design, construction, and location approved by Owner.
- C. No other signs are allowed without Owner permission except those required by law.

1.11. FIELD OFFICES

- A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack, and drawing display table.
- B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.
- C. Locate offices a minimum distance of 30 feet from existing and new structures.

1.12. REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Procedures for Owner-supplied products.
- F. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2. RELATED REQUIREMENTS

- A. Document 00 2110 - Instructions to Bidders: Product options and substitution procedures prior to bid date.
- B. Section 01 1000 - Summary: Identification of Owner-supplied products.
- C. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.
- D. Section 01 4000 - Quality Requirements: Product quality monitoring.
- E. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.3. SUBMITTALS

- A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Submit within 15 days after date of Agreement.
 - 2. For products specified only by reference standards, list applicable reference standards.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

PART 2 PRODUCTS

2.1. EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
- B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
- C. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.2. NEW PRODUCTS

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
 - 1. Containing lead, cadmium, or asbestos.
- C. Where other criteria are met, Contractor shall give preference to products that:
 - 1. Have longer documented life span under normal use.
 - 2. Have a published GreenScreen Chemical Hazard Analysis.

2.3. PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.4. MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1. SUBSTITUTION LIMITATIONS

- A. See Section 01 2500 - Substitution Procedures.
- B. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period and the documents required. Comply with requirements specified in Section 00 2100.

3.2. OWNER-SUPPLIED PRODUCTS

- A. See Section 01 1000 - Summary for identification of Owner-supplied products.
- B. Owner's Responsibilities:
 - 1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
 - 2. Arrange and pay for product delivery to site.
 - 3. On delivery, inspect products jointly with Contractor.
 - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
 - 5. Arrange for manufacturers' warranties, inspections, and service.
- C. Contractor's Responsibilities:
 - 1. Review Owner reviewed shop drawings, product data, and samples.
 - 2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
 - 3. Handle, store, install and finish products.
 - 4. Repair or replace items damaged after receipt.

3.3. TRANSPORTATION AND HANDLING

- A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
- B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

- C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
- D. Transport and handle products in accordance with manufacturer's instructions.
- E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
- G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4. STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 7419.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Provide off-site storage and protection when site does not permit on-site storage or protection.
- G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- H. Comply with manufacturer's warranty conditions, if any.
- I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Prevent contact with material that may cause corrosion, discoloration, or staining.
- L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cutting and patching.
- D. Cleaning and protection.
- E. Starting of systems and equipment.
- F. Demonstration and instruction of Owner personnel.
- G. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- H. General requirements for maintenance service.

1.2. RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- C. Section 01 4000 - Quality Requirements: Testing and inspection procedures.
- D. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.
- E. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- F. Section 01 7900 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections
- G. Section 02 4100 - Demolition: Selective demolition of existing building and site elements.

1.3. REFERENCE STANDARDS

- A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
 - 1. On request, submit documentation verifying accuracy of survey work.
 - 2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
 - 3. Submit surveys and survey logs for the project record.
- C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
- D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.5. QUALIFICATIONS

- A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,
- B. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.6. PROJECT CONDITIONS

- A. Use of explosives is not permitted.
- B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
- D. Perform dewatering activities, as required, for the duration of the project.
- E. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- F. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
- G. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
 - 1. Minimize amount of bare soil exposed at one time.
 - 2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
 - 3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
 - 4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.
- H. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
- I. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
- J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.7. COORDINATION

- A. See Section 01 1000 for occupancy-related requirements.
- B. Each contractor shall coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
 - 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 with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
- C. Notify affected utility companies and comply with their requirements.

- D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean-up of work of separate sections.
- H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.1. PATCHING MATERIALS

- A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.
- E. Verify that utility services are available, of the correct characteristics, and in the correct locations.
- F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2. PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3. PREINSTALLATION MEETINGS

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Architect and Owner four days minimum in advance of meeting dates.

- D. Prepare agenda and preside at meeting:
 - 1. Review conditions of examination, preparation and installation procedures.
 - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with electronic copies to Architect, Owner, participants, and those affected by decisions made.

3.4. LAYING OUT THE WORK

- A. Verify locations of survey control points prior to starting work.
- B. Promptly notify Architect of any discrepancies discovered.
- C. Contractor shall locate and protect survey control and reference points.
- D. Control datum for survey is that indicated on drawings.
- E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- H. Utilize recognized engineering survey practices.
- I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
 - 1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
 - 2. Grid or axis for structures.
 - 3. Building foundation, column locations, ground floor elevations.
- J. Periodically verify layouts by same means.
- K. Maintain a complete and accurate log of control and survey work as it progresses.

3.5. GENERAL INSTALLATION REQUIREMENTS

- A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
- B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
- C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
- D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
- E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6. ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.

1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 .
- C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- D. Remove existing work as indicated and as required to accomplish new work.
 1. Remove items indicated on drawings.
 2. Relocate items indicated on drawings.
 3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
 4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.
- E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and Security): Remove, relocate, and extend existing systems to accommodate new construction.
 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. See Section 01 1000 for other limitations on outages and required notifications.
 - c. Provide temporary connections as required to maintain existing systems in service.
 4. Verify that abandoned services serve only abandoned facilities.
 5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- F. Protect existing work to remain.
 1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 3. Repair adjacent construction and finishes damaged during removal work.
- G. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
 1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
 2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.

3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.
 - H. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
 - I. Refinish existing surfaces as indicated:
 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
 - J. Clean existing systems and equipment in areas of alteration and construction traffic.
 - K. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
 - L. Do not begin new construction in alterations areas before demolition is complete.
 - M. Comply with all other applicable requirements of this section.
- 3.7. CUTTING AND PATCHING
- A. Whenever possible, execute the work by methods that avoid cutting or patching.
 - B. See Alterations article above for additional requirements.
 - C. Perform whatever cutting and patching is necessary to:
 1. Complete the work.
 2. Fit products together to integrate with other work.
 3. Provide openings for penetration of mechanical, electrical, and other services.
 4. Match work that has been cut to adjacent work.
 5. Repair areas adjacent to cuts to required condition.
 6. Repair new work damaged by subsequent work.
 7. Remove samples of installed work for testing when requested.
 8. Remove and replace defective and non-complying work.
 - D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
 - E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
 - F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
 - G. Restore work with new products in accordance with requirements of Contract Documents.
 - H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 - I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.
 - J. Patching:
 1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
 2. Match color, texture, and appearance.

3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.8. PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.9. PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10. SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner seven days prior to start-up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11. DEMONSTRATION AND INSTRUCTION

- A. See Section 01 7900 - Demonstration and Training.

3.12. ADJUSTING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13. FINAL CLEANING

- A. Execute final cleaning prior to Substantial Completion.
- B. Use cleaning materials that are nonhazardous.
- C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- F. Replace filters of operating equipment.
- G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- H. Clean site; sweep paved areas, rake clean landscaped surfaces.
- I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14. CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect and Owner.
- B. Warranties: Ensure a Warranty and Maintenance Schedule for distribution to the Project Team and Owner. This Warranty and Maintenance Schedule shall identify warranty periods, maintenance activities and other requirements as recommended by the manufacturer for each major system/material.
 - 1. Facilitate at least one training seminar with the Owner to review the Warranty and Maintenance Schedule. Review the entire building envelope system in an effort to orientate the Owner with their new facility.
- C. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- D. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- E. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
- F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.
- G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- I. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15. MAINTENANCE

- A. Provide service and maintenance of components indicated in specification sections.

- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1. WASTE MANAGEMENT REQUIREMENTS

- A. Owner requires that this project generate the least amount of trash and waste possible.
- B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.
- C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- D. Owner may decide to pay for additional recycling, salvage, and/or reuse based on Landfill Alternatives Proposal specified below.
- E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.
- F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.
- G. The following sources may be useful in developing the Waste Management Plan:
 - 1. Illinois Department of Central Management Services, at <https://www.illinois.gov/cms/agency/recycling/Pages/default.aspx>.
 - 2. Illinois Environmental Protection Agency, at <http://www.epa.illinois.gov/topics/waste-management/>.
- H. Methods of trash/waste disposal that are not acceptable are:
 - 1. Burning on the project site.
 - 2. Burying on the project site.
 - 3. Dumping or burying on other property, public or private.
 - 4. Other illegal dumping or burying.
- I. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.2. DEFINITIONS

- A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.
- B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.
- C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
- E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

- H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- I. Return: To give back reusable items or unused products to vendors for credit.
- J. Reuse: To reuse a construction waste material in some manner on the project site.
- K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Landfill Alternatives Proposal: Within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner, submit a projection of trash/waste that will require disposal and alternatives to landfilling, with net costs.
 - 1. Submit to Architect for Owner's review and approval.
 - 2. If Owner wishes to implement any cost alternatives, the Contract Sum will be adjusted as specified elsewhere.
 - 3. Include an analysis of trash/waste to be generated and landfill options as specified for Waste Management Plan described below.
 - 4. Describe as many alternatives to landfilling as possible:
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the proposed local market for each material.
 - c. State the estimated net cost resulting from each alternative, after subtracting revenue from sale of recycled or salvaged materials and landfill tipping fees saved due to diversion of materials from the landfill.
 - 5. Provide alternatives to landfilling for at least the following materials:
 - a. Aluminum and plastic beverage containers.
 - b. Corrugated cardboard.
 - c. Wood pallets.
 - d. Clean dimensional wood.
 - e. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - f. Glass.
 - g. Plastic buckets.

- h. Carpet, carpet cushion, carpet tile, and carpet remnants: DuPont (<http://flooring.dupont.com>) and Interface (www.interfaceinc.com) conduct reclamation programs.
- C. Once Owner has determined which of the landfill alternatives addressed in the Proposal above are acceptable, prepare and submit Waste Management Plan; submit within 10 calendar days after notification by Architect.
- D. Waste Management Plan: Include the following information:
 - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
 - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
 - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
 - a. List each material proposed to be salvaged, reused, or recycled.
 - b. List the local market for each material.
 - c. State the estimated net cost, versus landfill disposal.
 - 4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
 - 5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
 - 6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.
 - 7. Recycling Incentives: Describe procedures required to obtain credits, rebates, or similar incentives.
- E. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
 - 1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
 - 2. Submit Report on a form acceptable to Owner.
 - 3. Landfill Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.
 - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - 4. Incinerator Disposal: Include the following information:
 - a. Identification of material.
 - b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.

- c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
- 5. Recycled and Salvaged Materials: Include the following information for each:
 - a. Identification of material, including those retrieved by installer for use on other projects.
 - b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
 - c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
 - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
 - e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
- 6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.
- F. Recycling Incentive Programs:
 - 1. Where revenue accrues to Contractor, submit copies of documentation required to qualify for incentive.
 - 2. Where revenue accrues to Owner, submit any additional documentation required by Owner in addition to information provided in periodic Waste Disposal Report.

PART 2 PRODUCTS

2.1. PRODUCT SUBSTITUTIONS

- A. See Section 01 6000 - Product Requirements for substitution submission procedures.
- B. For each proposed product substitution, submit the following information in addition to requirements specified in Section 01 6000:
 - 1. Relative amount of waste produced, compared to specified product.
 - 2. Cost savings on waste disposal, compared to specified product, to be deducted from the Contract Sum.
 - 3. Proposed disposal method for waste product.
 - 4. Markets for recycled waste product.

PART 3 EXECUTION

3.1. WASTE MANAGEMENT PROCEDURES

- A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.
- B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.
- C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.
- D. See Section 01 7000 for trash/waste prevention procedures related to cutting and patching, installation, protection, and cleaning.

3.2. WASTE MANAGEMENT PLAN IMPLEMENTATION

- A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

- C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.
- D. Meetings: Discuss trash/waste management goals and issues at project meetings.
 - 1. Prebid meeting.
 - 2. Preconstruction meeting.
 - 3. Regular job-site meetings.
- E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.
 - 1. Provide containers as required.
 - 2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
 - 3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.
- G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.
- I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7800 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Project Record Documents.
- B. Operation and Maintenance Data.
- C. Warranties and bonds.

1.2. RELATED REQUIREMENTS

- A. Section 00 7200 - General Conditions and 00 7300 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.3. SUBMITTALS

- A. Project Record Documents: Submit documents to Architect prior to claim for final Application for Payment.
- B. Operation and Maintenance Data:
 - 1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. Warranties and Bonds:
 - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
 - 2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
 - 3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1. PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.

5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 1. Measured depths of foundations in relation to finish first floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 4. Field changes of dimension and detail.
 5. Details not on original Contract drawings.

3.2. OPERATION AND MAINTENANCE DATA

- A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
- B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.3. OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

- A. For Each Product, Applied Material, and Finish:
 1. Product data, with catalog number, size, composition, and color and texture designations.
 2. Information for re-ordering custom manufactured products.
- B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
- C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
- D. Additional information as specified in individual product specification sections.
- E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.4. OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

- A. For Each Item of Equipment and Each System:
 - 1. Description of unit or system, and component parts.
 - 2. Identify function, normal operating characteristics, and limiting conditions.
 - 3. Include performance curves, with engineering data and tests.
 - 4. Complete nomenclature and model number of replaceable parts.
- B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
- C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- D. Include color coded wiring diagrams as installed.
- E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- G. Provide servicing and lubrication schedule, and list of lubricants required.
- H. Include manufacturer's printed operation and maintenance instructions.
- I. Include sequence of operation by controls manufacturer.
- J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- K. Provide control diagrams by controls manufacturer as installed.
- L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
- M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- N. Include test and balancing reports.
- O. Additional Requirements: As specified in individual product specification sections.

3.5. ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

- A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.
- B. Where systems involve more than one specification section, provide separate tabbed divider for each system.
- C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
- D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
- E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

- F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
- G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
- H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
- I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- J. Arrangement of Contents: Organize each volume in parts as follows:
 - 1. Project Directory.
 - 2. Table of Contents, of all volumes, and of this volume.
 - 3. Operation and Maintenance Data: Arranged by system, then by product category.
 - a. Source data.
 - b. Product data, shop drawings, and other submittals.
 - c. Operation and maintenance data.
 - d. Field quality control data.
 - e. Photocopies of warranties and bonds.

3.6. WARRANTIES AND BONDS

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.
- E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.
- F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
- G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
- H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- I. Include additional copies of each warranty in operation and maintenance manuals, indexed within respective sections.

END OF SECTION

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.1. SUMMARY

- A. Demonstration of products and systems where indicated in specific specification sections.
- B. Training of Owner personnel in operation and maintenance is required for:
 - 1. All software-operated systems.
 - 2. HVAC systems and equipment.
 - 3. Plumbing equipment.
 - 4. Electrical systems and equipment.
 - 5. Items specified in individual product Sections.
- C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
 - 1. Roofing, waterproofing, and other weather-exposed or moisture protection products.
 - 2. Finishes, including flooring, wall finishes, ceiling finishes.
 - 3. Fixtures and fittings.
 - 4. Items specified in individual product Sections.

1.2. RELATED REQUIREMENTS

- A. Section 01 7800 - Closeout Submittals: Operation and maintenance manuals.
- B. Other Specification Sections: Additional requirements for demonstration and training.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Training Plan: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
 - 1. Submit to Architect for transmittal to Owner.
 - 2. Submit not less than two weeks prior to start of training.
 - 3. Revise and resubmit until acceptable.
 - 4. Provide an overall schedule showing all training sessions.
 - 5. Include at least the following for each training session:
 - a. Identification, date, time, and duration.
 - b. Description of products and/or systems to be covered.
 - c. Name of firm and person conducting training; include qualifications.
 - d. Intended audience, such as job description.
 - e. Objectives of training and suggested methods of ensuring adequate training.
 - f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
 - g. Media to be used, such as slides, hand-outs, etc.
 - h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor.
- C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
 - 1. Include applicable portion of O&M manuals.

2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.
 3. Provide one extra copy of each training manual to be included with operation and maintenance data.
 - D. Training Reports:
 1. Identification of each training session, date, time, and duration.
 2. Sign-in sheet showing names and job titles of attendees.
 3. List of attendee questions and written answers given, including copies of and references to supporting documentation required for clarification; include answers to questions that could not be answered in original training session.
 - E. Video Recordings: Submit digital video recording of each demonstration and training session for Owner's subsequent use.
 1. Format: DVD Disc or USB flash drive.
 2. Label each disc and container with session identification and date.
- 1.4. QUALITY ASSURANCE
- A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
 1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
 2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1. DEMONSTRATION - GENERAL

- A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner.
- B. Demonstration may be combined with Owner personnel training if applicable.
- C. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.
 1. Perform demonstrations not less than two weeks prior to Substantial Completion.
 2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- D. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.
 1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.2. TRAINING - GENERAL

- A. Conduct training on-site unless otherwise indicated.
- B. Owner will provide classroom and seating at no cost to Contractor.
- C. Provide training in minimum two hour segments.
- D. Training schedule will be subject to availability of Owner's personnel to be trained; re-schedule training sessions as required by Owner; once schedule has been approved by Owner failure to

conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

- E. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
 - 1. The location of the O&M manuals and procedures for use and preservation; backup copies.
 - 2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
 - 3. Typical uses of the O&M manuals.
- F. Product- and System-Specific Training:
 - 1. Review the applicable O&M manuals.
 - 2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
 - 3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
 - 4. Provide hands-on training on all operational modes possible and preventive maintenance.
 - 5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
 - 6. Discuss common troubleshooting problems and solutions.
 - 7. Discuss any peculiarities of equipment installation or operation.
 - 8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
 - 9. Review recommended tools and spare parts inventory suggestions of manufacturers.
 - 10. Review spare parts and tools required to be furnished by Contractor.
 - 11. Review spare parts suppliers and sources and procurement procedures.
- G. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 02 4100 - DEMOLITION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Selective demolition of built site elements.
- B. Selective demolition of building elements for alteration purposes.

1.2. RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.
- D. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

1.3. REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2013.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1. SCOPE

- A. Remove paving and curbs as required to accomplish new work.

3.2. GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 3. Provide, erect, and maintain temporary barriers and security devices.
 - 4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 5. Do not close or obstruct roadways or sidewalks without permit.
 - 6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
 - 7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Protect existing structures and other elements that are not to be removed.

1. Provide bracing and shoring.
 2. Prevent movement or settlement of adjacent structures.
 3. Stop work immediately if adjacent structures appear to be in danger.
 - D. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
 - E. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.
- 3.3. EXISTING UTILITIES
- A. Protect existing utilities to remain from damage.
 - B. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
 - C. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
 - D. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
 - E. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- 3.4. SELECTIVE DEMOLITION FOR ALTERATIONS
- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 1. Verify that construction and utility arrangements are as indicated.
 2. Report discrepancies to Architect before disturbing existing installation.
 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
 - B. Separate areas in which demolition is being conducted from other areas that are still occupied.
 1. Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 5000 in locations indicated on drawings.
 - C. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
 - D. Remove existing work as indicated and as required to accomplish new work.
 - E. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 3. Verify that abandoned services serve only abandoned facilities before removal.
 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.
 - F. Protect existing work to remain.
 1. Prevent movement of structure; provide shoring and bracing if necessary.
 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.

3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.5. DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Remove from site all materials not to be reused on site; comply with requirements of Section 01 7419 - Waste Management.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 0505 - UNDERSLAB VAPOR BARRIER

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Sheet vapor barrier under concrete slabs on grade.

1.2. RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 2000 - Concrete Reinforcing.
- C. Section 03 3000 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.

1.3. REFERENCE STANDARDS

- A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011.
- B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2011.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.
- C. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Underslab Vapor Barrier:
 - 1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
 - 2. Thickness: 15 mils.
 - 3. Basis of Design:
 - a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
 - 1) BARRIER-BAC IntePlus XF Filk VB-350 (16 mil) is an approved substitution.
 - 2) ISI Building Products Viper II 15-mil Class A vapor barrier is an approved substitution.
- B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.2. INSTALLATION

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.
- B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.
- C. Lap joints minimum 6 inches.

- D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.
- E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.
- F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

SECTION 03 1000 - CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Form accessories.
- C. Form stripping.

1.2. RELATED REQUIREMENTS

- A. Section 03 2000 - Concrete Reinforcing.
- B. Section 03 3000 - Cast-in-Place Concrete.
- C. Section 05 1200 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

1.3. REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010.
- B. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010 (Errata 2012).
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute; 2011.
- D. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute; 2004.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.
- B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 PRODUCTS

2.1. FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.
- C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
- D. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.

2.2. WOOD FORM MATERIALS

- A. Plywood: Douglas Fir species; solid one side grade; sound undamaged sheets with clean, true edges.

2.3. REMOVABLE PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gage, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Preformed Plastic Forms: Thermoplastic polystyrene form liner, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

- C. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

2.4. FORMWORK ACCESSORIES

- A. Form Ties: Factory-fabricated, removeable, or snap-off type, fiber reinforced plastic or metal form, fixed length, ____ inch back break dimension, free of defects that could leave holes larger than 1 inch in concrete surface.
 - 1. Ties shall be designed to resist lateral pressure of fresh concrete on forms.
 - 2. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- C. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 1200.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.2. EARTH FORMS

- A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.3. ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- D. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 - 2. Class C, 1/2 inch (13 mm) for rough-formed finished surfaces.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Align joints and make watertight. Keep form joints to a minimum.
- G. 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.
- H. 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.

- I. Obtain approval before framing openings in structural members that are not indicated on drawings.
 - J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
 - K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
 - L. Coordinate this section with other sections of work that require attachment of components to formwork.
- 3.4. APPLICATION - FORM RELEASE AGENT
- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
 - B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- 3.5. INSERTS, EMBEDDED PARTS, AND OPENINGS
- A. Locate and set in place items that will be cast directly into concrete.
 - B. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
 - C. 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 303.
 - D. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.
- 3.6. FORM CLEANING
- A. Clean forms as erection proceeds, to remove foreign matter within forms.
 - B. Clean formed cavities of debris prior to placing concrete.
- 3.7. FORMWORK TOLERANCES
- A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.
- 3.8. FORM REMOVAL AND REUSE
- A. Do not remove forms or bracing until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 1. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
 - B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
 - C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.
 - D. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

- E. 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.

END OF SECTION

SECTION 03 2000 - CONCRETE REINFORCING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.2. RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories.
- B. Section 03 3000 - Cast-in-Place Concrete.

1.3. REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010 (Errata 2012).
- B. ACI 318 - Building Code Requirements For Structural Concrete and Commentary; American Concrete Institute International; 2011.
- C. ACI SP-66 - ACI Detailing Manual; American Concrete Institute International; 2004.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2015.
- E. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement; 2014.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- G. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; American Welding Society; 2011.
- H. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute; 2009.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include 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.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.5. QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301.

1.6. DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.1. REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Plain billet-steel bars.
- B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.
- C. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.
- D. Steel Welded Wire Reinforcement (WWR): Plain type; ASTM A1064/A1064M.

1. Form: as drawn steel wire into Flat Sheets.
 - E. Reinforcement Accessories:
 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
 2. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.
 3. 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:
 - a. 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.
 - 2.2. Re-bar Splicing:
 - A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.
 - 2.3. FABRICATION
 - A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
 - B. Welding of reinforcement is not permitted.
 - C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
- PART 3 EXECUTION
- 3.1. PLACEMENT
 - A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.
 - C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 1. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
 - D. 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.
 - E. Do not displace or damage vapor barrier.
 - F. Accommodate placement of formed openings.
 - G. Maintain concrete cover around reinforcing according to Construction Drawings.
 - 3.2. FIELD QUALITY CONTROL
 - A. An independent testing agency, as specified in Section 01 4000, will inspect installed reinforcement for conformance to contract documents before concrete placement.
 1. Steel reinforcement placement.
 2. Steel reinforcement welding.

END OF SECTION

SECTION 03 3000 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Floors and slabs on grade.
- B. Concrete foundation walls and footings.
- C. Concrete curing.

1.2. RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories: Forms and accessories for formwork.
- B. Section 03 2000 - Concrete Reinforcing.
- C. Section 07 9200 - Joint Sealants: Products and installation for sealants for saw cut joints and isolation joints in slabs.

1.3. REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute International; 2010.
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2009).
- C. ACI 301 - Specifications for Structural Concrete; American Concrete Institute International; 2010 (Errata 2012).
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007).
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- F. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.
- G. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.
- H. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001 (Reapproved 2008).
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2011.
- J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2014.
- K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2014.
- L. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.
- M. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2012.
- N. ASTM C150/C150M - Standard Specification for Portland Cement; 2012.
- O. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2014.
- P. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- Q. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- R. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.

- S. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2012.
- T. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2013.
- U. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- V. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.
- W. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.

1.4. ACTION SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. For each concrete mixture, indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
 - 2. For each concrete mixture, indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
 - 3. Indicate amounts of mixing water to be withheld for later addition at the Project site.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.5. INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, manufacturer, and testing agency.
- B. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Curing compounds.
 - 4. Bonding agents.
 - 5. Adhesives.
 - 6. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- D. Field quality-control reports.

1.6. QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

- D. 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."
 - E. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- 1.7. PRECONSTRUCTION TESTING
- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.
- 1.8. FIELD CONDITIONS
- A. 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.
 - B. 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.

PART 2 PRODUCTS

2.1. FORMWORK

- A. Comply with requirements of Section 03 1000.

2.2. REINFORCEMENT

- A. Comply with requirements of Section 03 2000.

2.3. CONCRETE MATERIALS

- A. Cement: ASTM C150, Type I/II Portland type, gray.
 - 1. Acquire all cement for entire project from same source.
- B. Normal-Weight Fine and Coarse Aggregates: ASTM C 33 or better, graded.
 - 1. Acquire all aggregates for entire project from same 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.
 - 2. Maximum Coarse-Aggregate Size: 1-1/2 inches unless noted otherwise per design mix.

3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

- C. Fly Ash: ASTM C618, Class C.
- D. Water: ASTM C 94/C 94M and potable.

2.4. ADMIXTURES

- A. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
- B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- C. Air Entrainment Admixture: ASTM C260/C260M.
- D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Retarding Admixture: ASTM C494/C494M Type B.
- H. Water Reducing Admixture: ASTM C494/C494M Type A.

2.5. ACCESSORY MATERIALS

- A. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
 1. ASTM C1107/C1107M; Grade A, B, or C.
 2. Minimum Compressive Strength at 48 Hours, ASTM C109/C109M: 2,000 pounds per square inch.
 3. Minimum Compressive Strength at 28 Days, ASTM C109/C109M: 7,000 pounds per square inch.

2.6. CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.
- B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309, Type 1, Class B.
- C. Curing and Sealing Compound, Moisture Emission Reducing: Liquid, membrane-forming, clear sealer, for application to newly placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.
 1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
 2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
 3. VOC Content: Less than 100 g/L.
 4. Solids Content: 25 percent, minimum.
- D. Moisture-Retaining Sheet: ASTM C171.
 1. Polyethylene film, clear, minimum nominal thickness of 0.0040 in..
 2. White-burlap-polyethylene sheet, weighing not less than 10 oz/per linear yd, 40 inches wide.
- E. Water: Potable, not detrimental to concrete.

2.7. 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/C 150M, 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.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C 150/C 150M, 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.

2.8. CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
1. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - a. Fly Ash: 25 percent.
 2. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, or both, as specified in ACI 301.
1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete for Isolated Footings and Continuous Footings:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
 2. Total Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size
 3. Maximum Slump: 5 inches for concrete without a water-reducing or plasticizing admixture. 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch
 4. Maximum Aggregate Size: 1-1/2 inch.
- E. Normal Weight Concrete for Foundation Walls and Pedestals:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.

2. Total Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2 inch nominal maximum aggregate size.
 3. Maximum Slump: 4 inches for concrete without high-range water-reducing or plasticizing admixture; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 4. Maximum Aggregate Size: 1-1/2 inch.
- F. Normal Weight Concrete for Interior Slabs on Grade:
1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: As indicated on drawings.
 2. Total Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
 3. Maximum Slump: 4 inches for concrete without a high-range water-reducing or plasticizing admixture; or 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
 4. Maximum Aggregate Size: 3/4 inch.
- 2.9. MIXING
- A. Transit Mixers: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M, and furnish batch ticket information.
1. Ticket to show amount of water required or allowed to be added on site.
 2. 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. EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.2. 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 vertical joints in walls beside pedestals integral with walls, near corners, and in concealed locations where possible.
 4. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.3. PREPARATION

- A. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. See Specification Section 03 0505.
- B. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- 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 is 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 not to 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.
- 3.4. PLACING CONCRETE
- A. Place concrete in accordance with ACI 304R.
 - B. Place concrete for floor slabs in accordance with ACI 302.1R.
 - C. Notify Architect not less than 24 hours prior to commencement of placement operations.
 - D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
 - E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
 - F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.
- 3.5. SLAB JOINTING
- A. Locate joints as indicated on the drawings.
 - B. Anchor joint fillers and devices to prevent movement during concrete placement.
 - C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.
 - D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.
 - E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.
- 3.6. FLOOR FLATNESS AND LEVELNESS TOLERANCES
- A. An independent testing agency, as specified in Section 01 4000, will inspect finished slabs for conformance to specified tolerances.
 - B. Measure floor and slab flatness and levelness within 24 hours of finishing.
 - C. Maximum Variation of Surface Flatness:
 1. Exposed Concrete Floors: 1/8 inch in 10 ft.
 2. Under Seamless Resilient Flooring: 1/8 inch in 10 ft.
 3. Under Carpeting: 1/8 inch in 10 ft.
 - D. Correct the slab surface if tolerances are less than specified.

- E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.7. CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
 - 1. Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
 - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
- D. Concrete Slabs: Finish to requirements of ACI 302.1R for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
 - 1. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - a. Surfaces to Receive Scratch Finish include quarry tile, ceramic tile, and terrazzo-(ADD 01)with full bed setting system.
 - 2. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 3. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - a. Surfaces to Receive Trowel Finish include carpeting, resilient flooring, seamless flooring, thin set quarry tile, and thin set ceramic tile.
 - 4. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 5. Other Surfaces to Be Left Exposed: Trowel Finish, minimizing burnish marks and other appearance defects.
- E. 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. CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot (ACI 301) or cold temperatures (ACI 306.1), and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than 7 days.

- C. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- D. Formed Surfaces: Cure by moist curing. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- E. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
 - 2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than four days by water ponding, water-fog spray, or absorptive cover.
 - a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.
 - b. Spraying: Spray water continuously over floor slab areas and maintain wet.
 - c. Saturated Burlap or Absorptive Cover: Saturate cover and place over concrete surfaces, lapping ends and sides a minimum of 12 inches; maintain in place and keep continuously wet.
 - 3. Final Curing: Begin after initial curing but before surface is dry.
 - a. Moisture-Retaining Sheet: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than three days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b. 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.
 - 1) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.
 - c. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.9. FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000. The contractor shall be responsible for scheduling all required tests.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Contractor shall notify the owner's representative a minimum of 48 hours prior to all placement of concrete.
- D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

- E. Inspections:
 - 1. Verification of use of required design mixture.
 - 2. Concrete placement, including conveying and depositing.
 - 3. Curing procedures and maintenance of curing temperature.
- F. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 - 3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - 4. Compressive Strength Tests: ASTM C39/C39M. Test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 - b. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 - 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
 - 6. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- G. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- H. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
- I. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- J. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.10. 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 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches 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 (0.25 mm) 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 (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.11. PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 04 2000 - UNIT MASONRY

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Common Brick.
- B. Mortar and Grout.
- C. Reinforcement and Anchorage.
- D. Flashings.
- E. Lintels.
- F. Accessories.

1.2. REFERENCE STANDARDS

- A. ACI 530/530.1/ERTA - Building Code Requirements and Specification for Masonry Structures and Related Commentaries; American Concrete Institute International; 2011.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- F. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale); 2013.
- G. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2014.
- H. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.
- I. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2011.
- J. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- K. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- L. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2014.
- M. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- N. ASTM C387/C387M - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar; 2011b.
- O. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- P. ASTM C476 - Standard Specification for Grout for Masonry; 2010.
- Q. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2012.
- R. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms; 2014.
- S. ASTM C1357 - Standard Test Methods for Evaluating Masonry Bond Strength; 2009.
- T. BIA Technical Notes No. 7 - Water Penetration Resistance - Design and Detailing; 2005.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, mortar, and masonry accessories.
- C. Samples: Submit four samples of facing brick units to illustrate color, texture, and extremes of color range.
 - 1. Submit sample of pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.4. QUALITY ASSURANCE

- A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

1.5. MOCK-UP

- A. Construct a masonry wall as an exterior wall mock-up panel sized 6 feet long by 6 feet high; include mortar, accessories, structural backup, and flashings (with lap joint, corner, and end dam) in mock-up.
 - 1. Include lower corner of glazing opening framed at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
 - 2. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
 - 3. Include metal studs, sheathing, sheathing joint-and-penetration treatment air barrier, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.
- B. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
- C. Approved mock-up may remain as part of the Work.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.1. BRICK UNITS

- A. Buff Brick (Brick "A"):
 - 1. Basis of Design: Belden 691-693.
 - 2. ASTM C216, Smooth, Type FBX.
 - 3. Compressive strength: 10,986 psi, measured in accordance with ASTM C67.
 - 4. Initial Rate of Absorption: Less than 3.5g/30 sq.in. per minute when tested per ASTM C67.
 - 5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 - 6. Nominal size: modular.
- B. Red Brick (Brick "B"):
 - 1. Basis of Design: Meridian Brick Company "Dark Red Wirecut", Columbia plant (formerly Hanson 350).

- C. Building (Common) Brick: ASTM C62, Grade SW; solid units.

1. Nominal size: As indicated on drawings.

2.2. MORTAR AND GROUT MATERIALS

- A. Masonry Cement: ASTM C91/C91M, Type N.

1. Colored Mortar: Premixed cement as required to match Architect's color sample.

2. Manufacturers:

- a. Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
- b. Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
- c. Lafarge North America Inc.; Eaglebond Portland & Lime.
- d. Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
- e. Substitutions: See Section 01 6000 - Product Requirements.

- B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.

- C. Hydrated Lime: ASTM C207, Type S.

- D. Mortar Aggregate: ASTM C144.

- E. Grout Aggregate: ASTM C404.

- F. Water: Clean and potable.

- G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Section 016000 "Product Requirements."

2. Products: Subject to compliance with requirements, provide one of the following:

- a. Euclid Chemical Company (The); Accelguard 80.
- b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
- c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

2.3. REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:

- 1. Blok-Lok Limited: www.blok-lok.com.
- 2. Hohmann & Barnard, Inc; 2-Seal Tie: www.h-b.com/sle.
- 3. WIRE-BOND: www.wirebond.com.
- 4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Seismic Adjustable Masonry-Veneer Anchors:

- 1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - a. Structural Performance Characteristics: Capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of 0.05 inch.
- 2. Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 0.187-inch diameter, hot-dip galvanized-steel wire unless otherwise indicated.
- 3. Screw-Attached, Masonry-Veneer Seismic Anchors: Units consisting of a wire tie and a metal anchor section.

- a. Products: Subject to compliance with requirements, provide the following:
 - 1) Masonry ties: Hohmann and Banard HB-213 SIS. Field verify from mock up the required depth.
- b. Anchor Section: Corrosion-resistant, self-drilling, eye-screw designed to receive wire tie. Eye-screw has spacer that seats directly against framing and is same thickness as sheathing and has gasketed, washer head that covers hole in sheathing.
- C. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches.

2.4. FLASHINGS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
 - 1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
 - 2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
 - 3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 - 4. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 - 5. Fabricate metal drip edges for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending at least 3 inches into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam. Form hem on upper surface of metal so that completed seam will shed water.
 - 6. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 - 7. Metal Sealant Stop: Fabricate from stainless steel. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and down into joint 1/4 inch to form a stop for retaining sealant backer rod.
 - 8. Metal Expansion-Joint Strips: Fabricate from stainless steel to shapes indicated.
- B. Flexible Flashing: Use the following unless otherwise indicated:
 - 1. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch thick.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
 - 2) Firestone Specialty Products; FlashGuard.
 - 3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.
 - 4) Hohmann & Barnard, Inc.; Epra-Max EPDM Thru-Wall Flashing.
 - 5) Sandell Manufacturing Co., Inc.; EPDM Flashing.
 - 2. Stainless Steel Flashing

- a. Products: York Flashings
 - C. Application: Unless otherwise indicated, use the following:
 - 1. Where flashing is indicated to receive counterflashing, use metal flashing.
 - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 - 3. Where flashing is fully concealed, use flexible flashing.
 - D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- 2.5. ACCESSORIES
- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
 - 1. Manufacturers:
 - a. Blok-Lok Limited: www.blok-lok.com.
 - b. Hohmann & Barnard, Inc: www.h-b.com/sle.
 - c. WIRE-BOND: www.wirebond.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 - B. Joint Filler: Closed cell polyvinyl chloride: oversized 50 percent to joint width; self expanding.
 - C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
 - 1. Full-Height Airspace Maintenance and Drainage Material: Mesh panels, fitted between masonry ties.
 - a. Manufacturers:
 - 1) Advanced Building Products, Inc.; Mortairvent-CW: www.advancedbuildingproducts.com/sle.
 - 2) CavClear/Archovations, Inc; CavClear Masonry Mat: www.cavclear.com.
 - 3) Substitutions: See Section 01 6000 - Product Requirements.
 - D. Drip Edge: Stainless steel; compatible with membrane and adhesives.
 - E. Weeps:
 - 1. Type: Polyester mesh.
 - a. Manufacturers:
 - 1) Blok-Lok Limited: www.blok-lok.com.
 - 2) CavClear/Archovations, Inc: www.cavclear.com.
 - 3) Mortar Net Solutions: www.mortarnet.com.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.
 - F. Cavity Vents:
 - 1. Type: Polyethylene tubing.
 - a. Manufacturers:
 - 1) Blok-Lok Limited: www.blok-lok.com.
 - 2) Hohmann & Barnard, Inc: www.h-b.com/sle.
 - 3) WIRE-BOND: www.wirebond.com.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.

- G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.6. LINTELS

- A. Provide lintels as shown on the Drawings.

2.7. MORTAR AND GROUT MIXES

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Interior, loadbearing masonry: Type N.
- B. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- C. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2. PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.3. COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

3.4. COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Running.
 - 2. Coursing: Three units and three mortar joints to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.5. PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.

- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners, except for units laid in stack bond.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- J. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.6. WEEPS/CAVITY VENTS

- A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.
- B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.7. CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. Install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions. Verify that airspace width is no more than 3/8 inch greater than panel thickness. Install horizontally between joint reinforcement. Stagger end joints in adjacent rows. Fit to perimeter construction and penetrations without voids.

3.8. REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.9. MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 6 inches into adjacent masonry or turn up at least 8 inches to form watertight pan at non-masonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Extend metal flashings through exterior face of masonry and turn down to form drip. Install joint sealer below drip edge to prevent moisture migration under flashing.
- C. Extend plastic, laminated, and EPDM flashings to within 1/4 inch of exterior face of masonry.

3.10. LINTELS

- A. Install lintels as shown on the Drawings.

3.11. CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

- C. Size control joints as indicated on drawings; if not shown, 3/4 inch wide and deep.

3.12. BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
 - 1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build into masonry construction organic materials that are subject to deterioration.

3.13. TOLERANCES

- A. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- B. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.14. FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67 requirements, sampling 5 randomly chosen units for each 50,000 installed.
- C. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.15. CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.

3.16. PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 04 7200 - CAST STONE MASONRY

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Architectural cast stone.
- B. Units required are indicated on drawings as "stone trim".

1.2. RELATED REQUIREMENTS

- A. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.

1.3. REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2011.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement; 2015.
- C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2009.
- D. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2015.
- F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- G. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- H. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- I. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2013.
- J. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2013.
- K. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2018.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Test results of cast stone components made previously by the manufacturer.
- C. Shop Drawings: Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, and piece numbers.
- D. Verification Samples: Pieces of actual cast stone components not less than 6 inches square, illustrating range of color and texture to be anticipated in components furnished for the project.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. A firm with a minimum of 5 years experience producing cast stone of types required for project.
 - 2. Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.6. MOCK-UP

- A. See Section 01 4000 - Quality Requirements for additional requirements.
- B. Approved mock-up will become standard for appearance and workmanship.
- C. Mock-up may remain as part of the completed work.
- D. Remove mock-up not incorporated into the work and dispose of debris.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- C. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- D. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- E. Store mortar materials where contamination can be avoided.
- F. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Architectural Cast Stone:
 - 1. Continental Cast Stone; Kirkwood, Missouri.
 - 2. Midwest Cast Stone; Kirkwood, Missouri.
 - 3. Edwards Cast Stone Company; Dubuque, Iowa.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.2. ARCHITECTURAL CAST STONE

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural granite, complying with ASTM C1364.
 - 1. Basis of Design for stone sills: Continental Cast Stone: SIL11JS1.
 - 2. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 - 3. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
 - 4. Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
 - 5. Color: Continental cast stone color "Whitestone".
 - 6. Remove cement film from exposed surfaces before packaging for shipment.
- B. Shapes: Provide shapes indicated on drawings.
 - 1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
 - 2. Unless otherwise indicated on drawings, provide:
 - a. Wash or slope of 1:12 on exterior horizontal surfaces.
 - b. Drips on projecting components, wherever possible.
 - c. Outside corner shapes.
- C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.

2.3. MATERIALS

- A. Portland Cement: ASTM C150/C150M.
 - 1. For Units: Type I or II, white.

2. For Mortar: Type I or II, except Type III may be used in cold weather.
 - B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
 - C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
 - D. Admixtures: ASTM C494/C494M.
 - E. Water: Potable.
 - F. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
 1. Galvanized in accordance with ASTM A767/A767M, Class I.
 - G. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
 - H. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
 - I. Mortar: Portland cement-lime, as specified in Section 04 0511; do not use masonry cement.
 - J. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.
- 2.4. SOURCE QUALITY CONTROL
- A. Test compressive strength and absorption of specimens selected at random from plant production.
 1. Test in accordance with ASTM C642.
 2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine construction to receive cast stone components. Notify Architect if construction is not acceptable.
- B. Do not begin installation until unacceptable conditions have been corrected.

3.2. INSTALLATION

- A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 2000.
- B. Mechanically anchor cast stone units indicated; set remainder in mortar.
- C. Setting:
 1. Drench cast stone components with clear, running water immediately before installation.
 2. Set units in a full bed of mortar unless otherwise indicated.
 3. Fill vertical joints with mortar.
 4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

3.3. TOLERANCES

- A. Installation Tolerances:
 1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
 2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
 3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.

4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.4. REPAIR

- A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.
- B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.
- C. Repair methods and results subject to Architect 's approval.

3.5. CLEANING

- A. Keep cast stone components clean as work progresses.
- B. Clean completed exposed cast stone after mortar is thoroughly set and cured.
 1. Wet surfaces with water before applying cleaner.
 2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
 3. Remove cleaner promptly by rinsing thoroughly with clear water.
 4. Do not use acidic cleaners.

3.6. PROTECTION

- A. Protect completed work from damage.
- B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

SECTION 05 1200 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Structural steel framing members, support members.
- B. Loose lintels.
- C. Base plates.
- D. Grouting under base plates.

1.2. RELATED REQUIREMENTS

- A. Section 05 3100 - Steel Decking: Support framing for small openings in deck.
- B. Section 07 8100 - Applied Fire Protection: Fireproof protection to framing and metal deck systems.
- C. Section 07 8123 - Intumescent Fire Protection: Fireproof protection to framing in selected areas.
- D. Section 09 9113 - Exterior Painting and Section 09 9123 - Interior Painting: surface preparation and priming requirements.

1.3. REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; American Institute of Steel Construction, Inc.; 2011.
- B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.; 2010.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014.
- E. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2010.
- F. ASTM A325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric); 2013.
- G. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- H. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2005 (Reapproved 2009).
- I. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts; 2007a (Reapproved 2014).
- J. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts [Metric]; 2007.
- K. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011.
- L. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014.
- M. ASTM E94 - Standard Guide for Radiographic Examination; 2004 (Reapproved 2010).
- N. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments; 2013.
- O. ASTM E165/E165M - Standard Test Method for Liquid Penetrant Examination for General Industry; 2012.
- P. ASTM E709 - Standard Guide for Magnetic Particle Testing; 2014.
- Q. ASTM F436 - Standard Specification for Hardened Steel Washers; 2011.
- R. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2007a.

- S. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.
- T. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2011 w/Errata.
- U. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections; 2009.

1.4. COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and cuts.
 - 2. Connections, connections not detailed, splices, and holes.
 - 3. Indicate welded connections with AWS A2.4 welding symbols. Distinguish between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts. Distinguish between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
 - 5. Include embedment Drawings.
- C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.
- D. Mill Test Reports for structural steel: Indicate structural strength, and chemical and physical properties.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- F. Product Data: For each type of product. Include Test Reports for the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shop Primers.
 - 5. Non-shrink grout.
- G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- H. Source quality-control reports.

1.6. QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC "Steel Construction Manual."
- B. Fabricate steel fasteners in accordance with RCSC "Specification for Structural Joints Using ASTM A325 or A490 Bolts."
- C. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.

- D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- F. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Steel Angles, Plates, and Channels: ASTM A36/A36M.
- B. Steel W Shapes and Tees: ASTM A992/A992M.
- C. Rolled Steel Structural Shapes: ASTM A992/A992M.
- D. Steel Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.
- E. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.
- F. High-Strength Structural Bolts, Nuts, and Washers: ASTM A325 or A325M, Type 1, medium carbon, plain, with matching compatible ASTM A563 Grade C or A563M Class 8S heavy-hex carbon-steel nuts and ASTM F436 Type 1 hardened carbon-steel washers.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.
- G. Unheaded Anchor Rods: ASTM F1554, per Documents (Grade 36 minimum), plain. Provide Hot-dip zinc coating, ASTM A 153/A 153M, Class C at exterior conditions. Provide matching ASTM A563 or A563M heavy-hex carbon-steel nuts and ASTM F436 Type 1 hardened carbon-steel washers.
- H. Headed Anchor Rods: As per Documents (ASTM F1554, Grade 36 minimum), plain. Provide Hot-dip zinc coating, ASTM A 153/A 153M, Class C at exterior conditions. Provide matching ASTM A563 or A563M heavy-hex carbon-steel nuts and ASTM F436 Type 1 hardened carbon-steel washers.
- I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

2.2. GROUT

- A. See Specification Section 03 3000.

2.3. PRIMER

- A. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

- B. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.4. FABRICATION

- A. Shop fabricate to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 2. Mark and match-mark materials for field assembly.
 - 3. Complete structural-steel assemblies, including welding of units, before starting shop- priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.
- D. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

2.5. SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.6. FINISH

- A. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- B. Prepare structural component surfaces in accordance with SSPC SP 6. Remove loose rust and mill scale and spatter, slag or flux deposits.
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.
- D. Shop prime structural steel members. Do not prime surfaces that will be galvanized, fireproofed, field welded, high strength bolted, or embedded in concrete or mortar..
- E. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.
3. Galvanize all exterior steel members and connectors.

2.7. SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts."
- C. Welded Connections: Visually inspect all shop-welded connections using one of the following at the testing agency's option:
 1. Radiographic testing performed in accordance with ASTM E94.
 2. Ultrasonic testing performed in accordance with ASTM E164.
 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 4. Magnetic particle inspection performed in accordance with ASTM E709.
- D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- E. Prepare test and inspection reports.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3. ERECTION

- A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges," accurately in locations and to elevations indicated.
- B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 2. Weld plate washers to top of baseplate.
 3. Snug-tighten anchor rods after supported members have been positioned and plumbed unless indicated to be pretensioned. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.

4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts
 - C. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
 - D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 1. Level and plumb individual members of structure.
 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
 - E. Splice members where indicated.
 - F. Do not use thermal cutting during erection unless approved by Construction Representative. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
 - G. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened shear connections and Pretensioned moment connections.
 2. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
 - H. Field weld components indicated on shop drawings.
 1. Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 2. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 3. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 4. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.
 - I. Do not field cut or alter structural members without approval of Architect.
 - J. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
 - K. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.
- 3.4. TOLERANCES
- A. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- 3.5. FIELD QUALITY CONTROL
- A. Owner shall engage an independent testing agency to perform field quality control tests, as specified in Section 01 4000 to include the following inspections:
 1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.

- B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC "Specification for Structural Joints Using High-Strength Bolts." _____
 - C. Welded Connections: Visually inspect all field-welded connections in accordance with AWS D.1./D1.1M and test using one of the following, at the testing agency's option:
 - 1. Radiographic testing performed in accordance with ASTM E94.
 - 2. Ultrasonic testing performed in accordance with ASTM E164.
 - 3. Liquid penetrant inspection performed in accordance with ASTM E165/E165M.
 - 4. Magnetic particle inspection performed in accordance with ASTM E709.
 - D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- 3.6. REPAIRS AND PROTECTION
- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.
 - B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION

SECTION 05 3100 - STEEL DECKING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Roof deck.
- B. Supplementary framing for openings up to and including 12 inches.

1.2. RELATED REQUIREMENTS

- A. Section 05 1200 - Structural Steel Framing: Support framing for openings larger than 12 inches .
- B. Section 07 8100 - Applied Fire Protection: Spray applied fireproofing.

1.3. REFERENCE STANDARDS

- A. ASTM A510/A510M - Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel; 2013.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2013.
- D. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2011 w/Errata.
- E. ICC-ES AC43 - Acceptance Criteria for Steel Deck Roof and Floor Systems; ICC Evaluation Service, Inc.; 2010 (R2013).
- F. ICC-ES AC70 - Acceptance Criteria for Fasteners Power Driven into Concrete, Steel and Masonry Elements; ICC Evaluation Service, Inc.; 2013.
- G. SDI (DM) - Publication No.31, Design Manual for Composite Decks, Form Decks, Roof Decks; Steel Deck Institute; 2007.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Shop Drawings: Indicate deck plan and layout, types of deck panels, anchorage details and attachment to other construction, support locations, projections, openings, reinforcement, pertinent details, and accessories.
- C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
- E. Certificates: Certify that products furnished meet or exceed specified requirements.
- F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months with the gage(s) of material specified.
- G. Field quality-control reports.

1.5. QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

- B. Store deck on dry wood sleepers, platforms, or pallets; slope for positive drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 PRODUCTS

2.1. PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

2.2. STEEL DECK

- A. Roof Deck: Non-composite type, fluted steel sheet, fabricated panels without top-flange stiffening grooves:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
 - 2. Structural Properties:
 - a. Span Design: 2-span or more.
 - 3. Minimum Base Metal Thickness: 20 gage, 0.0359 inch or as indicated in Drawings.
 - 4. Nominal Height: 1-1/2 inch.

2.3. ACCESSORY MATERIALS

- A. Welding Materials: AWS D1.1/D1.1M.
- B. Fasteners: Galvanized hardened steel, self tapping.
- C. Powder Actuated Mechanical Fasteners: Steel; with knurled shank and forged ballistic point. Comply with applicable requirements of ICC-ES AC70.
 - 1. Material: Steel; ASTM A510/A510M, Grade 1077.
 - a. Washers:
 - 1) Steel Bar Joist Framing Applications: 0.472 inch diameter, minimum.
 - b. Corrosion Resistance:
 - 1) Steel Bar Joist Framing Applications: ASTM B 633, SC1, Type III zinc electroplate..
- D. Mechanical Fasteners: Steel; hex washer head, self-drilling, self-tapping.
 - 1. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- E. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 1/8 inch thick.
- F. Galvanizing Repair Paint: ASTM A 780.
- G. Flute Closures: Closed cell vulcanized, synthetic rubber, minimum 1 inch thick; profiled to fit tight to the deck.

2.4. FABRICATED DECK ACCESSORIES

- A. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- B. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION, GENERAL

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners shall be used in lieu of welding to fasten deck where indicated. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3. ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:
 - 1. Weld Diameter: As indicated. Use weld washers.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals as indicated.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Miscellaneous Roof-Deck Accessories: Install finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

3.4. FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Construction Representative.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5. PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 4000 - COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Formed steel stud exterior wall and interior wall framing.
- B. Formed steel joist and purlin framing and bridging.

1.2. RELATED REQUIREMENTS

- A. Section 05 3100 - Steel Decking.
- B. Section 09 2116 - Gypsum Board Assemblies: Lightweight, non-load bearing metal stud framing.

1.3. REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.
- D. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2011c.
- E. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2011a.
- F. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2011 w/Errata.
- G. AWS D1.3/D1.3M - Structural Welding Code - Sheet Steel; American Welding Society; 2008.
- H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, limitations .
- C. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.
- D. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
 - 1. Indicate stud and ceiling joist layout, spacing, sizes, thickness, and types of cold-formed steel framing.
 - 2. Describe method for securing studs to tracks and for bolted, welded, or screwed framing connections.
 - 3. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 4. Provide design engineer's stamp on shop drawings.

- E. Delegated-Design Submittal: For cold-formed steel framing members and connections including calculations and drawings sealed by a licensed Structural Engineer in the State of Illinois.
- F. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .
- G. Qualification Data: For testing agency.

1.6. QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 PRODUCTS

2.1. PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 - Quality Requirements, to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated on GENERAL STRUCTURAL NOTES sheet in the Drawings.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Non-Gravity, Lateral Load-Bearing Wall Framing: Horizontal deflection of 1/600 of the wall height.
 - 3. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards:
 - 1. Floor and Roof Systems: AISI S210.
 - 2. Wall Studs: AISI S211.
 - 3. Headers: AISI S212.
 - 4. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

2.2. FRAMING SYSTEM

- A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.
- B. Shop fabricate framing system to the greatest extent possible.

- C. Deliver to site in largest practical sections.

2.3. FRAMING MATERIALS

- A. Sizes and thicknesses indicated are minimums. See Drawings for sizes and thicknesses.
- B. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track, unpunched, in matching nominal depth and compatible height.
 - 1. Gage and Depth: As indicated on the drawings.
 - 2. Stud Flange Width: 1-5/8 inch minimum
 - 3. Track Flange Width: 1-1/4 inch minimum
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as indicated on drawings
- D. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as indicated on drawings
- E. Joists and Purlins: Fabricated from ASTM A653/A653M steel sheet, with G90/Z275 hot dipped galvanized coating.
 - 1. Gage and Depth: As indicated on the drawings.
- F. Framing Connectors: Factory-made, formed steel sheet.
 - 1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch, and factory punched holes and slots.
 - 2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 - 3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
 - 4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.
 - 5. Wall Stud Bridging Connections: Provide mechanical load-transferring devices that accommodate wind load torsion and weak axis buckling induced by axial compression loads. Provide bridging connections where indicated on the drawings.

2.4. ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 - 1. Supplementary framing.
 - 2. Bracing, bridging, and solid blocking.
 - 3. Web stiffeners.
 - 4. Anchor clips.
 - 5. End clips.
 - 6. Foundation clips.
 - 7. Gusset plates.
 - 8. Stud kickers and knee braces.

9. Hole reinforcing plates.
10. Backer plates.
- C. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- D. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.5. FASTENERS

- A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.
 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- B. Anchorage Devices: Powder actuated.
 1. Fabricate from corrosion-resistant materials, with allowable load capacities calculated according to ICC- ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Anchor Bolts: ASTM F 1554, Grade 36 hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- E. Welding: In conformance with AWS D1.1/D1.1M.

2.6. FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 1. Fabricate framing assemblies using jigs or templates.
 2. Cut framing members by sawing or shearing; do not torch cut.
 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of- square tolerance of 1/8 inch.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify supporting substrates and abutting structural framing 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. PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3. INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 07 2100 - Thermal Insulation, in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4. INSTALLATION OF STUDS

- A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

- B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners along the ceiling per Drawings or Shop drawings. Securely anchor at corners and ends, spaced at maximum 24 inches unless noted otherwise on Drawings or Shop Drawings. Coordinate installation of sealant with floor and ceiling tracks.
- C. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Place studs at 16 inches on center; not more than 2 inches from abutting walls and at each side of openings. Connect studs to tracks using fastener method.
 - 1. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs unless noted otherwise on Drawings or Shop Drawings.
 - 1. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 2. Fasten jamb members together to uniformly distribute loads.
 - 3. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- E. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- F. Install load bearing studs full length in one piece. Splicing of studs is not permitted.
- G. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.
- H. Coordinate placement of insulation in multiple stud spaces made inaccessible after erection.
- I. Install intermediate studs above and below openings to align with wall stud spacing.
- J. Align studs vertically where floor framing interrupts wall-framing continuity.
- K. Provide deflection allowance in stud track, directly below horizontal building framing at non-load bearing framing.
- L. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 - 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- M. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings. Fasten at each stud intersection.
 - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
 - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

- N. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- O. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5. INSTALLATION OF JOISTS AND PURLINS

- A. Install framing components in accordance with manufacturer's instructions.
- B. Make provisions for erection stresses. Provide temporary alignment and bracing.

3.6. WALL SHEATHING

- A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.

3.7. TOLERANCES

- A. Maximum Variation from True Position: 1/8 inch in 10 feet.
- B. Maximum Variation of any Member from Plane: 1/8 inch.

3.8. FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9. REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 06 1000 - ROUGH CARPENTRY

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Roof-mounted curbs.
- B. Roofing nailers.
- C. Roofing cant strips.
- D. Preservative treated wood materials.
- E. Fire retardant treated wood materials.
- F. Concealed wood blocking, nailers, and supports.
- G. Miscellaneous wood nailers, furring, and grounds.

1.2. RELATED REQUIREMENTS

- A. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
- B. Section 07 7200 - Roof Accessories: Prefabricated roof curbs.
- C. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based exterior sheathing.

1.3. REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2009.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- D. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.
- E. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010.
- F. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- H. AWWA U1 - Use Category System: User Specification for Treated Wood; 2012.
- I. PS 20 - American Softwood Lumber Standard; 2010.
- J. SPIB (GR) - Grading Rules; 2014.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and fire retardant treated materials.
- C. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.6. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1. GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. Species: Douglas Fir-Larch, unless otherwise indicated.
 - 2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.

2.2. DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Sizes: Nominal sizes as indicated on drawings, S4S.
- B. Moisture Content: S-dry or MC19.
- C. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2 or Standard Grade.
 - 2. All wood materials used within the building shall be fire treated.

2.3. ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2.4. FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWP A U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
 - 2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWP A standards.
- B. Fire Retardant Treatment:
 - 1. Manufacturers:
 - a. Lonza Group: www.wolmanizedwood.com/#sle.
 - b. Hoover Treated Wood Products, Inc: www.frtw.com.
 - c. Koppers, Inc: www.koppersperformancechemicals.com/#sle.
 - d. Viance, LLC; D-Blaze: www.treatedwood.com/#sle.
 - 2. Exterior Type: AWP A U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for

an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.

- a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. Treat all exterior rough carpentry items.
 - c. Do not use treated wood in direct contact with the ground.
 3. Interior Type A: AWP A U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
 - a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
 - b. All interior rough carpentry items are to be fire retardant treated.
 - c. Treat rough carpentry items as indicated .
 - d. Do not use treated wood in applications exposed to weather or where the wood may become wet.
- C. Preservative Treatment:
 1. Manufacturers:
 - a. Lonza Group: www.wolmanizedwood.com/#sle.
 - b. Koppers Performance Chemicals, Inc: www.koppersperformancechemicals.com/#sle.
 - c. Viance, LLC; Preserve ACQ: www.treatedwood.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 2. Preservative Pressure Treatment of Lumber Above Grade: AWP A U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
 - b. Treat lumber in contact with roofing, flashing, or waterproofing.
 - c. Treat lumber in contact with masonry or concrete.
 3. Preservative Pressure Treatment of Plywood Above Grade: AWP A U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - b. Treat plywood in contact with roofing, flashing, or waterproofing.
 - c. Treat plywood in contact with masonry or concrete.

PART 3 EXECUTION

3.1. PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.2. INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.3. BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide the following specific non-structural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall brackets.
 - 3. Handrails.
 - 4. Grab bars.
 - 5. Towel and bath accessories.
 - 6. Wall-mounted door stops.
 - 7. Chalkboards and marker boards.
 - 8. Wall paneling and trim.
 - 9. Joints of rigid wall coverings that occur between studs.

3.4. ROOF-RELATED CARPENTRY

- A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.
- B. Provide wood curb at all roof openings except where specifically indicated otherwise. Form corners by alternating lapping side members.

3.5. TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.6. CLEANING

- A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 4100 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Hardware.
- C. Preparation for installing utilities.

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 12 3600 - Countertops.

1.3. REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.
- C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2010.
- D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
 - 1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
 - 2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 3. Include certification program label.
- C. Product Data: Provide data for hardware accessories.
- D. Samples: Submit actual samples of architectural cabinet construction, minimum 8 inches square, illustrating proposed cabinet, countertop, and shelf unit substrate and finish.
- E. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, locksets, and surface materials, demonstrating hardware design, quality, and finish.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

1.6. QUALITY ASSURANCE

- A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.
 - 1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
 - 2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- B. Quality Certification:
 - 1. AWI Certification is desired but not required upon the Bidder's presentation of a quality control program acceptable to the Owner.

- a. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 2. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.
 3. Replace, repair, or rework all work for which certification is refused.
- 1.7. DELIVERY, STORAGE, AND HANDLING
- A. Protect units from moisture damage.
- 1.8. FIELD CONDITIONS
- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1. CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom grade.
- C. Cabinets:
 1. Finish - Exposed Exterior Surfaces: Decorative laminate.
 2. Finish - Exposed Interior Surfaces: Decorative laminate.
 3. Finish - Semi-Exposed Surfaces: Thermoset decorative panels.
 - a. Edges of Thermoset Decorative Panel Shelves: PVC or polyester edge banding.
 - b. For semi-exposed backs of panels with exposed plastic laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3 Grade VGS.
 4. Door and Drawer Front Edge Profiles: Square edge with thin applied band.
 5. Casework Construction Type: Type A - Frameless.
 6. Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
 7. Layout for Cabinet and Door Fronts: Flush panel.
 - a. Custom Grade: Doors, drawer fronts and false fronts wood grain to run and match vertically within each cabinet unit.
 8. Adjustable Shelf Loading: 50 lbs. per sq. ft.
 9. Cabinet Style: Flush overlay.
 10. Cabinet Doors and Drawer Fronts: Flush style.
 11. Drawer Side Construction: Glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints. Metal drawer system sides also acceptable..
 12. Drawer Construction Technique: Dovetail joints.

2.2. WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.
- B. Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 1. Wood moisture content: 5 to 10 percent.

- C. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Particleboard: ANSI A208.1, Grade M-2.
 - 2. Softwood Plywood: DOC PS 1, medium-density overlay.
 - 3. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGJL, for test methods 3.3, 3.4, 3.6, 3.8 and 3.10.

2.3. LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Arborite: www.arborite.com/#sle.
 - 2. Formica Corporation; ____: www.formica.com/#sle.
 - 3. Panolam Industries International, Inc: www.panolam.com/#sle.
 - 4. Wilsonart LLC; ____: www.wilsonart.com/#sle.
 - 5. Nevamar; www.nevamar.com/#sle.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Architect to select color from full range of manufacturer's line.
- C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.
- D. Provide specific types as follows:
 - 1. Edges: PVC edge banding, 1mm thick PVC on Cabinet, 3mm PVC on all Doors and Drawer fronts, matchint laminate in color, pattern and finish.

2.4. COUNTERTOPS

- A. Countertops are specified in Section 12 3600.

2.5. ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.
- C. Fasteners: Size and type to suit application.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.
- E. Concealed Joint Fasteners: Threaded steel.
- F. Grommets: Standard plastic grommets for cut-outs, in color to be selected by Architect from manufacturer's full range.
 - 1. Basis of Design: Bainbridge Manufacturing, Inc.; Plastic Cord Grommet #1035, 2" diameter.
 - 2. Locate grommets per Owner. Coordinate prior to order and installation.

2.6. HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.
- C. Fixed Standard Shelf, Countertop, and Workstation Brackets:

1. Material: Steel.
 2. Finish: Manufacturer's standard, factory-applied powder coat.
 3. Color: Selected by Architect from manufacturer's standard range.
 4. Products:
 - a. A&M Hardware, Inc; Standard Brackets: <http://www.aandmhardware.com/#sle>.
 - D. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.
 - E. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with chrome finish.
 - F. Catches: Magnetic.
 - G. Drawer Slides:
 1. Type: Full extension.
 2. Static Load Capacity: Heavy Duty grade.
 3. Mounting: Side mounted.
 - H. Hinges: European style concealed self-closing type, steel with satin finish.
- 2.7. FABRICATION
- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
 - B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
 - C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
 - D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.
 - E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Seal cut edges.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.2. INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use fixture attachments in concealed locations for wall mounted components.
- D. Use concealed joint fasteners to align and secure adjoining cabinet units.
- E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- F. Secure cabinets to floor using appropriate angles and anchorages.

3.3. ADJUSTING

- A. Test installed work for rigidity and ability to support loads.
- B. Adjust moving or operating parts to function smoothly and correctly.

3.4. CLEANING

- A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

SECTION 06 8316 - FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Fiberglass reinforced plastic panels.
- B. Trim.

1.2. REFERENCE STANDARDS

- A. 9 CFR 416.2 - Regulatory Requirements Under the Federal Meat Inspection Act and the Poultry Products Inspection Act, Part 416-Sanitation; current edition.
- B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010 (Reapproved 2018).
- C. ASTM D2583 - Standard Test Method for Indentation Hardness of Rigid Plastics by Means of Barcol Impressor; 2013a.
- D. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- E. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2017.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- G. ISO 2812-1 - Paints and varnishes -- Determination of resistance to liquids -- Part 1: Immersion in liquids other than water; 2017.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Samples: Submit two samples 4 by 4 inch in size illustrating material and surface design of panels.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Panels: Quantity equal to 5 percent of total installed.

1.4. DELIVERY, STORAGE, AND HANDLING

- A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Fiberglass Reinforced Plastic Panels:
 - 1. Nudo Products, Inc; FiberLite FRP, Class A: www.nudo.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.2. PANEL SYSTEMS

- A. Wall Panels FRP-1:
 - 1. Panel Size: 4 by 8 feet.
 - 2. Panel Thickness: 0.10 inch.
 - 3. Surface Design: Pebbled.
 - 4. Color: As indicated on drawings..

5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.3. MATERIALS

- A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
 1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Scratch Resistance: Barcol hardness score greater than 35, when tested in accordance with ASTM D2583.
 4. Impact Strength: Greater than 6 ft lb force per inch, when tested in accordance with ASTM D256.
 5. Sanitation and Cleanability: Comply with 9 CFR 416.2.
 6. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.
- B. Trim: Vinyl; color coordinating with panel.
- C. Adhesive: Type recommended by panel manufacturer.
- D. Sealant: Type recommended by panel manufacturer; color matching panel.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions and substrate flatness before starting work.
- B. Verify that substrate conditions are ready to receive the work of this section.

3.2. INSTALLATION - WALLS

- A. Install panels in accordance with manufacturer's instructions.
- B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
- C. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
- D. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
- E. Install panels with manufacturer's recommended gap for panel field and corner joints.
- F. Place trim on panel before fastening edges, as required.
- G. Fill channels in trim with sealant before attaching to panel.
- H. Install trim with adhesive and screws or nails, as required.
- I. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
- J. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 0553 - FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.2. REFERENCE STANDARDS

- A. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of marking, indicating font, foreground and background colors, wording, and overall dimensions.
- C. Schedule: Completely define scope of proposed marking, and indicate location of affected walls and partitions, and number of markings.

1.4. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.5. FIELD CONDITIONS

- A. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.1. FIRE AND SMOKE ASSEMBLY IDENTIFICATION

- A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.2. INSTALLATION

- A. Locate markings as required by ICC (IBC).
- B. Install neatly, with horizontal edges level.
- C. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 2100 - THERMAL INSULATION

PART 1 GENERAL

1.1. SECTION INCLUDES

1.2. RELATED REQUIREMENTS

- A. Section 07 2119 - Foamed-In-Place Insulation: Plastic foam insulation other than boards.
- B. Section 07 2500 - Weather Barriers: Separate air barrier and vapor retarder materials.
- C. Section 07 5323 EPDM Thermoset Single-Ply Roofing: Insulation specified as part of roofing system.
- D. Section 09 2116 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.3. REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- D. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.5. FIELD CONDITIONS

- A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.6. 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. APPLICATIONS

- A. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- B. Insulation Inside Masonry Cavity Walls: Extruded polystyrene (XPS) carbon black board.
- C. Insulation Over Metal Stud Framed Walls, Continuous: Extruded polystyrene (XPS) board.

2.2. FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
 - 1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
 - 2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
- B. Extruded Polystyrene (XPS) Cavity Wall Insulation Board: Complies with ASTM C578, and manufactured using carbon black technology.
 - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88), minimum, per 1 inch thickness at 75 degrees F mean temperature.
 - 4. Board Size: 15-3/4 inch by 96 inch.
 - 5. Board Thickness: 1-3/4 inch.
 - 6. Board Edges: Square.

2.3. ACCESSORIES

- A. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
 - 1. Application: Sealing of interior circular penetrations, such as pipes or cables.
 - 2. Width: Are required for application.
- B. Z-Furring: Non-thermally bridging Z-furring for use on exterior face.

PART 3 EXECUTION

3.1. BOARD INSTALLATION AT FOUNDATION PERIMETER

- A. Adhere a 6 inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
- B. Install boards horizontally on foundation perimeter.
 - 1. Butt edges and ends tightly to adjacent boards and to protrusions.
- C. Extend boards over expansion joints, unbonded to foundation on one side of joint.
- D. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.2. BOARD INSTALLATION AT EXTERIOR WALLS

- A. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
- B. Install boards vertically on walls, with thermally broken z-furring running vertically @ 16" o.c. to simultaneously support both the rigid insulation and the fiber cement siding.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.3. BOARD INSTALLATION AT CAVITY WALLS

- A. Install boards to fit snugly between wall ties.
- B. Install boards horizontally on walls.
 - 1. Butt edges and ends tightly to adjacent boards and to protrusions.
- C. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

- D. Insulation should lay flat against backup wall to avoid ledges to catch mortar. If adesive strips are used to maintain insulation position, apply adhesive in vertical stips to allow any water behind insulation to drain.

3.4. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.5. PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 2119 - FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Foamed-in-place insulation.
 - 1. In exterior wall crevices.
 - 2. At junctions of dissimilar wall and roof materials.
 - 3. At roof expansion joints.
- B. Protective intumescent coating.

1.2. REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2012.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, insulation properties, and preparation requirements.
- C. Certificates: Certify that products of this section meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.
- E. Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

1.4. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience.

1.5. FIELD CONDITIONS

- A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, open or closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.
 - 1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment, and overcoat limitations.
 - 2. Thermal Resistance: R-value of 5.0, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.

3. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
5. Air Permeance: 0.04 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.57 psf.
6. Closed Cell Content: At least 90 percent.
7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.

2.2. ACCESSORIES

- A. Primer: As required by insulation manufacturer.
- B. Protective Coating: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify work within construction spaces or crevices is complete prior to insulation application.
- B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.2. PREPARATION

- A. Mask and protect adjacent surfaces from over spray or dusting.
- B. Apply primer in accordance with manufacturer's instructions.

3.3. APPLICATION

- A. Apply insulation in accordance with manufacturer's instructions.
- B. Apply insulation by spray method, to a uniform monolithic density without voids.
- C. Patch damaged areas.
- D. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.
- E. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.4. PROTECTION

- A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 2400 - EXTERIOR INSULATION AND FINISH SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Composite wall and cornice cladding of rigid insulation and reinforced finish coating (Class PB).
- B. Drainage and water-resistive barriers behind insulation board.

1.2. RELATED REQUIREMENTS

- A. Section 05 4000 - Cold-Formed Metal Framing: Sheathing on metal studs.
- B. Section 07 6200 - Sheet Metal Flashing and Trim: Perimeter flashings.
- C. Section 07 9200 - Joint Sealants: Sealing joints between EIFS and adjacent construction and penetrations through EIFS.

1.3. REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- C. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.
- D. ASTM C297/C297M - Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions; 2016.
- E. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.
- F. ASTM C1397 - Standard Practice for Application of Class PB Exterior Insulation and Finish Systems (EIFS) and EIFS with Drainage; 2013 (Reapproved 2019).
- G. ASTM D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive; 2017.
- H. ASTM D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity; 2015.
- I. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- K. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).
- M. ASTM E2273 - Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies; 2018.
- N. ASTM E2485/E2485M - Standard Test Method for Freeze/Thaw Resistance of Exterior Insulation and Finish Systems (EIFS) and Water Resistive Barrier Coatings; 2013 (Reapproved 2018).
- O. ASTM E2486/E2486M - Standard Test Method for Impact Resistance of Class PB and PI Exterior Insulation and Finish Systems (EIFS); 2013 (Reapproved 2018).
- P. ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.
- Q. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials; 2013.
- R. ICC-ES AC219 - Acceptance Criteria for Exterior Insulation and Finish Systems; 2009, with Editorial Revision (2014).

- S. ICC-ES AC235 - Acceptance Criteria for EIFS Clad Drainage Wall Assemblies; 2009, with Editorial Revision (2012).
- T. ISO 9001 - Quality management systems -- Requirements; 2015.
- U. NFPA 259 - Standard Test Method for Potential Heat of Building Materials; 2018.
- V. NFPA 268 - Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source; 2017.
- W. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on system materials, product characteristics, performance criteria, and system limitations.
- C. Shop Drawings: Indicate wall and soffit joint patterns, joint details, and molding profiles.
- D. Selection Samples: Submit manufacturer's standard range of samples illustrating available coating colors and textures.
- E. Verification Samples: Submit actual samples of selected coating on specified substrate, minimum 12 inches square, illustrating project colors and textures.
- F. Manufacturer's Installation Instructions: Indicate preparation required, installation techniques, and jointing requirements.

1.5. QUALITY ASSURANCE

- A. EIFS Manufacturer Qualifications: Provide EIFS products other than insulation from the same manufacturer with qualifications as follows:
 - 1. Member in good standing of EIMA (EIFS Industry Members Association).
 - 2. Manufacturer of EIFS products for not less than 5 years.
 - 3. Manufacturing facilities ISO 9001 certified.
- B. Insulation Manufacturer Qualifications: Approved by manufacturer of EIFS and approved and labeled under third party quality program as required by applicable building code.
- C. Installer Qualifications: Company specializing in the type of work specified and with at least three years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to project site in manufacturer's original, unopened containers with labels intact. Inspect materials and notify manufacturer of any discrepancies.
- B. Storage: Store materials as directed by manufacturer's written instructions.
 - 1. Protect adhesives and finish materials from freezing, temperatures below 40 degrees F and temperatures in excess of 90 degrees F.
 - 2. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a dry location.
 - 3. Protect insulation materials from exposure to sunlight.

1.7. FIELD CONDITIONS

- A. Do not prepare materials or apply EIFS under conditions other than those described in the manufacturer's written instructions.
- B. Do not prepare materials or apply EIFS during inclement weather unless areas of installation are protected. Protect installed EIFS areas from inclement weather until dry.

- C. Do not install coatings or sealants when ambient temperature is below 40 degrees F.
- D. Do not leave installed insulation board exposed to sunlight for extended periods of time.

1.8. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide manufacturer's standard material warranty, covering a period of not less than 5 years.
- C. Provide separate warranty from installer covering labor for repairs or replacement for a period of not less than 5 years.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Basis of Design:
 - 1. BASF Wall Systems; Senergy; Senerflex Channeled Insulation Design, Class PB: www.senergy.basf.com/#sle.
- B. Other Acceptable Exterior Insulation and Finish Systems Manufacturers:
 - 1. Dryvit Systems, Inc; Dryvit Outsulation EIFS, Class PB: www.dryvit.com/#sle.
 - 2. Master Wall, Inc; Aggre-flex Drainage System - Class PB Drainage EIFS: www.masterwall.com/#sle.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.2. EXTERIOR INSULATION AND FINISH SYSTEM

- A. Exterior Insulation and Finish System: DRAINAGE type; reinforced finish coating on mechanically-fastened grooved insulation board over water-resistive coating over substrate; provide a complete system that has been tested to show compliance with the following characteristics; include all components of specified system and substrate(s) in tested samples.
- B. Fire Characteristics:
 - 1. Flammability: Pass, when tested in accordance with NFPA 285.
 - 2. Ignitibility: No sustained flaming when tested in accordance with NFPA 268.
 - 3. Potential Heat of Foam Plastic Insulation Tested Independently of Assembly: No portion of the assembly having potential heat that exceeds that of the insulation sample tested for flammability (above), when tested in accordance with NFPA 259 with results expressed in Btu per square foot.
- C. Adhesion of Water-Resistive Coating to Substrate: For each combination of coating and substrate, minimum flatwise tensile bond strength of 15 psi, when tested in accordance with ASTM C297/C297M.
- D. Adhesion to Water-Resistive Coating: For each combination of insulation board and substrate, when tested in accordance with ASTM C297/C297M, maximum adhesive failure of 25 percent unless flatwise tensile bond strength exceeds 15 psi in all samples.
- E. Water Penetration Resistance: No water penetration beyond the plane of the base coat/insulation board interface after 15 minutes, when tested in accordance with ASTM E331 at 6.24 psf differential pressure with tracer dye in the water spray; include in tested sample at least two vertical joints and one horizontal joint of same type to be used in construction; disassemble sample if necessary to determine extent of water penetration.
- F. Drainage Efficiency: Average minimum efficiency of 90 percent, when tested in accordance with ASTM E2273 for 75 minutes.
- G. Freeze-Thaw Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 10 cycles, when tested in accordance with ICC-ES AC219 or ICC-ES AC235.

- H. Weathering Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating when viewed under 5x magnification after 2000 hours of accelerated weathering conducted in accordance with ASTM G153 Cycle 1 or ASTM G155 Cycles 1, 5, or 9.
- I. Water Degradation Resistance: No cracking, checking, crazing, erosion, blistering, peeling, delamination, or corrosion of finish coating after 14 days exposure, when tested in accordance with ASTM D2247.
- J. Mildew Resistance: No growth supported on finish coating during 28 day exposure period, when tested in accordance with ASTM D3273.
- K. Abrasion Resistance Of Finish: No cracking, checking or loss of film integrity when tested in accordance with ASTM D968 with 113.5 gallons of sand.
- L. Impact Resistance: Construct system to provide the following impact resistance without exposure of broken reinforcing mesh, when tested in accordance with ASTM E2486/E2486M:
 - 1. Standard: 25 to 49 in-lb, for areas not indicated as requiring higher impact resistance.

2.3. MATERIALS

- A. Finish Coating Top Coat: Water-based, air curing, acrylic or polymer-based finish with integral color and texture.
 - 1. EIFS Type A (Buff) Texture/color: BASF Wall Systems; Senergy Classic; 3103 Sandstorm.
 - 2. EIFS Type B (Off White) Texture/color: BASF Wall Systems, Senergy Classic; Off White to match existing above windows on adjacent portion of the existing building.
- B. Base Coat: Fiber-reinforced, acrylic or polymer-based product compatible with insulation board and reinforcing mesh, Class PB.
- C. Reinforcing Mesh: Balanced, open weave glass fiber fabric, treated for compatibility and improved bond with coating, weight, strength, and number of layers as required to meet required system impact rating.
- D. Expanded Polystyrene (EPS) Board Insulation: Complies with ASTM C578.
 - 1. Grooved Board: Back side of board adjacent to sheathing grooved with vertical channels designed to allow moisture to drain; at drainage points provide board configuration that permits drainage to the exterior.
 - 2. Board Size: 24 by 48 inches.
 - 3. Board Size Tolerance: Plus/minus 1/16 inch from square and dimension.
 - 4. Board Thickness: As indicated on drawings.
 - 5. Board Edges: Square.
 - 6. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, when tested in accordance with ASTM E84.
- E. Water-Resistive Barrier Coating: Fluid-applied air and water barrier membrane; applied to sheathing; furnished or approved by EIFS manufacturer.
- F. Fluid-Applied Flashing: Flexible water based polymer material suitable for use with reinforcing mesh and, if used with water-resistive barrier sheet, certified compatible with sheet material.
- G. Flashing Tape: Self-adhering rubberized asphalt tape with polyethylene backing or other material and surface conditioner furnished or approved by EIFS manufacturer.

2.4. ACCESSORY MATERIALS

- A. Insulation Adhesive: Type required by EIFS manufacturer for project substrate.
- B. Insulation Fasteners: Fastener and plate system appropriate for substrate and as recommended by EIFS manufacturer.

- C. Trim: EIFS manufacturer's standard PVC or galvanized steel trim accessories, as required for a complete project and including starter track and drainage accessories.
- D. Sealant Materials: Compatible with EIFS materials and as recommended by EIFS manufacturer.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that substrate is sound and free of oil, dirt, other surface contaminants, efflorescence, loose materials, or protrusions that could interfere with EIFS installation and is of a type and construction that is acceptable to EIFS manufacturer. Do not begin work until substrate and adjacent materials are complete and thoroughly dry.
- B. Verify that substrate surface is flat, with no deviation greater than 1/4 in when tested with a 10 ft straightedge.

3.2. PREPARATION

- A. Apply primer to substrate as recommended by EIFS manufacturer for project conditions.

3.3. INSTALLATION - GENERAL

- A. Install in accordance with EIFS manufacturer's instructions and ASTM C1397.
 - 1. Where different requirements appear in either document, comply with the most stringent.
 - 2. Neither of these documents supercedes provisions of Contract Documents that defines contractual relationships between parties or scope of this work.

3.4. INSTALLATION - WATER-RESISTIVE BARRIER

- A. Apply barrier coating as recommended by coating manufacturer; prime substrate as required before application.
- B. Seal substrate transitions and intersections with other materials to form continuous water-resistive barrier on exterior of sheathing, using method recommended by manufacturer.
- C. At door and window rough openings and other wall penetrations, seal water-resistive barrier and flexible flashings to rough opening before installation of metal flashings, sills, or frames, using method recommended by manufacturer.
- D. At moving expansion joints, apply flexible flashing or flashing tape across and recessed into joint with U-loop forming continuous barrier but allowing movement.
- E. Lap flexible flashing or flashing tape at least 2 inches on each side of joint or transition.
- F. Install drainage layer or spacers after flashing tape has been completed.

3.5. INSTALLATION - INSULATION

- A. Install in accordance with manufacturer's instructions.
- B. Install back wrap reinforcing mesh at all openings and terminations that are not to be protected with trim.
- C. On wall surfaces, install boards horizontally. On horizontal surfaces, install boards _____.
- D. Place boards in a method to maximize tight joints. Stagger vertical joints and interlock at corners. Butt edges and ends tight to adjacent board and to protrusions. Achieve a continuous flush insulation surface, with no gaps in excess of 1/16 inch.
- E. Fill gaps greater than 1/16 inch with strips or shims cut from the same insulation material.
- F. Rasp irregularities off surface of installed insulation board.
- G. Mechanical Fastening: Space fasteners as recommended by EIFS manufacturer.
- H. Adhesive Attachment: Use method required by manufacturer to achieve drainage efficiency specified; do not close up drainage channels when placing insulation board.

3.6. INSTALLATION - CLASS PB FINISH

- A. Base Coat: Apply in thickness as necessary to fully embed reinforcing mesh, wrinkle free, including back-wrap at terminations of EIFS. Install reinforcing fabric as recommended by EIFS manufacturer.
 - 1. Lap reinforcing mesh edges and ends a minimum of 2-1/2 inches.
 - 2. Allow base coat to dry a minimum of 24 hours before next coating application.
- B. Apply finish coat after base coat has dried not less than 24 hours, embed finish aggregate, and finish to a uniform texture and color.
- C. Finish Coat Thickness: As recommended by manufacturer.
- D. Seal control and expansion joints within the field of exterior finish and insulation system, using procedures recommended by sealant and finish system manufacturers.

3.7. CLEANING

- A. Clean EIFS surfaces and work areas of foreign materials resulting from EIFS operations.

3.8. PROTECTION

- A. Protect completed work from damage and soiling by subsequent work.

END OF SECTION

SECTION 07 2500 - WEATHER BARRIERS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls water vapor resistant and air tight.
- B. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof, and joints around frames of openings in exterior walls.

1.2. RELATED REQUIREMENTS

- A. Section 05 4000 - Cold-Formed Metal Framing: Water-resistive barrier under exterior cladding.
- B. Section 07 2400 - Exterior Insulation and Finish Systems: Water-resistive barrier under exterior insulation.
- C. Section 07 9200 - Joint Sealants: Sealing building expansion joints.
- D. Section 09 2116 - Gypsum Board Assemblies: Water-resistive barrier under exterior cladding.

1.3. DEFINITIONS

- A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.
- B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.
- C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.
 - 1. Water Vapor Permeance: For purposes of conversion, $57.2 \text{ ng}/(\text{Pa s sq m}) = 1 \text{ perm}$.

1.4. REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- C. ICC-ES AC212 - Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers over Exterior Sheathing; ICC Evaluation Service, Inc; 2015.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Shop Drawings: Provide drawings of special joint conditions.
- D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.
- E. Manufacturer's Installation Instructions: Indicate preparation, installation methods, and storage and handling criteria.
- F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.
- G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.
- H. Testing Agency Qualification Statement.

1.6. QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.7. MOCK-UP

- A. Install air barrier/vapor barrier materials in a representative exterior wall mock up in coordination with other work.
 - 1. Build mockup for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.

1.8. FIELD CONDITIONS

- A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

1.9. WARRANTY

- A. Manufacturer's Special Warranty: Weather barrier and accessories are free of defects at time of delivery and are manufactured to meet manufacturer's published physical properties and material specifications.
- B. Warranty Period: Five years from date of substantial completion.

PART 2 PRODUCTS

2.1. WEATHER BARRIER ASSEMBLIES

- A. Exterior Vapor Retarder / Air Barrier:
 - 1. On outside surface of sheathing use vapor retarder coating.

2.2. [AVB] VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)

- A. Vapor Retarder Coating: Liquid applied, resilient, UV-resistant coating and associated joint treatment.
 - 1. LowTemperature Crack Bridging: ASTM C1305, no cracking after 10 cycles at -15°F (-26°C)
 - 2. Elongation: ASTM D412, primary air barrier and vapor barrier material, > 500%.
 - 3. Tensile Strength: ASTM D412, > 200 psi (1378 kPa).
 - 4. Dry Film Thickness: 40 mils (0.040 inch), minimum.
 - 5. Water Vapor Permeance: 0.1 perm, maximum, when tested in accordance with ASTM E96/E96M.
 - 6. Air Leakage: Less than 0.2 L/m2s @ 75 Pa
 - 7. VOC Content: Less than 100 g per L when tested in accordance with 40 CFR 59, Subpart D (EPA Method 24).
 - 8. Resistance to Fungal Growth: No growth when tested according to ASTM D5590.
 - 9. Code Acceptance: Comply with applicable requirements of ICC-ES AC212.
 - 10. Suitable for use on concrete, masonry, plywood and glass mat gypsum sheathing.
 - 11. Joint Preparation Treatment: Coating manufacturer's recommended method, either tape or reinforcing mesh saturated with coating material.
 - 12. Manufacturers:
 - a. Basis of Design: Sto Corp; Sto VaporSeal (40 mil application): www.stocorp.com/#sle
 - 1) Rough Opening Treatments: StoGuard VaporSeal with StoGuard Fabric and StoGuard Redicorner™: flexible waterproof air barrier membrane material with non-woven integrally reinforced cloth reinforcements
 - 2) Transition Membrane:

- (a) StoGuard Transition Membrane: flexible air barrier membrane for continuity at transitions: sheathing to foundation, dissimilar materials (CMU to frame wall), flashing shingle lap transitions, floor line deflection joints, masonry control joints, and through wall joints in masonry or frame construction.
 - (b) StoGuard RapidFill: one component gun-applied air and moisture barrier membrane material for continuity at static transitions such as through wall penetrations such as pipes, electrical boxes, and scupper penetrations.
 - b. Other approved manufacturers (dependant on meeting basis of design and specification criteria):
 - 1) BASF Corporation
 - 2) Grace Construction & Packaging
 - 3) Henry Company
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 - 13. Joint Filler: As recommended by coating manufacturer and suitable to the substrate.
- 2.3. ACCESSORIES
- A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.
 - B. Primer, joint reinforcing strip, substrate-patching membrane, adhesive, and tape as recommended by material manufacturer.
 - C. Thinners and Cleaners: As recommended by material manufacturer.
- PART 3 EXECUTION
- 3.1. EXAMINATION
- A. Verify that surfaces and conditions are ready to accept the work of this section.
- 3.2. PREPARATION
- A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.
 - B. Clean and prime substrate surfaces to receive air/vapor barrier material in accordance with manufacturer's instructions.
- 3.3. INSTALLATION
- A. Install materials in accordance with manufacturer's instructions.
 - B. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
 - C. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.
 - D. Coatings:
 - 1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
 - 2. Where exterior masonry veneer is to be installed, install masonry anchors before installing weather barrier over masonry; seal around anchors air tight.
 - 3. Mastic Coating: Install by trowel or roller to minimum thickness of 1/4 inch; use sheet seal to join to adjacent construction, seal air tight with sealant.
 - 4. Use flashing to seal to adjacent construction and to bridge joints.
 - E. Openings and Penetrations in Exterior Weather Barriers:

1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.4. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Coordination of ABAA Tests and Inspections:
 1. Provide testing and inspection required by ABAA QAP.
 2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
 3. Cooperate with ABAA testing agency.
 4. Allow access to air barrier work areas and staging.
 5. Do not cover air barrier work until tested, inspected, and accepted.
- C. Do not cover installed weather barriers until required inspections have been completed.
- D. Take digital photographs of each portion of the installation prior to covering up.

3.5. PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.
- B. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- C. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 4213.23 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Exterior cladding consisting of formed metal composite material (MCM) sheet, secondary supports, and anchors to structure, attached to solid backup.
- B. Matching flashing and trim.

1.2. RELATED REQUIREMENTS

- A. Section 07 2500 - Weather Barriers: Weather barrier behind wall panel system.
- B. Section 07 6200 - Sheet Metal Flashing and Trim: Metal flashing components integrated with this wall system.
- C. Section 07 9200 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.3. REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- C. ASTM D1781 - Standard Test Method for Climbing Drum Peel for Adhesives; 1998 (Reapproved 2012).
- D. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics; 2020.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- F. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2019.
- G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).
- I. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Meeting: Convene one week before starting work of this section to verify project requirements, coordinate with installers of other work, establish condition and completeness of building substrate, and review manufacturers' installation instructions and warranty requirements.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data - MCM Sheets: Manufacturer's data sheets on each product to be used, including thickness, physical characteristics, and finish, and:
 - 1. Finish manufacturer's data sheet showing physical and performance characteristics.
 - 2. Storage and handling requirements and recommendations.
 - 3. Fabrication instructions and recommendations.
 - 4. Specimen warranty for finish, as specified herein.
- C. Shop Drawings: Show layout and elevations, dimensions and thickness of panels, connections, details and location of joints, sealants and gaskets, method of anchorage, support clips, number of anchors, supports, reinforcement, trim, flashings, and accessories.

1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.
 - D. Design Data: Submit structural calculations stamped by design engineer, for Architect's information and project record.
 - E. Test Report: Submit report of full-size mock-up tests for air infiltration, water penetration, and wind performance.
 - F. Test Report: Submit test report verifying compliance with NFPA 285 for previously-tested exterior wall assembly.
 - G. Manufacturer's Field Reports: Provide within 48 hours of field review. State what was observed and what changes, if any, were requested or required.
 - H. Installer's Qualification Statement.
 - I. Testing Agency's Qualification Statement.
 - J. Maintenance Data: Care of finishes and warranty requirements.
 - K. Executed Warranty: Submit warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- 1.6. QUALITY ASSURANCE
- A. Field Measurements: Verify actual dimensions by field measurement before fabrication; show recorded measurements on shop drawings.
 - B. Design Engineer's Qualifications: Design structural supports and anchorages under direct supervision of a Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
 - C. Installer Qualifications: Company specializing in performing work of the type specified in this section.
 1. With minimum three years of documented experience.
 - D. Testing Agency Qualifications: Independent agency experienced in testing assemblies of the type required for this project and having the necessary facilities for full-size mock-up testing of the type specified.
- 1.7. DELIVERY, STORAGE, AND HANDLING
- A. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.
 1. Protect finishes by applying heavy-duty removable plastic film during production.
 2. Package for protection against transportation damage.
 3. Provide markings to identify components consistently with drawings.
 4. Exercise care in unloading, storing, and installing panels to prevent bending, warping, twisting, and surface damage.
 - B. Store products protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
 1. Store in well-ventilated space out of direct sunlight.
 2. Protect from moisture and condensation with tarpaulins or other suitable weathertight covering installed to provide ventilation.
 3. Store at a slope to ensure positive drainage of accumulated water.
 4. Do not store in enclosed space where ambient temperature can exceed 120 degrees F.
 5. Avoid contact with other materials that might cause staining, denting, or other surface damage.
- 1.8. WARRANTY
- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

- B. Correct defective work within a five year period after Date of Substantial Completion, including defects in water tightness and integrity of seals for insulated metal wall panel systems.
- C. Correct defective work within a five year period after Date of Substantial Completion for degradation of panel finish, including color fading caused by exposure to weather.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Metal Composite Material Wall Panels:
 - 1. Basis of Design: Castel Metal Products, RS-200 4mm System.
 - 2. System Description: Drained and back-ventilated rainscreen design consisting of dry seal joinery designed to minimize water penetration and induce air circulation in the space behind the panel system. Moisture weeping trim at panel base details allows water to drain out of the system.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.

2.2. WALL PANEL SYSTEM

- A. Wall Panel System: Metal panels, fasteners, and anchors designed to be supported by framing or other substrate provided by others; provide installed panel system capable of maintaining specified performance without defects, damage, or failure.
 - 1. Provide structural design by or under direct supervision of a Structural Engineer licensed in the State in which the Project is located.
 - 2. Provide panel jointing and weatherseal using a dry seal joinery system.
 - 3. Anchor panels to supporting framing without exposed fasteners.

2.3. PERFORMANCE REQUIREMENTS

- A. Thermal Movement: Provide for free and noiseless vertical and horizontal thermal movement due to expansion and contraction under material temperature range of minus 20 degrees F to 180 degrees F without buckling, opening of joints, undue stress on fasteners, or other detrimental effects; allow for ambient temperature at time of fabrication, assembly, and erection procedures.
 - 1. Wind Performance: Provide system tested in accordance with ASTM E330/E330M without permanent deformation or failures of structural members under the following conditions:
 - 2. Maximum deflection of perimeter framing member of L/175 normal to plane of the wall; maximum deflection of individual panels of L/60.
 - 3. Maximum anchor deflection in any direction of 1/16 inch at connection points of framing members to anchors.
- B. Air Infiltration: 0.06 cfm/sq ft of wall area, maximum, when tested at 1.57 psf in accordance with ASTM E283/E283M.
- C. Water Penetration: No water penetration under static pressure when tested in accordance with ASTM E331 at a differential of 10 percent of inward acting design load, 6.24 psf minimum, after 15 minutes.
 - 1. Water penetration is defined as the appearance of uncontrolled water on the interior face of the wall.
 - 2. Design to drain leakage and condensation to the exterior face of the wall.
- D. Fire Performance: Tested in accordance with, and complying with acceptance criteria of NFPA 285.
- E. General: Provide composite wall panel system meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.
- F. Structural Performance: Design composite wall panel system fabricated to withstand effects of indicated loads and stresses within limits and under conditions indicated below.

1. Wind Loads: Determine loads based on uniform pressure, building category, exposure category, and basic wind speed indicated on drawings.
2. Limits of Deflection: Composite wall panel system shall withstand design wind pressure with the following allowable deflection:
3. Maximum allowable deflection limited to L/175 deflection of panel head and sill normal to plane of wall.
4. Maximum allowable deflection of panel stiffeners and aluminum panel material combined limited to L/60.
5. Seismic Performance: Comply with ASCE 7 Section 9, "Earthquake Loads."
- G. System Performance: A third party test report utilizing the standard ASTM E 283, E 331 and AAMA 501 procedures following the test protocol described in AAMA 508-07 must be submitted prior to bid. Test panel must include a horizontal joint, with an imperfect air barrier.
- H. Drained and Back Ventilated Rain Screen Performance: Per AAMA 509-09:
 1. Water penetration through panel system: W1 classification.
 2. Ventilation: V4 classification.
- I. Air/Moisture Barrier: Refer to Division 07 Section "Weather Barriers."
- J. Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction.
- K. Fire Performance Characteristics: Provide metal composite wall systems with the following fire-test characteristics determined by indicated test standard as applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.
 1. Surface-Burning Characteristics: Provide metal composite wall system panels with the following characteristics when tested per ASTM E 84.
 - a. Flame spread index: 25 or less.
 - b. Smoke developed index: 450 or less.

2.4. WALL PANEL SYSTEM

- A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.
- B. Basis-of-Design: Castel Metal Products, RS-200 4mm Rainscreen System.
 1. Core: Fire retardant.
 2. Factory Finish: Two coat fluoropolymer resin coating, approved by coating manufacturer for length of warranty specified for project, and applied by coil manufacturing facility that specializes in coil applied finishes.
 - a. Design intent for panels and trim systems is buff color to match buff color of EIFS Type A system.
 3. Substitutions: See Section 01 6000 - Product Requirements.
- C. Composite Wall Panel Accessories
 1. Provide manufacturer's factory-formed clips, shims, flashings, sealants, and tapes for a complete installation.

2. Extruded Trim: Aluminum, minimum thickness 0.060 inch (1.59 mm) for trim and 0.90 inch (2.38 mm) for structural units. Include manufacturer-provided extruded trim for the following locations and as indicated on Drawings:
 - a. Base trim.
 - b. Coping.
 - c. Panel installation perimeter.
 - d. Opening perimeters.
3. Sealants: Type recommended by composite wall panel system manufacturer for application, meeting requirements of Division 07 Section "Joint Sealants."
4. Flashing Tape: 4 inch (102 mm) wide self-adhering butyl flashing tape.
- D. Secondary Metal Framing
 1. Miscellaneous Framing Components, General: Cold-formed metallic-coated steel sheet, ASTM C 645, Grade 50, with ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating.
 - a. Hat Channels: 0.053" minimum/16 ga. (1.35 mm) minimum.
 - b. Sill Channels: 0.053" minimum/16 ga. (1.35 mm) minimum.

2.5. FABRICATION

- A. General: Fabricate composite wall panels and accessories at factory identical to tested units using manufacturer's standard procedures and processes necessary to meet performance requirements.
 1. Provide components of composite wall panel system that are products of one manufacturer, including composite panels, gaskets, head and sill trim, bottom weep, base extrusion, and metal copings.
- B. Composite Panels: Fabricate composite wall panels with extruded aluminum stiffeners requiring no further fabrication or modification in field.
 1. Horizontal Joints: Dry seal, drained and back ventilated.
 2. Vertical Joints: Pre-formed returns with metal spline or gasket and aluminum extrusion receptors and extruded drain channels.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine dimensions, tolerances, and interfaces with other work.
 1. Verify that weather barrier system is properly installed; refer to Section 07 2500 for requirements.
- B. Examine substrate on-site to determine that conditions are acceptable for product installation in accordance with manufacturer's written instructions.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Notify Architect in writing of conditions detrimental to proper and timely completion of work, and do not proceed with erection until unsatisfactory conditions have been corrected.

3.2. INSTALLATION

- A. Do not install products that are defective, including warped, bowed, dented, and broken members, and members with damaged finishes.
- B. Comply with instructions and recommendations of MCM sheet manufacturer and wall system manufacturer, as well as with approved shop drawings.
- C. Install wall system securely allowing for necessary thermal and structural movement; comply with wall system manufacturer's instructions for installation of concealed fasteners.

- D. Do not handle or tool products during erection in manner that damages finish, decreases strength, or results in visual imperfection or failure in performance. Return component parts that require alteration to shop for refabrication, if possible, or for replacement with new parts.
 - E. Do not form panels in field unless required by wall system manufacturer and approved by the Architect; comply with MCM sheet manufacturer's instructions and recommendations for field forming.
 - F. Separate dissimilar metals; use gasket fasteners, isolation shims, or isolation tape where needed to eliminate possibility of electrolytic action between metals.
 - G. Install square, plumb, straight, and true, accurately fitted, with tight joints and intersections maintaining the following installation tolerances:
 - 1. Variation From Plane or Location: 1/2 inch in 30 feet of length and up to 3/4 inch in 300 feet, maximum.
 - 2. Deviation of Vertical Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 3. Deviation of Horizontal Member From True Line: 0.1 inch in 25 feet run, maximum.
 - 4. Offset From True Alignment Between Two Adjacent Members Abutting End To End, In Line: 0.03 inch, maximum.
 - H. Replace damaged products.
- 3.3. FIELD QUALITY CONTROL
- A. Wall System Manufacturer's Field Services: Provide field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with instructions.
- 3.4. CLEANING
- A. Ensure weep holes and drainage channels are unobstructed and free of dirt and sealants.
 - B. Remove protective film after installation of joint sealers, after cleaning of adjacent materials, and immediately prior to completion of work.
 - C. Remove temporary coverings and protection of adjacent work areas.
 - D. Clean installed products in accordance with manufacturer's instructions.
- 3.5. PROTECTION
- A. Protect installed panel system from damage until Date of Substantial Completion.

END OF SECTION

SECTION 07 4213.53 - METAL SOFFIT PANELS

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 metal soffit panels.

1.3. PREINSTALLATION MEETINGS

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

1.4. ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.5. INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.6. CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal panels 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. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof eave, including fascia, and soffit; approximately 24 inches wide by full eave width, including attachments and accessories.
 - 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.

1.8. DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.9. FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10. COORDINATION

- A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11. WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: One year from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel 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. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 2.86 lbf/sq. ft.
 - D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient, material surfaces.
- 2.2. METAL SOFFIT PANELS
- A. General: Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
 - B. Metal Soffit Panels: match finish of composite metal wall panels.
 - C. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and a flat pan between panel edges; with flush joint between panels.
 - 1. Basis-of-Design Product: Series UC-500 Panel as manufactured by Firestone Metal Products.
 - 2. Panel width: 12 inches.
 - 3. Panel height: 1 inch.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- 2.3. MISCELLANEOUS MATERIALS
- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
 - B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 - C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.
 - D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
 - E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.4. FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
 6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5. FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 1. Metallic Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- D. Aluminum Panels and Accessories:

1. 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.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
 2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.
 - a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.
 1. Soffit Framing: Wire tie or clip furring channels to supports.

3.3. METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
 2. Aluminum Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
 3. Stainless-Steel Panels: Use stainless-steel fasteners.

- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.
 - D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 - 1. Apply panels and associated items true to line for neat and weathertight enclosure.
 - 2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
 - 3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 - 4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 - E. Watertight Installation:
 - 1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
 - 2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - 3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
 - F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
 - G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
 - 1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
 - 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).
- 3.4. CLEANING AND PROTECTION
- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
 - B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

SECTION 07 5423 - THERMOPLASTIC-POLYOLEFIN ROOFING (TPO) - FIRESTONE

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Thermoplastic membrane roofing system, including all components specified.

1.2. RELATED REQUIREMENTS

- A. Section 05 3100 - Metal Decking: Metal roof deck.
- B. Section 06 1000 - Rough Carpentry: Wood nailers associated with roofing and roof insulation.
- C. Section 07 6200 - Sheet Metal Flashing and Trim: Formed metal flashing and trim items associated with roofing.
- D. Section 07 7100 - Roof Specialties: Manufactured copings, fascias, gravel stops, and other flashing-related items.
- E. Section 07 7123 - Manufactured Gutters and Downspouts: Gutters and downspouts at entry canopy.
- F. Section 07 7200 - Roof Accessories: Roof equipment mounting and roof penetration curbs.
- G. Section 07 8100 - Applied Fire Protection: Fire proofing at underside of roof deck and supporting structure.
- H. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based exterior sheathing.

1.3. DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D1079 for definition of terms related to roofing work not otherwise defined in the section.
- B. LTTR: Long Term Thermal Resistance, as defined by CAN-ULC-S770.

1.4. REFERENCE STANDARDS

- A. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.
- B. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- C. ASTM C473 - Standard Test Methods for Physical Testing of Gypsum Panel Products; 2019.
- D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- E. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.
- F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.
- G. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer; 2016.
- H. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.
- I. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting; 2013.
- J. ASTM D1079 - Standard Terminology Relating to Roofing and Waterproofing; 2020.
- K. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics; 2016.
- L. ASTM D1622/D1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics; 2014.
- M. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

- N. ASTM D4601/D4601M - Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing; 2004 (Reapproved 2020).
- O. ASTM D6163/D6163M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements; 2016.
- P. ASTM D6164/D6164M - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements; 2016.
- Q. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing; 2019.
- R. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- S. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2012.
- T. CAN-ULC-S770 - Standard Test Method Determination of L-Term Thermal Resistance Of Closed-Cell Thermal Insulating Foams; 2015.
- U. FM (AG) - FM Approval Guide; current edition.
- V. FM 4470 - Approval Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction; 2016.
- W. FM DS 1-29 - Roof Deck Securement and Above-Deck Roof Components; 2016, with Editorial Revision (2020).
- X. ISO 9000 - Quality management systems -- Fundamentals and vocabulary; 2015.

1.5. ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: Before start of roofing work, Contractor shall hold a meeting to discuss the proper installation of materials and requirements to achieve the warranty.
 - 1. Require attendance with all parties directly influencing the quality of roofing work or affected by the performance of roofing work.
 - 2. Notify Architect well in advance of meeting.

1.6. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data:
 - 1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
- C. Shop Drawings: Provide:
 - 1. The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
 - 2. For tapered insulation, provide project-specific layout and dimensions for each board.
- D. Specimen Warranty: Submit prior to starting work.
- E. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.
- F. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.
- G. Executed Warranty.

1.7. QUALITY ASSURANCE

- A. Installer Qualifications: Roofing installer shall have the following:
 - 1. Current approval, license, or authorization as applicator by the manufacturer.
 - 2. At least five years experience in installing specified system.

1.8. DELIVERY, STORAGE AND HANDLING

- A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.
- B. Store materials clear of ground and moisture with weather protective covering.
- C. Keep combustible materials away from ignition sources.

1.9. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.
- C. Warranty: Firestone Red Shield Roofing System Limited Warranty covering membrane, roof insulation, and other indicated components of the system, for the term indicated.
 - 1. Warranty Term: 20 years.
 - 2. Limit of Liability: No dollar limitation.
 - 3. Scope of Coverage: Repair leaks in the roofing system caused by:
 - a. Ordinary wear and tear of the elements.
 - b. Unintentional damage due to normal rooftop inspections, maintenance, or service at areas protected by protective walkway surface.
 - c. Manufacturing defect in Firestone brand materials.
 - d. Defective workmanship used to install these materials.
 - e. Damage due to winds up to 55 mph.
 - 4. Not Covered:
 - a. Damage due to winds in excess of 55 mph.
 - b. Damage due to hurricanes or tornadoes.
 - c. Damage due to hail.
 - d. Intentional damage.
 - e. Unintentional damage due to normal rooftop inspections, maintenance, or service at areas not protected by protective walkway surface.
- D. Insulation Warranty: Separate Firestone ISO 95+ Insulation Warranty with warranty term coinciding with Red Shield Warranty.
 - 1. Limit of Liability: No dollar limitation
 - 2. Scope of Coverage: Provide replacement for insulation that warps, bows, or is on the point of causing a roof leak as a result of manufacturing defect.
- E. Metal Roof Edging: Firestone full-system warranty for roof edge system, covering blow-off from winds up to 150 mph.
- F. Metal Roof Edging with Exposed Decorative Fascia: Provide 20 year warranty for painted finish covering color fade, chalk, and film integrity.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Acceptable Manufacturer - Roofing System: Firestone Building Products LLC, Carmel, IN: www.firestonebpco.com/#sle.
- B. Acceptable Installer: B&L Sheet Metal and Roofing, Inc.;
- C. Basis of Design: The Owner has confirmed that the existing roofing system on the existing hospital building affected by this project is Firestone Ultraply TPO Platinum Membrane, 0.080 inch membrane adhered to tapered polyisocyanurate insulation; which will serve as basis of design for this project.
- D. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.
- E. Manufacturer of Metal Roof Edging: Same manufacturer as roof membrane.
 - 1. Metal roof edging products by other manufacturers are not acceptable.
 - 2. Field- or shop-fabricated metal roof edgings are not acceptable.
- F. No substitutions are permitted.

2.2. ROOFING SYSTEM DESCRIPTION

- A. Roofing System: Thermoplastic polyolefin (TPO) single-ply membrane.
 - 1. Membrane Attachment: Fully adhered.
 - 2. Warranty: Full system warranty; Firestone 20 year Red Shield Limited Warranty covering membrane, roof insulation, and membrane accessories.
 - 3. Slope: Deck is flat, provide slope of 1/4 inch per foot by means of tapered insulation.
 - 4. Comply with applicable local building code requirements.
 - 5. Provide assembly having Underwriters Laboratories, Inc. (UL) Class A Fire Hazard Classification.
- B. Roofing System Components: Listed in order from the top of the roof down:
 - 1. Membrane: Thickness as indicated.
 - 2. Base Sheet Over Insulation: Cold adhesive attached.
 - 3. Insulation Cover Board: High density polyisocyanurate; cold adhesive attached.
 - 4. Insulation:
 - a. Maximum Board Thickness: 3 inches; use as many layers as necessary; stagger joints in adjacent layers.
 - b. Tapered: Slope as indicated; provide minimum R-value at thinnest point; place tapered layer on bottom.
 - c. Total R-value of 30, minimum.
 - d. Crickets: Tapered insulation of same type as specified for top layer; slope as indicated.
 - 5. Vapor Retarder: One layer SBS modified bitumen base sheet; heat fused.
 - 6. Roof Sheathing: Refer to Section 09 2116 for exterior sheathing.
 - 7. Metal Roof Deck: Refer to Section 05 3100 for metal roof deck.
 - 8. Applied Fire Proofing: Refer to Section 07 8100 for applied fire proofing.

2.3. MEMBRANE MATERIALS

- A. Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D6878/D6878M, with polyester weft inserted reinforcement and the following additional characteristics:

1. Thickness: 0.080 inch plus/minus 10 percent, with coating thickness over reinforcement of 0.030 inch plus/minus 10 percent.
 2. Puncture Resistance: 415 lbf, minimum, when tested in accordance FTM 101C Method 2031.
 3. Solar Reflectance: 0.79, minimum, when tested in accordance with ASTM C1549.
 4. Color: White.
 5. Acceptable Product: UltraPly Platinum TPO by Firestone.
- B. Slip Sheet: Coated glass fiber mat; qualified as part of Class A assembly over combustible and non-combustible decks, complying with ASTM D828 tensile testing.
1. Adhesive: Token application may be necessary under windy conditions.
- C. Curb and Parapet Flashing: Same material as membrane, with encapsulated edge which eliminates need for seam sealing the flashing-to-roof splice; precut to 18 inches wide.
- D. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
1. Thickness: 0.060 inch plus/minus 10 percent.
 2. Tensile Strength: 1550 psi, minimum, when tested in accordance with ASTM D638 after heat aging.
 3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D638 after heat aging.
 4. Tearing Strength: 12 lbf, minimum, when tested in accordance with ASTM D1004 after heat aging.
 5. Color: White.
 6. Acceptable Product: UltraPly TPO Flashing by Firestone.
- E. Tape Flashing: 5-1/2 inch nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 0.065 inch nominal; TPO QuickSeam Flashing by Firestone.
- F. Bonding Adhesive: Neoprene and SBR rubber blend, formulated for compatibility with the membrane other substrate materials, including masonry, wood, and insulation facings; UltraPly Bonding Adhesive by Firestone.
- G. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone.
- H. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.
- I. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches wide by 0.10 inch thick; Firestone Termination Bar by Firestone.
- J. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; UltraPly TPO Cut Edge Sealant by Firestone.
- K. General Purpose Sealant: EPDM-based, one part, white general purpose sealant; UltraPly TPO General Purpose Sealant by Firestone.
- L. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc.; UltraPly TPO Small and Large Pipe Flashing by Firestone.
- M. Water Block Seal: Butyl rubber sealant for use between two surfaces, not exposed; Water Block Seal by Firestone.
- N. Roof Walkway Pads: Non-reinforced TPO walkway pads, 0.130 inch by 30 inches by 40 feet long with patterned traffic bearing surface; UltraPly TPO Walkway Pads by Firestone.

2.4. VAPOR RETARDER MATERIALS

- A. Base Sheet: Firestone MB Base Sheet; high-performance, asphalt coated, fiberglass reinforced, roofing base sheet complying with ASTM D4601/D4601M Type II.
- B. Base Sheet: Torch grade SBS polymer-modified bitumen sheet, reinforced with non-woven fabric, complying with ASTM D6163/D6163M, Type I, Grade S, or ASTM D6164/D6164M, Type I, Grade S, formulated for torch application to substrate and cap sheet; Firestone SBS Poly Torch Base or SBS Glass Torch Base.
- C. Adhesive: As recommended by roofing membrane manufacturer.

2.5. ROOF INSULATION AND COVER BOARDS

- A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C1289 Type II Class 1, with the following additional characteristics:
 - 1. Thickness: As indicated elsewhere.
 - 2. Size: 48 inches by 48 inches, nominal.
 - 3. R-value (LTTR):
 - a. 4.0 inch Thickness: 25.0, minimum.
 - 4. Compressive Strength: 20 psi when tested in accordance with ASTM C1289.
 - 5. UL-Classified and FM-approved for direct to steel deck applications.
 - 6. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
 - 7. Recycled Content: 19 percent post-consumer and 15 percent pre-consumer (post-industrial), average.
 - 8. Acceptable Product: ISO 95+ GL Polyisocyanurate Insulation by Firestone.
- B. High Density Polyisocyanurate Cover Board: Non-combustible, water resistant, high density closed cell polyisocyanurate core with coated glass mat facers, with the following characteristics:
 - 1. Size: 48 inches by 48 inches, nominal.
 - 2. Thickness: 1/2 inch.
 - 3. Thermal Value: R-value of 2.5, when tested in accordance with ASTM C518 and ASTM C177.
 - 4. Surface Water Absorption: 3 percent, maximum, when tested in accordance with ASTM C209.
 - 5. Compressive Strength: 120 psi, when tested in accordance with ASTM D1621.
 - 6. Density: 5 pcf, when tested in accordance with ASTM D1622/D1622M.
 - 7. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.
 - 8. Mold Growth Resistance: Passing ASTM D3273.
 - 9. Acceptable Product: ISOGARD HD Cover Board by Firestone.

2.6. METAL ACCESSORIES

- A. Metal Roof Edging and Fascia: Continuous metal edge member serving as termination of roof membrane and retainer for metal fascia; watertight with no exposed fasteners; mounted to roof edge nailer.
 - 1. Wind Performance:
 - a. Membrane Pull-Off Resistance: 100 lbs/ft, minimum, when tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-1.
 - b. Fascia Pull-Off Resistance: At least minimum required when tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-2.

- c. Provide product listed in FM (AG) with at least FM 1-270 rating.
 2. Fascia Face Height: 5 inches.
 3. Edge Member Height Above Nailer: 1-1/4 inches.
 4. Length: 144 inches.
 5. Functional Characteristics: Fascia retainer supports while allowing for free thermal cycling of fascia.
 6. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion.
 7. Anchor Bar Cleat: 20 gauge, 0.036 inch G90 coated commercial type galvanized steel with pre-punched holes.
 8. Fasteners: Factory-provided corrosion resistant fasteners, with drivers; no exposed fasteners permitted.
 9. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, scuppers, and end caps; minimum 14 inch long legs on corner pieces.
- B. Parapet Copings: Formed metal coping with galvanized steel anchor/support cleats for capping any parapet wall; watertight, maintenance free, without exposed fasteners; butt type joints with concealed splice plates; mechanically fastened as indicated; Firestone PTCE.
1. Wind Performance:
 - a. At least minimum required when tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3.
 - b. Provide product listed in FM (AG) with at least FM 1-90 rating.
 2. Description: Coping sections allowed to expand and contract freely while locked in place on anchor cleats by mechanical pressure from hardened stainless steel springs factory attached to anchor cleats; 8 inch wide splice plates with factory applied dual non-curing sealant strips capable of providing watertight seal.
 3. Dimensions:
 - a. Wall Width: As indicated on the drawings.
 - b. Piece Length: Minimum 144 inches.
 4. Anchor/Support Cleats: 20 gauge, 0.036 inch thick prepunched galvanized cleat with 12 inch wide stainless steel spring mechanically locked to cleat at 72 inches on center.
 5. Special Shaped Components: Provide factory-fabricated pieces necessary for complete installation, including miters, corners, intersections, curves, pier caps, and end caps; minimum 14 inch long legs on corner, intersection, and end pieces.
 6. Fasteners: Factory-furnished; electrolytically compatible; minimum pull out resistance of 240 pounds for actual substrate used; no exposed fasteners.

PART 3 INSTALLATION

3.1. GENERAL

- A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.
- B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

- C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.
- D. Perform work using competent and properly equipped personnel.
- E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.
- F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F.
- G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
 - 1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
 - 2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
 - 3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.
- H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.
- I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.2. EXAMINATION

- A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.
- B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.
- C. Examine roof substrate to verify that it is properly sloped to drains.
- D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptance of project conditions and requirements.

3.3. PREPARATION

- A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.
- B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.
- C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch wide with fill material acceptable insulation to membrane manufacturer.
- D. Wood Nailers: Provide wood nailers at all perimeters and other locations where indicated on the drawings, of total height matching the total thickness of insulation being used.
 - 1. Install with 1/8 inch gap between each length and at each change of direction.
 - 2. Mechanically fasten to deck to resist force of 200 lbf per linear foot.

3.4. VAPOR RETARDER

- A. Before installing insulation install vapor retarder directly over the deck.

- B. Ensure that all penetrations and edge conditions are sealed to prevent moisture and air drive into the roofing system.

3.5. INSULATION AND COVER BOARD INSTALLATION

- A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.
- B. Install insulation in a manner that will not compromise the vapor retarder integrity.
- C. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.
- D. Lay roof insulation in courses parallel to roof edges.
- E. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch.

3.6. SINGLE-PLY MEMBRANE INSTALLATION

- A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.
- B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.
- C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.
- D. Install membrane adhered to the substrate, with edge securement as specified.
- E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.
- F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
 - 1. Exceptions: Round pipe penetrations less than 18 inches in diameter and square penetrations less than 4 inches square.
 - 2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.7. FLASHING AND ACCESSORIES INSTALLATION

- A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.
- B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
 - 1. Follow roofing manufacturer's instructions.
 - 2. Remove protective plastic surface film immediately before installation.
 - 3. Install water block sealant under the membrane anchorage leg.
 - 4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
 - 5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
 - 6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.

7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.
 - C. Scuppers: Set in sealant and secure to structure; flash as recommended by manufacturer.
 - D. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer.
 - E. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches high above membrane surface.
 1. Use the longest practical flashing pieces.
 2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
 3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
 4. Provide termination directly to the vertical substrate as shown on roof drawings.
 - F. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
 1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
 2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches deep, with at least 1 inch clearance from penetration, sloped to shed water.
 3. Structural Steel Tubing: If corner radii are greater than 1/4 inch and longest side of tube does not exceed 12 inches, flash as for pipes; otherwise, provide a standard curb with flashing.
 4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
 5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F, protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.
- 3.8. FINISHING AND WALKWAY INSTALLATION
- A. Install walkways at access points to the roof, around rooftop equipment and ductwork that may require maintenance, and where indicated on the drawings.
 - B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch and maximum of 3.0 inches from each other to allow for drainage.
 1. If installation of walkway pads over field fabricated splices or within 6 inches of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches on either side.
 2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.
- 3.9. FIELD QUALITY CONTROL
- A. See Section 01 4000 - Quality Requirements, for additional requirements.
 - B. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).
 - C. Perform all corrections necessary for issuance of warranty.

3.10. CLEANING

- A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.
- B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.
- C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.11. PROTECTION

- A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, and accent trim band.
- B. Sealants for joints within sheet metal fabrications.

1.2. RELATED REQUIREMENTS

- A. Section 07 5423 - Thermoplastic Polyolefin Roofing (TPO): Manufactured roof edges and copings associated with membrane roof system.
- B. Section 07 7100 - Roof Specialties: roof edge drainage systems.
- C. Section 07 7123 - Manufactured Gutters and Downspouts: gutters and downspouts for entry canopy.
- D. Section 07 7200 - Roof Accessories: Roof equipment mounting and penetration curbs.
- E. Section 07 9200 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.3. REFERENCE STANDARDS

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2015.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- F. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.
- G. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free; 2007 (Reapproved 2012).
- H. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2012).
- I. CDA A4050 - Copper in Architecture - Handbook; current edition.
- J. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
- C. Samples: Submit two samples 2 by 3 inch minimum in size illustrating metal finish colors for final selection.

1.5. QUALITY ASSURANCE

- A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.
- B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1. SHEET MATERIALS

- A. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch thick base metal, shop pre-coated with PVDF coating.
 - 1. Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
 - 2. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system.
 - 3. Color: As indicated on drawings.
- B. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gage, (0.0156 inch) thick; smooth No. 4 - Brushed finish.

2.2. FABRICATION

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
- E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
- F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.3. ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Underlayment: ASTM D226/D226M, organic roofing felt, Type II (No. 30).
- C. Primer: Zinc chromate type.
- D. Protective Backing Paint: Asphaltic mastic, ASTM D4479 Type I.
- E. Concealed Sealants: Non-curing butyl sealant.
- F. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- G. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.1. PREPARATION

- A. Install starter and edge strips, and cleats before starting installation.
- B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.2. INSTALLATION

- A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..
- B. Apply plastic cement compound between metal flashings and felt flashings.

- C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- D. Seal metal joints watertight.

3.3. SCHEDULE

- A. Through-Wall Flashing in Masonry: Stainless Steel
- B. Coping, Cap, Parapet, Sill and Ledge Flashings: Pre-Finished Galvanized Steel

END OF SECTION

SECTION 07 7100 - ROOF SPECIALTIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Manufactured roof specialties not included in other Sections.
- B. Roof-edge drainage systems.
- C. Reglets and counter flashings.

1.2. RELATED REQUIREMENTS

- A. Section 07 5423 - Thermoplastic Polyolefin Roofing (TPO): Manufactured roof edges and copings associated with membrane roof system.
- B. Section 07 7123 - Manufactured Gutters and Downspouts: Gutters and downspouts for entry canopy.
- C. Section 07 7200 - Roof Accessories: Roof equipment mounting and penetration curbs.

1.3. REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2015.
- C. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- D. ANSI/SPRI/FM 4435/ES-1 - Test Standard for Edge Systems Used with Low Slope Roofing Systems; 2017.
- E. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- G. NRCA (RM) - The NRCA Roofing Manual; 2017.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on shape of components, materials and finishes, anchor types and locations.
- C. Shop Drawings: Indicate configuration and dimension of components, adjacent construction, required clearances and tolerances, and other affected work.
- D. Samples: Submit two appropriately sized samples of coping, illustrating component shape, finish, and color.
- E. Manufacturer's Installation Instructions: Indicate special procedures, fasteners, supporting members, and perimeter conditions requiring special attention.

1.5. CLOSEOUT SUBMITTALS

- A. Maintenance Data.
- B. Executed Manufacturer's Warranties.

1.6. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Manufacturer's Standard Warranty: Warranted materials shall be free of defects in material and workmanship for five years after shipment. If, after inspection, the manufacturer agrees that materials are defective, the manufacturer shall at their option repair or replace them.

- C. Manufacturer's Special Warranty: Warranty shall guarantee that a standard size roof edge system, when installed per manufacturer's instructions, will not blow off, leak, or cause membrane failure, even in wind conditions up to 110 mph, or the manufacturer shall at their option repair or replace their materials.

- 1. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Roof Edge Flashings and Copings:
 - 1. Architectural Products Co: www.archprod.com/#sle.
 - 2. ATAS International, Inc; Rapid-Lok Fascia: www.atas.com/#sle.
 - 3. Drexel Metals Inc; Fascia: www.drexmet.com/#sle.
 - 4. Metal-Era Inc: www.metalera.com/#sle.
 - 5. Metal Roofing Systems, Inc; Rapid Lock Coping: www.metalroofingsystems.biz/#sle.
 - 6. OMG Roofing Products; Formed Coping Plus: www.omgroofing.com/#sle.
 - 7. Substitutions: See Section 01 6000 - Product Requirements.

2.2. COMPONENTS

- A. Copings: Factory fabricated to sizes required; mitered, welded corners; concealed fasteners.
 - 1. Configuration: Concealed continuous hold down cleat at both legs; internal splice piece at joints of same material, thickness and finish as cap; concealed stainless steel fasteners.
 - 2. Pull-Off Resistance: Tested in accordance with ANSI/SPRI/FM 4435/ES-1 using test method RE-3 to positive and negative design wind pressure as defined by applicable local building code.
 - 3. Material: Formed steel sheet, galvanized, 0.050 inch thick, minimum.
 - 4. Clips: Galvanized steel, 20 gage thick, minimum.
 - 5. Finish: 70 percent polyvinylidene fluoride.
 - 6. Color: As indicated on drawings.

2.3. ROOF-EDGE DRAINAGE SYSTEMS

- A. Downspouts: Plain rectangular complete with elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.
 - 1. Zinc-Coated Steel: Nominal 0.034-inch thickness.
- B. Parapet Scuppers: Manufactured with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof.
 - 1. Zinc-Coated Steel: Nominal 0.028-inch thickness.
- C. Conductor Heads: Manufactured conductor heads, each with flanged back and stiffened top edge, and of dimensions and shape indicated, complete with outlet tube that nests into upper end of downspout, exterior flange trim,.
 - 1. Basis of Design Product: GutterSupply.com; Standard 6" Conductor Head.
 - 2. Zinc-Coated Steel: Nominal 0.028-inch thickness.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- D. Zinc-Coated Steel Finish: Two-coat fluoropolymer / Two-coat mica fluoropolymer.
 - 1. Color: Match dark bronze anodized aluminum.

2.4. REGLETS AND COUNTER FLASHINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Castle Metal Products.
 - 2. Cheney Flashing Company.
 - 3. Fry Reglet Corporation.
 - 4. Heckmann Building Products Inc.
 - 5. Hickman Company, W. P.
 - 6. Keystone Flashing Company, Inc.
 - 7. Metal-Era, Inc.
 - 8. Metal-Fab Manufacturing, LLC.
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
 - 1. Formed Aluminum: 0.050 inch thick.
 - 2. 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.
 - 3. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.
- 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 or through-wall-flashing receiver and compress against base flashings with joints lapped, from the following exposed metal:
 - 1. Formed Aluminum: 0.032 inch thick.
- D. Accessories:
 - 1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
 - 2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.5. FINISHES

- A. Color Anodized Finish: AAMA 611 AA-M12C22A42/44 Class I integrally or electrolytically colored anodic coating not less than 0.7 mils thick; color as indicated.
- B. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

2.6. ACCESSORIES

- A. Sealant for Joints in Linear Components: As recommended by component manufacturer.
- B. Adhesive for Anchoring to Roof Membrane: Compatible with roof membrane and approved by roof membrane manufacturer.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that deck, curbs, roof membrane, base flashing, and other items affecting work of this Section are in place and positioned correctly.

3.2. INSTALLATION

- A. Install components in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Seal joints within components when required by component manufacturer.
- C. Anchor components securely.
- D. Coordinate installation of components of this section with installation of roofing membrane and base flashings.
- E. Coordinate installation of sealants and roofing cement with work of this section to ensure water tightness.
- F. Coordinate installation of flashing flanges into reglets.

END OF SECTION

SECTION 07 7123 - MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Aluminum gutters and downspouts.
- B. Precast concrete splash pads.

1.2. RELATED REQUIREMENTS

- A. Section 07 7100 - Roof Specialties: Roof-edge drainage parapet scuppers and conductor heads.

1.3. REFERENCE STANDARDS

- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.
- B. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on prefabricated components.
- C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.
- D. Samples: Submit two samples, 4 inch long illustrating component design, finish, color, and configuration.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Gutters and Downspouts:
 - 1. ATAS International, Inc; Water Control System: www.atas.com/#sle.
 - 2. Cheney Flashing Company: www.cheneyflashing.com/#sle.
 - 3. OMG Roofing Products: www.omgroofing.com/#sle.
 - 4. SAF Perimeter Systems, a division of Southern Aluminum Finishing Company, Inc: www.saf.com/persys/#sle.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.2. MATERIALS

- A. Pre-Finished Aluminum Sheet: ASTM B209 (ASTM B209M); 0.032 inch thick.
 - 1. Finish: Plain, shop pre-coated with PVDF (polyvinylidene fluoride) coating.
 - 2. Color: As indicated.

2.3. COMPONENTS

- A. Gutters: Profile as indicated.
- B. Downspouts: SMACNA Rectangular profile.
- C. Anchors and Supports: Profiled to suit gutters and downspouts.
- D. Fasteners: Galvanized steel, with soft neoprene washers.

2.4. ACCESSORIES

- A. Leaf Guards:
 - 1. Basis of design is SAF Commercial Gutter Leaf Guard.
 - a. Manufactured from 0.040" aluminum with 3/16" holes @ 1/4" staggered centers to provide a 50% open area for drainage while keeping debris out of the gutter system.
 - b. System is to be attached with clips at 30" on center to allow for the end user the ability to remove debris if needed.
 - c. Finish: same color as gutter system.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Splash Pads: Precast concrete type, size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.

2.5. FABRICATION

- A. Form gutters and downspouts of profiles and size indicated.
- B. Fabricate with required connection pieces.
- C. Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- D. Hem exposed edges of metal.
- E. Fabricate gutter and downspout accessories; seal watertight.

2.6. FINISHES

- A. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system; color as indicated.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that surfaces are ready to receive work.

3.2. PREPARATION

- A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.3. INSTALLATION

- A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.
- B. Slope gutters 0.025 inch per foot, 2.5 percent minimum.
- C. Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
- D. Connect downspouts to storm sewer system. Grout connection watertight.

END OF SECTION

SECTION 07 7200 - ROOF ACCESSORIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Curbs.
- B. Roof penetration mounting curbs.

1.2. RELATED REQUIREMENTS

- A. Section 07 5423 Thermoplastic Polyolefin Roofing (TPO): gravel stops and copies associated with membrane roofing system.
- B. Section 07 7100 - Roof Specialties: Other manufactured roof items, roof edge drainage systems.
- C. Section 07 7123 - Manufactured Gutters and Downspouts: Gutters and downspouts at entry canopy.

1.3. REFERENCE STANDARDS

- A. 29 CFR 1910.23 - Ladders; current edition.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- E. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010 (Reapproved 2015).
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
- H. FM (AG) - FM Approval Guide; current edition.
- I. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used.
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
 - 4. Maintenance requirements.
- C. Shop Drawings: Submit detailed layout developed for this project and provide dimensioned location and number for each type of roof accessory.
 - 1. Non-penetrating Rooftop Supports: Submit design calculations for loadings and spacings.
 - 2. Submit shop drawings sealed and signed by a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- D. Warranty Documentation:
 - 1. Submit manufacturer warranty.
 - 2. Ensure that forms have been completed in Owner's name and registered with manufacturer.

3. Submit documentation that roof accessories are acceptable to roofing manufacturer, and do not limit the roofing warranty.
- 1.5. DELIVERY, STORAGE, AND HANDLING
 - A. Store products in manufacturer's unopened packaging until ready for installation.
 - B. Store products under cover and elevated above grade.
- 1.6. WARRANTY
 - A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
 - B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1. ROOF CURBS

- A. Manufacturers:
 1. AES Industries Inc: www.aescurb.com/#sle.
 2. The Pate Company: www.patecurbs.com/#sle.
 3. LMCurbs; Roof Curbs: www.lmcurbs.com/#sle.
 4. Roof Products & Systems (RPS): www.rpscurbs.com/#sle.
 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Roof Curbs Mounting Assemblies: Factory fabricated hollow sheet metal construction, internally reinforced, and capable of supporting superimposed live and dead loads and designated equipment load with fully mitered and sealed corner joints welded or mechanically fastened, and integral counterflashing with top and edges formed to shed water.
 1. Applications: Roof curbs used for roof penetrations/openings as indicated on drawings.
 2. Provide layouts and configurations indicated on drawings.
- C. Curbs Adjacent to Roof Openings: Provide curb on each side of opening, with top of curb horizontal for equipment mounting.
 1. Provide preservative treated wood nailers along top of curb.
 2. Insulate inside curbs with 1-1/2 inch thick fiberglass insulation.
 3. Height Above Finished Roof Surface: 8 inches, minimum.
- D. Equipment Rail Curbs: Straight curbs on each side of equipment, with top of curbs horizontal and level with each other for equipment mounting.
 1. Provide preservative treated wood nailers along top of rails.
 2. Height Above Finished Roof Surface: 8 inches, minimum.
 3. Manufacturers:
 - a. MKT Metal Manufacturing; Equipment Rails: www.mktduct.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- E. Equipment Support: Straight curbs on each side of equipment, with top of curbs parallel with metal roofing system and each other for equipment mounting.
 1. Height Above Metal Roofing System: 8 inches, minimum.
- F. Pipe, Duct, or Conduit Mounting Curbs: Vertical posts, minimum 8 inches square unless otherwise indicated.
 1. Provide sliding channel welded along top edge with adjustable height steel bracket, fabricated to fit item supported.

2. Height Above Finished Roof Surface: 8 inches, minimum.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2. PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by manufacturer for achieving acceptable results for applicable substrate under project conditions.

3.3. INSTALLATION

- A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

3.4. CLEANING

- A. Clean installed work to like-new condition.

3.5. PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8100 - APPLIED FIRE PROTECTION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Applied fire protection of interior structural steel not exposed to damage or moisture.
- B. Preparation of applied fire protection for application of exposed overcoat finish specified elsewhere.

1.2. RELATED REQUIREMENTS

- A. Section 07 8123 - Intumescent Fire Protection.

1.3. REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- B. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993, with Editorial Revision (2015).
- C. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2017.
- D. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2020).
- E. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2020).
- F. ASTM E761/E761M - Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2020).
- G. ASTM E859/E859M - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Material (SFRMs) Applied to Structural Members; 1993 (Reapproved 2020).
- H. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2020).
- I. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- J. UL (FRD) - Fire Resistance Directory; current edition.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Provide data indicating product characteristics.
- C. Manufacturer's Certificate: Certify that applied fireproofing products meet or exceed requirements of Contract Documents.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Field Quality Control Submittals: Submit field test report.
- F. Manufacturer's Qualification Statement.

1.6. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience

1.7. FIELD CONDITIONS

- A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.
- B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.
- C. Provide temporary enclosure to prevent spray from contaminating air.

1.8. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a two year period after Date of Substantial Completion.
 - 1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
 - 2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.1. APPLIED FIRE PROTECTION ASSEMBLIES

- A. Provide UL fire-rated assemblies to hourly ratings as follows:
 - 1. Columns: Two hours; basis of design is UL No. X723.
 - 2. Roof deck and beams: One and one half hours; basis of design is UL No. P701.

2.2. MATERIALS

- A. Applied Fire Protection Material for Interior Applications, Concealed: Manufacturer's standard factory mixed material, which when combined with water is capable of providing indicated fire resistance, and complying with following requirements:
 - 1. Bond Strength: 150 pounds per square foot, minimum, when tested in accordance with ASTM E736/E736M when set and dry.
 - 2. Dry Density: As required by fire resistance design.
 - 3. Compressive Strength: 8.33 pounds per square inch, minimum.
 - 4. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
 - 5. Corrosivity: No evidence of corrosion, when tested in accordance with ASTM E937/E937M.
 - 6. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.

2.3. ACCESSORIES

- A. Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Primer Adhesive: Of type recommended by applied fire protection manufacturer.
- C. Overcoat: As recommended by manufacturer of applied fire protection material.
- D. Metal Lath: Expanded metal lath; minimum weight of 1.7 psf, galvanized finish.
- E. Water: Clean, potable.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that surfaces are ready to receive fireproofing.

- B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.
- C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.
- D. Verify that voids and cracks in substrate have been filled.
- E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.2. PREPARATION

- A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.
- B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.
- C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.
- D. Apply fireproofing manufacturer's recommended bonding agent on primed steel.
- E. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.
- F. Close off and seal duct work in areas where fireproofing is being applied.

3.3. APPLICATION

- A. Install metal lath over structural members as indicated or as required by UL Assembly Design Numbers.
- B. Apply primer adhesive in accordance with manufacturer's instructions.
- C. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.
- D. In exposed locations, trowel surface smooth and form square edges, using tools and procedures recommended by fireproofing manufacturer.

3.4. FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 4000 - Quality Requirements.
- B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.
- C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).
- D. Repair or replace applied fireproofing at locations where test results indicate fireproofing does not meet specified requirements.
- E. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.5. CLEANING

- A. Remove excess material, overspray, droppings, and debris.
- B. Remove fireproofing from materials and surfaces not required to be fireproofed.

END OF SECTION

SECTION 07 8123 - INTUMESCENT FIRE PROTECTION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Thin-film intumescent fire protection.
- B. Protective and/or decorative topcoats.

1.2. RELATED REQUIREMENTS

- A. Section 07 8100 - Applied Fire Protection: Conventional cementitious and mineral fiber fireproofing.

1.3. REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness; 2005 (Reapproved 2010).
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- E. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- F. SSPC-PA 2 - Procedure For Determining Conformance To Dry Coating Thickness Requirements; 2015, with Editorial Revision (2018).

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittals procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Performance characteristics and test results.
 - 2. Preparation instructions and recommendations.
 - 3. Storage and handling requirements and recommendations.
 - 4. Installation methods.
- C. Test Reports: Published fire resistive designs for structural elements of the types required for the project, indicating hourly ratings of each assembly.
- D. Field Quality Control Submittals: Submit field test report.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company that specializes in manufacturing the type of products specified, with minimum of ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

1.6. FIELD CONDITIONS

- A. Protect areas of application from windblown dust and rain.
- B. Maintain ambient field conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under ambient conditions outside manufacturer's absolute limits.
 - 1. Provide temporary enclosures as required to control ambient conditions.

2. Do not apply intumescent fireproofing when ambient temperatures are below 50 degrees F without specific approval from manufacturer.
3. Maintain relative humidity between 40 and 60 percent in areas of application.
4. Maintain ventilation in enclosed spaces during application and for not less than 72 hours afterward.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Intumescent Thin-Film Fire Protection:

1. Albi Manufacturing Division of StanChem Inc: www.albi.com/#sle.
2. Contego International, Inc; High Solids Reactive Fire Barrier (HS RFB): www.contegointernational.com/#sle.
3. Hilti, Inc; Fire Finish Steel Protection Spray CFP-SP WB: www.us.hilti.com/#sle.
4. Isolatek International Corp: www.isolatek.com/#sle.
5. Substitutions: See Section 01 6000 - Product Requirements.

2.2. SYSTEM REQUIREMENTS

- A. Fireproofing: Provide intumescent thin-film fire protection systems tested by an independent testing agency in accordance with ASTM E119 and acceptable to authorities having jurisdiction (AHJ).
- B. Structural Steel Columns: Fire resistance rating of 2 hours; Design Number X638.

2.3. MATERIALS

- A. Fire Resistive Coating System: Thin-film intumescent fire protection system for structural steel.
 1. Surface Burning Characteristics: Tested in accordance with ASTM E84.
 - a. Flame Spread Index (FSI): 25, maximum.
 - b. Smoke Developed Index (SDI): 50, maximum.
 2. For Interior Use:
 - a. Durometer Hardness, Type D: 45, minimum, in accordance with ASTM D2240.
- B. Protective and Decorative Top Coating: As recommended by fireproofing manufacturer for exposure and substrate conditions.
 1. Color and Gloss: As selected by Architect.
 2. Coordinate with paint as specified in Section 09 9123 for color and sheen to match between intumescent fireproof coating and adjacent painted surfaces.
- C. Sealers and Primer: As required by tested and listed assemblies, and recommended by fireproofing manufacturer to suit specific substrate conditions.
- D. Reinforcement: Glass fiber fabric matching type used in tested and listed assemblies.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine substrates to determine if they are in satisfactory condition to receive intumescent fire protection; verify that substrates are clean and free of oil, grease, incompatible primers, or other foreign substances capable of impairing bond to fireproofing system.
- B. Do not begin installation until substrates have been properly prepared.
- C. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2. PREPARATION

- A. Thoroughly clean surfaces to receive fireproofing.
- B. Repair substrates to remove surface imperfections that could effect uniformity of texture and thickness of fireproofing system, and remove minor projections and fill voids that could telegraph through finished work.
- C. Cover or otherwise protect other work that might be damaged by fallout or overspray of fireproofing system, and provide temporary enclosures as necessary to confine operations and maintain required ambient field conditions.

3.3. APPLICATION

- A. Comply with manufacturer's instructions for each particular intumescent fire protection system installation application as indicated.
- B. Apply manufacturer's recommended primer to required coating thickness.
- C. Apply fireproofing to full thickness over entire area of each substrate to be protected.
- D. Apply coats at manufacturer's recommended rate to achieve dry film thickness (DFT) as required for fire resistance ratings designated for each condition.
- E. Apply intumescent fire protection by spraying to maximum extent possible, and as necessary complete coverage by roller application or other method acceptable to manufacturer.

3.4. FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 4000 - Quality Requirements.
 - 1. Arrange for testing of installed intumescent fire protection by an independent testing laboratory using magnetic pull-off dry film thickness gage in accordance with SSPC-PA 2, and ensure it meets requirements of authorities having jurisdiction (AHJ).
 - 2. Submit field test reports promptly to Contractor and Architect.
- B. Repair or replace intumescent fire protection at locations where test results indicate fireproofing does not meet specified requirements.

3.5. CLEANING

- A. Immediately after installation of fireproofing in each area, remove overspray and fallout from other surfaces and clean soiled areas.

3.6. PROTECTION

- A. Protect installed intumescent fire protection from damage due to subsequent construction activities, so fireproofing is without damage or deterioration before Date of Substantial Completion.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 8400 - FIRESTOPPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Firestopping systems.
- B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.2. RELATED REQUIREMENTS

- A. Section 07 8100 - Applied Fire Protection.

1.3. REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- C. ITS (DIR) - Directory of Listed Products; current edition.
- D. FM (AG) - FM Approval Guide; current edition.
- E. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- F. UL (DIR) - Online Certifications Directory; Current Edition.
- G. UL (FRD) - Fire Resistance Directory; current edition.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

1.5. QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained by manufacturer.

1.6. FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
 - 2. A/D Fire Protection Systems Inc: www.adfire.com/#sle.
 - 3. Hilti, Inc: www.us.hilti.com/#sle.

4. Nelson FireStop Products: www.nelsonfirestop.com/#sle.
5. Specified Technologies Inc: www.stifirestop.com/#sle.
6. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic:
www.tremcosealants.com/#sle.
7. Substitutions: See Section 01 6000 - Product Requirements.

2.2. MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.3. FIRESTOPPING SYSTEMS

- A. Firestopping: Any material meeting requirements.
 1. Fire Ratings: Use any system that is listed by FM (AG) or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.
 2. Fire Ratings: See drawings for required ratings.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.2. PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.

3.3. INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code and identification of the specific fire rating of firestopping installations.

3.4. CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.5. PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 9200 - JOINT SEALANTS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Nonsag gunnable joint sealants.
- B. Self-leveling pourable joint sealants.
- C. Joint backings and accessories.

1.2. RELATED REQUIREMENTS

- A. Section 07 2500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.
- B. Section 07 8400 - Firestopping: Firestopping sealants.
- C. Section 08 7100 - Door Hardware: Setting exterior door thresholds in sealant.
- D. Section 08 8000 - Glazing: Glazing sealants and accessories.
- E. Section 09 2116 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

1.3. REFERENCE STANDARDS

- A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2015.
- B. ASTM C834 - Standard Specification for Latex Sealants; 2014.
- C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2000 (Reapproved 2011).
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).
- H. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.
- I. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
 - 2. List of backing materials approved for use with the specific product.
 - 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 - 4. Substrates the product should not be used on.
 - 5. Substrates for which use of primer is required.
 - 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
 - 7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 - 8. Sample product warranty.
 - 9. Certification by manufacturer indicating that product complies with specification requirements.

- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

1.5. QUALITY ASSURANCE

- A. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Allow sufficient time for testing to avoid delaying the work.
 - 4. Deliver to manufacturer sufficient samples for testing.
 - 5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 - 6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

1.6. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.
- D. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Verify available warranties and warranty periods with manufacturers listed in Part 2 articles.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- E. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural 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. MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

- B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Retain subparagraph below if sealants are indicated for Use I. Revise if a liquid other than water is used in testing.
 - 2. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
 - C. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
 - D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.
- 2.2. MANUFACTURERS
- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
 - 1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
 - 2. Bostik Inc: www.bostik-us.com.
 - 3. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 - 4. Pecora Corporation: www.pecora.com.
 - 5. Sika Corporation: www.usa-sika.com/#sle.
 - 6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 7. Substitutions: See Section 01 6000 - Product Requirements.
 - B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
 - 1. BASF Construction Chemicals-Building Systems: www.buildingsystems.basf.com.
 - 2. Bostik Inc: www.bostik-us.com.
 - 3. Dow Corning Corporation: www.dowcorning.com/construction/#sle.
 - 4. Pecora Corporation: www.pecora.com.
 - 5. Sika Corporation: www.usa-sika.com/#sle.
 - 6. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 - 7. Substitutions: See Section 01 6000 - Product Requirements.
- 2.3. JOINT SEALANT APPLICATIONS
- A. Scope:
 - 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Wall expansion and control joints.
 - b. Joints between door, window, and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
 - 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.

- b. Gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
 - 1) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
 - c. Other joints indicated below.
 - 3. Do not seal the following types of joints.
 - a. Intentional weepholes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
 - B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
 - 1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
 - 2. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
 - C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
 - 1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 - 2. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
 - 3. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
 - 4. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
 - D. Interior Wet Areas: Bathrooms, restrooms, kitchens, and food service areas; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.
 - E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".
- 2.4. NONSAG JOINT SEALANTS
- A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
 - 2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
 - 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 - 4. Color: Match adjacent finished surfaces.
 - 5. Cure Type: Single-component, neutral moisture curing.
 - 6. Service Temperature Range: Minus 65 to 180 degrees F.
 - B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Color: Match adjacent finished surfaces.
 - 3. Cure Type: Single-component, neutral moisture curing
 - 4. Service Temperature Range: Minus 65 to 180 degrees F.

- C. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
 - 1. Color: Clear.
- D. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; multi-component; not expected to withstand continuous water immersion or traffic.
 - 1. Movement Capability: Plus and minus 50 percent, minimum.
 - 2. Color: Match adjacent finished surfaces.
 - 3. Service Temperature Range: Minus 40 to 180 degrees F.
- E. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .
 - 1. Movement Capability: Plus and minus 35 percent, minimum.
 - 2. Color: Match adjacent finished surfaces.
 - 3. Service Temperature Range: Minus 40 to 180 degrees F.
- F. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Color: Match adjacent finished surfaces.
 - 3. Service Temperature Range: Minus 40 to 180 degrees F.
- G. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
 - 1. Color: To be selected by Architect from manufacturer's standard range.
 - 2. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).
- H. Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding.
 - 1. Manufacturers:
 - a. Basis of Design: Tremco; TremPro JS-773.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.5. SELF-LEVELING SEALANTS

- A. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .
 - 1. Movement Capability: Plus and minus 25 percent, minimum.
 - 2. Color: To be selected by Architect from manufacturer's standard range.
 - 3. Service Temperature Range: Minus 40 to 180 degrees F.

2.6. ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
 - 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.

2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 3. Open Cell: 40 to 50 percent larger in diameter than joint width.
 4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
- B. Preformed Extruded Silicone Joint Seal: Pre-cured low-modulus silicone extrusion, in sizes to fit applications indicated on drawings, combined with a neutral-curing liquid silicone sealant for bonding joint seal to substrates.
1. Size: 1 inch wide, in rolls 100 feet long.
 2. Thickness: 0.78 inch, with ridges along outside bottom edges for bonding area.
 3. Color: As selected by Architect..
- C. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- D. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.
- E. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.
- F. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.
- C. Verify that backer rods are of the correct size.

3.2. PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.3. INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- E. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

- G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
- I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.4. FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.5. POST-OCCUPANCY

- A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION

SECTION 07 9513 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Expansion joint cover assemblies for wall and ceiling surfaces.

1.2. RELATED REQUIREMENTS

- A. Section 04 2000 - Unit Masonry: Placement of joint cover assembly frames in masonry.
- B. Section 09 2116 - Gypsum Board Assemblies: Gypsum board control joint trim.
- C. Section 09 5100 - Acoustical Ceilings: Expansion joint assemblies in suspended ceiling grids.

1.3. REFERENCE STANDARDS

- A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
- C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.
- D. ASTM B455/B455M - Standard Specification for Copper-Zinc-Lead Alloy (Leaded-Brass) Extruded Shapes; 2020.
- E. ITS (DIR) - Directory of Listed Products; current edition.
- F. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Installation Templates: For frames and anchors to be embedded in concrete or masonry, furnish templates to relevant installers; include installation instructions and tolerances.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.
- C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.
- D. Samples: Submit two samples 6 inch long, illustrating profile, dimension, color, and finish selected.
- E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Expansion Joint Cover Assemblies: Basis of Design: Inpro JointMaster, www.inprocorp.com.
- B. Substitutions: See Section 01 6000 - Product Requirements.

2.2. EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

- A. EJC1 (Exterior Wall Joint) Basis of Design: inpro JointMaster 615 model, #615-A09-050.
 - 1. System Description: Wall to corner (wall), exterior: 2 inches, silicone seal, custom color, fill with compressible mineral wool insulation.
 - 2. Provide manufacturer's standard EPDM vapor barrier system.
- B. EJC2 (Interior Wall Joint) Basis of Design: inpro JointMaster 101 Series, #101-A09-050LP.

1. System Description: Wall to wall, ceiling to ceiling interior, 2 inches, low profile system, continuous seal in continuous aluminum frame.
 2. Provide manufacturer's standard fire blanket system at fire rated locations.
 - C. EJC3 (Acoustical Ceiling to Wall Joint) Basis of Design: Inpro JointMaster 116 Series, #116-A18-050.
 1. System Description: Acoustical ceiling to wall, 2 inches, continuous seal in continuous aluminum frame. Attached to ceiling grid on one side with pop rivets and wall on other side.
 - D. EJC3 (Acoustical Ceiling to Acoustical Ceiling Joint) Basis of Design: Inpro JointMaster 116 Series, #116-A24-050.
 1. System Description: Acoustical ceiling to acoustical ceiling, 2 inches, continuous seal in continuous aluminum frame attached to ceiling grid on both sides with pop rivets.
 - E. All fire-rated joints to use Fire Blanket Joint System: JointMaster "Fireline" F520; 2-hour typical.
 - F. Substitutions: See Section 01 6000 - Product Requirements.
- 2.3. EXPANSION JOINT COVER ASSEMBLIES
- A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.
 1. Joint Dimensions and Configurations: As indicated on drawings.
 2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
 3. Joint Movement Capability: If not indicated, provide minimum plus/minus 25 percent joint movement capability.
 4. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 5. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.
- 2.4. MATERIALS
- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper; or ASTM B308/B308M, 6061 alloy, T6 temper.
 1. Exposed Finish Outdoors: Natural anodized.
 2. Exposed Finish at Walls and Ceilings: Natural anodized.
 - B. Resilient Seals:
 1. For Ceilings: Manufacturer's standard resilient material, flush, pleated, or hollow gasket.
 - C. Anchors and Fasteners: As recommended by cover manufacturer.
 - D. Backing Paint for Aluminum Components in Contact with Cementitious Materials: Asphaltic type.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.
- B. Verify that frames and anchors installed by others are in correct locations and suitable for installation of remainder of assembly.

3.2. INSTALLATION

- A. Install components and accessories in accordance with manufacturer's instructions.
- B. Align work plumb and level, flush with adjacent surfaces.
- C. Rigidly anchor to substrate to prevent misalignment.

- D. Transition to Roof Expansion Joint Covers: Coordinate installation of exterior wall expansion joint covers with roof expansion joint covers.
 - 1. Install factory-fabricated units at transition between exterior walls and roof expansion joint cover assemblies.
- E. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.
 - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.3. PROTECTION

- A. Provide strippable coating to protect finish surface.

END OF SECTION

SECTION 08 1113 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Hollow metal frames for wood doors.

1.2. RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware.
- B. Section 09 9123 - Interior Painting: Field painting.

1.3. ABBREVIATIONS AND ACRONYMS

- A. ANSI: American National Standards Institute.
- B. ASCE: American Society of Civil Engineers.
- C. HMMA: Hollow Metal Manufacturers Association.
- D. NAAMM: National Association of Architectural Metal Manufacturers.
- E. NFPA: National Fire Protection Association.
- F. SDI: Steel Door Institute.
- G. UL: Underwriters Laboratories.

1.4. REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- C. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- D. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2015.
- G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2014.
- H. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- J. ITS (DIR) - Directory of Listed Products; current edition.
- K. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- L. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- M. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.
- N. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2006.
- O. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- P. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

- Q. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.
- R. UL (DIR) - Online Certifications Directory; Current Edition.
- S. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.
- C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- D. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.

1.6. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

1.8. PROJECT CONDITIONS

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

1.9. COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to the Project site in time for installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/#sle.
 - 4. Mesker Doors and Frames.
 - 5. Substitutions: See Section 01 6000 - Product Requirements.

2.2. PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 3. Door Top Closures: Flush end closure channel, with top and door faces aligned.
 4. Door Edge Profile: Manufacturers standard for application indicated.
 5. Typical Door Face Sheets: Flush.
 6. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Flush.
 7. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 8. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvanized) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
 - a. Based on SDI Standards: Provide at least A40/ZF120 (galvanized) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvanized) for corrosive locations.
- B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.
- 2.3. HOLLOW METAL FRAMES
- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
 - B. Interior Door Frames, Non-Fire Rated: Face welded type.
 - C. Door Frames, Fire-Rated: Face welded type.
 1. Fire Rating: Same as door, labeled.
 2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
 - D. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
 - E. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
 - F. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- 2.4. FINISHES
- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
 - B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.
- 2.5. ACCESSORIES
- A. Grout for Frames: Portland cement grout with maximum 4 inch slump for hand troweling; thinner pumpable grout is prohibited.

- B. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.2. PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3. INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install fire rated units in accordance with NFPA 80.
- C. Coordinate frame anchor placement with wall construction.
- D. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- E. Install door hardware as specified in Section 08 7100.
- F. Coordinate installation of electrical connections to electrical hardware items.

3.4. TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5. ADJUSTING

- A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 1416 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Flush wood doors; flush and flush glazed configuration; fire-rated and non-rated.

1.2. RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames.
- B. Section 08 7100 - Door Hardware.
- C. Section 08 8000 - Glazing.

1.3. REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- B. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- D. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.
- E. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- F. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D. Samples: Submit two samples of door veneer, 8 by 10 inch in size illustrating wood grain, stain color, and sheen for each species of veneer and solid lumber specified.
- E. Warranty, executed in Owner's name.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Comply with requirements of referenced standard and manufacturer's written instructions.
- C. Accept doors on site in manufacturer's packaging. Inspect for damage.
- D. Protect doors with resilient packaging. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.7. FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during remainder of construction period.

1.8. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.
- D. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1. Basis of Design: VT Industries, Heritage Series: www.vtindustries.com.
 - a. Finish Profile: Red Oak, Alpine AL18.
 - 2. Other Acceptable Manufacturers (dependent on compliance with Basis of Design requirements and specification):
 - a. Eggers Industries: www.eggersindustries.com/#sle.
 - b. Graham Wood Doors: www.grahamdoors.com/#sle.
 - c. Masonite Architectural; Aspiro Select Wood Veneer Doors: www.architectural.masonite.com/#sle.
 - 3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2. DOORS

- A. Doors: Refer to drawings for locations and additional requirements.
 - 1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
 - 2. Wood Veneer Faced Doors: 5-ply or 7-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C - Positive Pressure; Underwriters Laboratories Inc (UL) or Intertek/Warnock Hersey (WHI) labeled without any visible seals when door is open.
 - 3. Smoke and Draft Control Doors: In addition to required fire rating, provide flush wood door assemblies in compliance with WDMA I.S. 1A requirements for "S" label; no additional gasketing or edge sealing allowed.
 - 4. Wood veneer facing with factory transparent finish.

2.3. DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.
- B. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.4. DOOR FACINGS

- A. Veneer Facing for Standard Finish: Red Oak, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 - 1. Vertical Edges: Same species as face veneer.
 - a. Provide finish at exposed top edge where door is visible from above.
 - 2. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.
 - 3. Finish: VT Industries, Heritage, Alpine AL18 stain.

2.5. DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Cores Constructed with stiles and rails:
 - 1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
 - 2. Provide solid blocking for other throughbolted hardware.
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- E. Provide edge clearances in accordance with the quality standard specified.

2.6. FACTORY FINISHING - WOOD VENEER DOORS

- A. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
 - 1. Transparent:
 - a. System - TR-2, Catalyzed Lacquer.
 - b. Grade: Premium
 - c. Stain: as specified in Door Facings section above.
 - d. Sheen: Satin.
- B. Seal door top edge with color sealer to match door facing.

2.7. ACCESSORIES

- A. Glazing: As specified in Section 08 8000.
- B. Glazing Stops: Wood, of same species as door facing, metal clips for rated doors, mitered corners; prepared for countersink style tamper proof screws.
- C. Door Hardware: As specified in Section 08 7100.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2. INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
 - 1. Install fire-rated doors in accordance with NFPA 80 requirements.

2. Install smoke and draft control doors in accordance with NFPA 105 requirements.
 - B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
 - C. Use machine tools to cut or drill for hardware.
 - D. Coordinate installation of doors with installation of frames and hardware.
 - E. Coordinate installation of glazing.
- 3.3. TOLERANCES
 - A. Comply with specified quality standard for fit and clearance tolerances.
 - B. Comply with specified quality standard for telegraphing, warp, and squareness.

END OF SECTION

SECTION 08 3100 - ACCESS DOORS AND PANELS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Wall access door and frame units.

1.2. REFERENCE STANDARDS

- A. UL (FRD) - Fire Resistance Directory; current edition.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- D. Project Record Documents: Record actual locations of each access unit.

PART 2 PRODUCTS

2.1. ACCESS DOORS AND PANELS ASSEMBLIES

A. Wall-Mounted Units:

- 1. Location: As indicated on drawings and specifications.
- 2. Material: Steel.
- 3. Size: 18 inch by 18 inch, unless otherwise indicated.
- 4. Door/Panel: Concealed hinged, standard duty, with screwdriver-operated spring or cam lock and no handle.
- 5. Gypsum Board Mounting Criteria: Provide concealed drywall bead frame with door surface flush with wall surface.

B. Fire-Rated Wall-Mounted Units:

- 1. Location: As indicated on drawings and specifications.
- 2. Wall Fire-Rating: As indicated on drawings.
- 3. Material: Steel.
- 4. Size: 18 inch by 18 inch, unless otherwise indicated.
- 5. Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

2.2. WALL-MOUNTED UNITS

A. Manufacturers:

- 1. ACUDOR Products Inc: www.acudor.com/#sle.
- 2. Babcock-Davis: www.babcockdavis.com/#sle.
- 3. Cendrex, Inc: www.cendrex.com/#sle.
- 4. Milcor, Inc: www.milcorinc.com/#sle.
- 5. Nystrom, Inc: www.nystrom.com/#sle.
- 6. Substitutions: See Section 01 6000 - Product Requirements.

- B. Wall-Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.

1. Door Style: Single thickness with rolled or turned in edges.
2. Frames: 16 gage, 0.0598 inch, minimum thickness.
3. Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
4. Steel Finish: Primed.
5. Hardware:
 - a. Hardware for Fire-Rated Units: As required for listing.
 - b. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
 - c. Latch/Lock: Screw driver slot for quarter turn cam latch.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that rough openings are correctly sized and located.

3.2. INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 4229 - AUTOMATIC ENTRANCES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Packaged power-operated door assemblies of following types:
 - 1. Sliding type.
- B. Controllers, actuators and safety devices.
- C. Maintenance.

1.2. DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.

1.3. REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- C. BHMA A156.19 - American National Standard for Power Assist and Low Energy Power Operated Doors; 2013.
- D. IAC - Illinois Accessibility Code
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements.
 - 2. Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes.
- C. Product Data: Provide data on system components, sizes, features, and finishes.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and manufacturer's hardware and component templates.
- E. Manufacturer's Qualification Statement.
- F. Installer's Qualification Statement.
- G. Maintenance Contract.
- H. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- I. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.
- J. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience, and a member of AAADM.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.6. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Special Warranty: Manufacturer agrees to repair or replace components of automatic entrances 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. Faulty operation of operators, controls, and hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Five years from date of Substantial Completion.
- C. Special Finish Warranty: Manufacturer agrees to repair or replace components on which finishes fail in materials or workmanship within specified warranty period.
 - 1. 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. Warranty Period: Five years from date of Substantial Completion.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Sliding Automatic Entrance Door Assemblies:
 - 1. Sliding Automatic Door, Vestibule, C101-1.
 - a. Basis of design is Horton Profiler Series 2000B Belt Drive, Type 310 Single Slide, SO-SX, 8' unit width.
 - b. Operational description: 3'-6" slider opening, breakaway operation, door to have fail safe auto lock to be activated by card reader from vestibule side and by wall mounted push button adjacent to door from building interior side.
 - 2. Sliding Automatic Door, Registration, 132-2.
 - a. Basis of design is Horton Profiler Series 2000B Belt Drive, Type 310 Single Slide, SO-SX, 8' unit width.
 - b. Operational description: 3'-6" slider opening, breakaway operation, door to have option to be activated by wall mounted push button adjacent to door at each side in lieu of standard sensor operation.

2.2. AUTOMATIC ENTRANCE DOOR ASSEMBLIES

- A. Comply with ADA Standards for egress requirements.
- B. Framing Members: Provide manufacturer's standard extruded aluminum framing, reinforced as required to support imposed loads.
 - 1. Nominal Sizes:

- a. Single Slide and Bi-Parting Sliding Doors: 1-3/4 inch wide by 4-1/2 inch deep.
 - 2. Transoms: Provide flush glazed transom with framing that is integral with automatic entrance framing system.
 - C. Door and Sidelight Construction: Heavy duty interlocked extruded aluminum tubular stile and rail sections, through-rod bolted construction with steel corner support at hinge stile of carrier-suspended swinging panels or mechanically fastened corners with welded reinforcing brackets to reduce sag in sliding or breakout mode.
 - 1. Door Thickness: 1-3/4 inch, nominal.
 - 2. Stile Design:
 - a. Wide stile, 4 inch, nominal width.
 - 3. Top Rail Height: 4 inch, nominal.
 - 4. Center Rail (Muntin Bar) Height: 2 inch, nominal.
 - 5. Bottom Rail Height: 10 inch, nominal.
 - 6. Glazing Stops: Manufacturer's standard snap-on extruded aluminum square stops with preformed resilient glazing gaskets.
 - 7. Glazing Stop Width: Manufacturers standard.
 - 8. Glazing Thickness: 1/4 inch.
 - D. Door and Frame Finish: clear anodized aluminum.
- 2.3. CONTROLLERS, ACTUATORS, AND SAFETIES
- A. Controller: Provide microprocessor operated controller for each door.
 - B. Comply with BHMA A156.10 for actuator and safety types and zones.
 - C. Proximity Detector Actuator/Safety: Microwave; distance of control sensitivity adjustable.
- 2.4. ELECTRICAL CHARACTERISTICS AND COMPONENTS
- A. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
 - B. Disconnect Switch: Factory mount disconnect switch in control panel.
 - C. Electrical Interlocks: Provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available and is of the correct characteristics.

3.2. INSTALLATION

- A. Install equipment in accordance with manufacturer's instructions.
- B. Provide for dimensional distortion of components during operation.
- C. Coordinate installation of components with related and adjacent work; level and plumb.

3.3. ADJUSTING

- A. Adjust door equipment for correct function and smooth operation.
- B. Readjust door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

3.4. CLEANING

- A. Remove temporary protection, clean exposed surfaces.

3.5. CLOSEOUT ACTIVITIES

- A. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.6. MAINTENANCE

- A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide a separate maintenance contract for specified maintenance service.
- C. Provide service and maintenance of operating equipment for one year from Date of Substantial Completion, at no extra charge to Owner.

END OF SECTION

SECTION 08 4313 - ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Aluminum-framed storefront, with vision glass.
- B. Aluminum doors and frames.
- C. Weatherstripping.

1.2. RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.
- B. Section 08 8000 - Glazing: Glass and glazing accessories.

1.3. REFERENCE STANDARDS

- A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.
- B. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; 2009.
- C. AAMA 503 - Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems; 2014.
- D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.
- H. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).
- I. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- J. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).
- K. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordinate with installation of other components that comprise the exterior enclosure.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details.
- C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

- D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- E. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- F. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.
- G. Designer's Qualification Statement.
- H. Manufacturer's Qualification Statement.
- I. Installer's Qualification Statement.
- J. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.6. QUALITY ASSURANCE

- A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.
- B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Handle products of this section in accordance with AAMA CW-10.
- B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.8. FIELD CONDITIONS

- A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.9. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.
- C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
- D. Provide 20 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

1.10. MAINTENANCE SERVICE

- A. Entrance Door Hardware:
 - 1. 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 entrance door hardware.
 - 2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 PRODUCTS

2.1. BASIS OF DESIGN -- FRAMING

- A. Center-Set Style, Thermally-Broken:
 - 1. Basis of Design: Kawneer TriFab 451UT.
 - 2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
- B. Substitutions: See Section 01 6000 - Product Requirements.

2.2. BASIS OF DESIGN -- SWINGING DOORS

- A. Wide Stile, Insulating Glazing, Thermally-Broken:
 - 1. Basis of Design: Kawneer, 500T Insulpour Thermal Entrance.
 - 2. Thickness: 1-3/4 inches.
- B. Substitutions: See Section 01 6000 - Product Requirements.
 - 1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.3. STOREFRONT

- A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
 - 1. Finish: Class I color anodized.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
 - 2. Finish Color: Dark bronze.
 - 3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
 - 4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
 - 5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
 - 6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
 - 7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
 - 8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
 - 9. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.
- B. Performance Requirements:
 - 1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.

- a. Member Deflection: Limit member deflection to 1/175 in any direction, with full recovery of glazing materials.
2. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
3. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.
4. Condensation Resistance Factor of Framing: 50, minimum, measured in accordance with AAMA 1503.
5. Overall U-value Including Glazing: 0.38 Btu/(hr sq ft deg F), maximum.

2.4. COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
 1. Glazing Stops: Flush.
- B. Glazing: As specified in Section 08 8000.
 1. For Exterior Framing: Type IG-1.
 2. For Interior Framing: Type G-1.
- C. Swing Doors: Glazed aluminum.
 1. Thickness: 1-3/4 inches.
 2. Top Rail: 5 inches wide.
 3. Vertical Stiles: 5 inches wide.
 4. Bottom Rail: 10 inches wide.
 5. Glazing Stops: Square.
 6. Finish: Same as storefront.

2.5. MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Fasteners: Stainless steel.
- C. Exposed Flashings: Aluminum sheet, 20 gage, 0.032 inch minimum thickness; finish to match framing members.
- D. Concealed Flashings: Sheet aluminum, 26 gage, 0.017 inch minimum thickness.
- E. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.
- F. Sealant for Setting Thresholds: Non-curing butyl type.
- G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.
- H. Glazing Accessories: As specified in Section 08 8000.
- I. Shop and Touch-Up Primer for Steel Components: Zinc oxide, alkyd, linseed oil primer appropriate for use over hand cleaned steel.

2.6. FINISHES

- A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.
- B. Color: Dark bronze.

2.7. HARDWARE

- A. For each door, include weatherstripping and sill sweep strip.
- B. Other Door Hardware: As specified in Section 08 7100.
- C. Weatherstripping at exterior doors: Wool pile, continuous and replaceable; provide on all doors.
- D. Silencers at interior doors: Provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- E. Sill Sweep Strips at exterior doors: Resilient seal type, retracting, of neoprene; provide on all doors.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2. INSTALLATION

- A. Install wall system in accordance with manufacturer's instructions.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.
- G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.
- H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- I. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3. TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.
- B. Provide field testing of installed storefront system by independent laboratory in accordance with AAMA 503 during construction process and before installation of interior finishes.
 - 1. Perform a minimum of two tests in each designated area as indicated on drawings.
 - 2. Conduct tests in each area prior to 10 percent and 50 percent completion of this work.
 - 3. Field test for water penetration in accordance with ASTM E1105 with uniform static air pressure difference (Procedure A) not less than 4.18 psf.

- a. Maximum allowable rate of water penetration in 15-minute test is 0.5 ounce that is not contained in an area with provisions to drain to exterior, or collected on surface of interior horizontal framing member.
 - C. Repair or replace storefront components that have failed designated field testing, and retest to verify performance conforms to specified requirements.
- 3.5. ADJUSTING
- A. Adjust operating hardware for smooth operation.
- 3.6. CLEANING
- A. Remove protective material from pre-finished aluminum surfaces.
 - B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.
- 3.7. PROTECTION
- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5659 - SERVICE AND TELLER WINDOW UNITS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Service and teller window units; referred to as rolling door assembly.

1.2. REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

1.3. ADMINISTRATIVE REQUIREMENTS

- A. Coordinate work with adjacent materials specified in other sections and as indicated on drawings and approved shop drawings.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturer's product data for specified products indicating materials, operation, glazing, finishes, and installation instructions.
- C. Shop Drawings: Indicate configuration, sizes, rough-in, mounting, anchors and fasteners, and installation clearances.
- D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Service and Teller Window Rolling Door Assembly:
 - 1. Basis of Design: Stylmark, Inc.; www.stylmark.com; rolling door assembly

2.2. SERVICE AND TELLER WINDOW ROLLING DOOR ASSEMBLY

- A. Location: Built within interior wall, as indicated on drawings.
- B. Location: Built as a portion of the transaction station at the main reception counter.
 - 1. See Section 08 8000 - Glazing for rolling doors and surrounding glass.
- C. Basis of Design: Stylmark rolling door 610185.
- D. Window Type: rolling door, 2 panels.
 - 1. Mounting: Floating header, top and bottom track, routed into countertop at sill.
 - 2. Window Size: As indicated on drawings.
 - 3. Material: Aluminum.
 - a. Finish: Natural anodized.
 - 4. Components:
 - a. Floating Header: Stylmark FH4SACS, 1 3/4" x 4", aluminum mullion.
 - b. Rolling Door Tracks: Stylmark #110007.
 - c. Rolling Door Bottom Roller Assemblies: Stylmark #110009, #510001 and #110012.
 - d. Rolling Door Top Trim: Stylmark #419007.
 - e. Manufacturer's standard sick on finger pulls.
 - f. Manufacturer's standard ratchet-type keyed lock.

- E. Glazing: Single (monolithic), 1/4 inch thick, clear.
 - 1. Tempered safety glazing, refer to section 08 8000.

PART 3 EXECUTION

3.1. COORDINATION

- A. Coordinate rolling door assembly installation with glazing and reception counter construction.

3.2. EXAMINATION

- A. Verify that window openings are ready for installation of windows.
- B. Verify that correct embedded anchors are in place and in proper location; repair or replace anchors as required to achieve satisfactory installation.
- C. Notify Architect if conditions are not suitable for installation of units; do not proceed until conditions are satisfactory.

3.3. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install units in correct orientation (inside/outside or secure/non-secure).
- C. Anchor units securely in manner so as to achieve performance specified.

3.4. ADJUSTING

- A. Adjust operating components for smooth operation while also maintaining a secure, weather-tight enclosure and a tight fit at the contact points; lubricate operating hardware.

3.5. CLEANING

- A. Remove protective material from factory finished surfaces.
- B. Clean exposed surfaces promptly after installation without damaging finishes.

3.6. PROTECTION

- A. Provide temporary protection to ensure that service and teller windows are without damage upon Date of Substantial Completion.

END OF SECTION

SECTION 08 7100 - DOOR HARDWARE

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Hardware for wood and aluminum doors.
- B. Hardware for fire-rated doors.
- C. Electrically operated and controlled hardware.
- D. Thresholds.
- E. Weatherstripping and gasketing.

1.2. RELATED REQUIREMENTS

- A. Section 08 1113 - Hollow Metal Doors and Frames.
- B. Section 08 4313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.
- C. Section 28 4600 - Fire Detection and Alarm: Electrical connection to activate door closers.

1.3. REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. BHMA A156.1 - American National Standard for Butts and Hinges; 2013.
- C. BHMA A156.2 - American National Standard for Bored and Preamsembled Locks & Latches; 2011.
- D. BHMA A156.3 - American National Standard for Exit Devices; 2014.
- E. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.
- F. BHMA A156.6 - American National Standard for Architectural Door Trim; 2010.
- G. BHMA A156.7 - American National Standard for Template Hinge Dimensions; 2014.
- H. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; 2010.
- I. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2012.
- J. BHMA A156.15 - American National Standard for Release Devices - Closer Holder, Electromagnetic and Electromechanical; 2011.
- K. BHMA A156.16 - American National Standard for Auxiliary Hardware; 2013.
- L. BHMA A156.18 - American National Standard for Materials and Finishes; 2012.
- M. BHMA A156.21 - American National Standard for Thresholds; 2014.
- N. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012.
- O. BHMA A156.23 - American National Standard for Electromagnetic Locks; 2010.
- P. BHMA A156.26 - American National Standard for Continuous Hinges; 2012.
- Q. BHMA A156.28 - American National Standard for Recommended Practices for Mechanical Keying Systems; 2013.
- R. BHMA A156.31 - American National Standard for Electric Strikes and Frame Mounted Actuators; 2013.
- S. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2014.
- T. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
- U. DHI (H&S) - Sequence and Format for the Hardware Schedule; 1996.
- V. DHI (KSN) - Keying Systems and Nomenclature; 1989.
- W. ITS (DIR) - Directory of Listed Products; current edition.

- X. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- Y. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- Z. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.
- AA. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.
- AB. UL (DIR) - Online Certifications Directory; Current Edition.
- AC. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- AD. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
 - 1. Installer's Architectural Hardware Consultant (AHC).
 - 2. Hardware Installer.
 - 3. Owner's Information Technology representative.
- C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- D. Keying Requirements Meeting:
 - 1. Attendance Required:
 - a. Contractor.
 - b. Owner.
 - c. Installer's Architectural Hardware Consultant (AHC).
 - d. Owner's Information Technology representative.
 - 2. Agenda:
 - a. Establish keying requirements.
 - b. Verify locksets and locking hardware are functionally correct for project requirements.
 - c. Verify that keying and programming complies with project requirements.
 - d. Establish keying submittal schedule and update requirements.
 - 3. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 - a. Access control requirements.
 - b. Key control system requirements.
 - c. Schematic diagram of preliminary key system.
 - 4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
 - 5. Deliver established keying requirements to manufacturers.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 - 2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
 - 3. List groups and suffixes in proper sequence.
 - 4. Provide complete description for each door listed.
 - 5. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
 - 6. Include account of abbreviations and symbols used in schedule.
- D. Shop Drawings - Electrified Door Hardware: Submit diagrams for power, signal, and control wiring for electrified door hardware that include details of interface with building safety and security systems. Provide elevations and diagrams for each electrified door opening as follows:
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC).
 - 2. Elevations: Submit front and back elevations of each door opening showing electrified devices with connections installed and an operations narrative describing how opening operates from either side at any given time.
 - 3. Diagrams: Submit point-to-point wiring diagram that shows each device in door opening system with related colored wire connections to each device.
 - 4. Coordinate with access control and security low voltage systems provided by the Owner.
- E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
 - 1. Submit manufacturer's parts lists and templates.
- F. Keying Schedule:
 - 1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

1.6. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) and Electrified Hardware Consultant (EHC) to assist in work of this section.
 - 1. Coordination Responsibility: Coordinate installation of electronic security hardware with Owner, Architect and related subcontractors.
 - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- D. Product Substitutions: Comply with product requirements stated in Division 01 and as specified herein.

1. The Owner has identified certain products as their facility standards and those are included in the hardware sets developed for this project. Substitutions are not permitted for these products.
 2. Any requests for substitution items not identified as "substitutions not permitted" must be accompanied by a detailed comparison of significant qualities of proposed substitution with those of the product specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the product specified.
- E. Special Requirements:
1. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
 - a. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 1) Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
 2. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
 - a. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.
 3. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.
 4. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
 - a. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
 - b. Maximum opening-force requirements:
 - 1) Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
 - 2) Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
 - 3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - c. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
 - d. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.
- 1.7. DELIVERY, STORAGE, AND HANDLING
- A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.
 - B. Promptly replace products damaged during shipping.
 - C. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.

1.8. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
 - 1. Closers: Ten years, minimum.
 - 2. Exit Devices: Three years, minimum.
 - 3. Locksets and Cylinders: Three years, minimum.
 - 4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.1. DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 - 3. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
 - 4. Hardware for Smoke and Draft Control Doors (Indicated as "S" on Drawings): Provide door hardware that complies with local codes, and requirements of assemblies tested in accordance with UL 1784.
 - 5. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.
 - 6. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
 - 7. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.
- D. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.
- E. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. Refer to Drawings for listing of hardware sets.
- F. Fasteners:
 - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
 - 2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
 - a. Self-drilling (Tek) type screws are not permitted.
 - 3. Provide stainless steel machine screws and lead expansion shields for concrete and masonry substrates.
 - 4. Provide spacers or sex bolts with sleeves for through bolting of hollow metal doors and frames.

5. Fire-Rated Applications: Comply with NFPA 80.
 - a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
 - b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.2. HINGES

- A. Manufacturers:
 1. Basis of Design: Ives.
 - a. Basis of Design for Continuous Hinges: Ives, 224HD, 628 finish.
 - b. Basis of Design for Continuous Hinges with electrical cutouts: Ives, 224HD EPT, 628 finish.
 - c. Basis of Design for Butt Hinges: Ives, 5BB1 4.5 X 4.5, 652 finish.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Hinges: Comply with BHMA A156.1, Grade 1.
 1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 - a. Provide hinge width required to clear surrounding trim.
 2. Continuous Hinges: Aluminum geared hinges complying with BHMA A156.26 on exterior doors and interior doors where scheduled.
 3. Provide hinges on every swinging door.
 4. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
 5. Provide following quantity of butt hinges for each door:
 - a. Doors From 60 inches High up to 90 inches High: Three hinges.
 - b. Doors 90 inches High up to 120 inches High: Four hinges.
 - c. Doors over 120 inches High: One additional hinge per each additional 30 inches in height.
 6. Provide hospital tips on hinges where scheduled.

2.3. EXIT DEVICES

- A. Manufacturers:
 1. Basis of Design: Von Duprin, 9900 Series.
 - a. Basis of Design for Panic Device with Electric Latch Retraction: Von Duprin EL9975-NL-17-F-RX, 626 finish.
 - b. Basis of Design for Standard Panic Rim Device, Von Duprin, 99-L-17, 626 finish.
 - c. Basis of Design for Concealed Vertical Rod Device, Double Egress, Von Duprin, 99-47WDC-EO, 626 finish.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Exit Devices: Comply with BHMA A156.3, Grade 1.
 1. Lever design to match lockset trim.
 2. Provide cylinder with cylinder dogging or locking trim, where scheduled.
 - a. Rim cylinder to have Schlage keyway.
 3. Provide exit devices properly sized for door width and height.
 4. Provide strike as recommended by manufacturer for application indicated.
 5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

6. For electrical options, provide a complete system to accomplish scheduled operational description, including but not limited to:
 - a. Manufacturer's recommended Electric Power Transfer, sprayed aluminum finish.
 - b. Manufacturer's recommended Power Supply.
 - c. Manufacturer's recommended Multitech Reader. Provide card, keypad or wave activation as scheduled.
 - d. Manufacturer's recommended wire harness and other accessories needed for a complete system installation.
 - e. Provide MULTITECH Reader, MT15 where scheduled and/or shown.
7. Concealed Vertical Cable Exit Devices: provide cable-actuated concealed vertical latch system in two-point for non-rated or fire rated wood doors up to a 90 minute rating and less bottom latch (LBL) configuration for non-rated or fire rated wood doors up to 20 minute rating.

2.4. ELECTRIC STRIKES

- A. Manufacturers:
 1. Basis of Design: HES, 5000, 630 finish.
 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Electric Strikes: Comply with BHMA A156.31, Grade 1.
 1. Provide UL (DIR) listed burglary-resistant electric strike; style to suit locks.
 2. Provide non-handed 24 VDC electric strike suitable for door frame material and scheduled lock configuration.
 3. Provide field selectable Fail Safe/Fail Secure modes.
 4. Provide transformer and rectifier as necessary for complete installation.
 5. Connect electric strikes into fire alarm where non-rated doors are scheduled to release with fire or sprinkler alarm condition.
 6. Provide MULTITECH Reader, MT15 where scheduled and/or shown.

2.5. LOCK CYLINDERS

- A. Manufacturers:
 1. Basis of Design: Schlage.
 2. Substitutions: Not permitted.
- B. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
 1. Provide Schlage 6-pin core/keyway, 626 finish. Basis of Design is Primus XP Key System.
 - a. Provide cylinders from same manufacturer as locking device.
 - b. Provide cams and/or tailpieces as required for locking devices.

2.6. CYLINDRICAL LOCKS

- A. Manufacturers:
 1. Basis of Design: Schlage ND Series.
 - a. Basis of Design for Passage function Latchset: ND10S, Rhodes trim, 626 finish.
 - b. Basis of Design for Privacy function Lockset: ND40S, Rhodes trim, 626 finish.
 - c. Basis of Design for Classroom function Lockset: ND70PD, Rhodes trim, 626 finish.
 - d. Basis of Design for Storeroom function Lockset: ND80PD, Rhodes trim, 626 finish.
 2. Substitutions: See Section 01 6000 - Product Requirements.

- B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
 - 1. Bored Hole: 2-1/8 inch diameter.
 - 2. Latchbolt Throw: 1/2 inch, minimum.
 - 3. Backset: 2-3/4 inch unless otherwise indicated.
 - 4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 - a. Finish: To match lock or latch.
 - 5. Provide an classroom function lockset for swinging door where hardware set is not indicated.
 - 6. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.

2.7. CLOSERS

- A. Manufacturers; Surface Mounted:
 - 1. Basis of Design: LCN 4040XP, 689 finish.
 - a. Provide heavy duty hold open arm where noted.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Closers: Comply with BHMA A156.4, Grade 1.
 - 1. Type: Surface mounted to door.
 - 2. Provide door closer on each exterior door.
 - 3. Provide door closer on each fire-rated and smoke-rated door.
 - 4. At corridor entry doors, mount closer on room side of door.
 - 5. At outswinging exterior doors, mount closer on interior side of door.
- C. Fire/Life Door Hold Opens:
 - 1. Basis of Design: LCN 4040 SEH.
 - 2. 'SEH' hold open unit is continuously energized allowing the doors to be held open under normal building conditions. When the fire alarm is activated, power to the 'SEH' unit is disconnected allowing the auxiliary door closer to close door automatically.

2.8. AUTOMATIC DOOR OPERATORS

- A. Manufacturers:
 - 1. Basis of Design: LCN 4642, 689 finish.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Automatic Door Operators:
 - 1. Auto Equalizer Low Energy Power Door Operator.
 - 2. Easily accessible switches to provide on/off and continuous hold-open.
 - 3. Control module provides all timing and sequential door functions, electric strike controls and adjustments for opening speed and force.
 - 4. UL and ULc listed with regular arm for self-closing doors.
 - 5. ADA compliant, meets the provisions of ANSI Standards A117.1, A156.19.
- C. Actuators:
 - 1. Basis of Design: LCN 8310-853T.
 - a. Coordinate with card reader access control where scheduled.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.

2.9. PROTECTION PLATES

- A. Manufacturers:
 - 1. Basis of Design: Hiawatha.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Protection Plates: Comply with BHMA A156.6.
- C. Metal Properties: Stainless steel.
 - 1. Metal, Heavy Duty: Thickness 0.062 inch, minimum.
 - 2. Satin stainless steel finish.
- D. Edges: Beveled, on four sides unless otherwise indicated.
- E. Fasteners: Countersunk screw fasteners.

2.10. KICK PLATES

- A. Manufacturers:
 - 1. Basis of Design: Hiawatha.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Kick Plates: Provide along bottom edge of scheduled doors, unless otherwise indicated.
 - 1. Size: 10 inch high by 2 inch less door width (LDW) on push side of door.

2.11. FLOOR STOPS

- A. Manufacturers:
 - 1. Basis of Design: Ives, FS13, 630 finish.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Type: Manual hold-open, with pencil floor stop.
 - 2. Material: Aluminum housing with rubber insert.

2.12. WALL STOPS

- A. Manufacturers:
 - 1. Basis of Design: Ives, WS406/407CCV, 630 finish.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Provide wall stops to prevent damage to wall surface upon opening door.
 - 2. Type: Bumper, concave, wall stop.
 - 3. Material: Stainless steel housing with rubber insert.

2.13. ASTRAGALS

- A. Manufacturers:
 - 1. Basis of Design: Reese, M35, 628 finish.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Astragals: Comply with BHMA A156.22.
 - 1. Type: Split, two parts, and with sealing gasket.

2. Material: Aluminum, with neoprene weatherstripping.
3. Provide non-corroding fasteners at exterior locations.

2.14. THRESHOLDS

A. Manufacturers:

1. Basis of Design for typical Thresholds: Reese, S205A, aluminum.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Thresholds: Comply with BHMA A156.21.

1. Provide threshold at each exterior door, unless otherwise indicated.
2. Type: ADA compliant, saddle type at typical thresholds.
3. Material: Aluminum.
4. Threshold Surface: Fluted horizontal grooves across full width.
5. Field cut threshold to profile of frame and width of door sill for tight fit.
6. Provide non-corroding fasteners at exterior locations.

2.15. WEATHERSTRIPPING AND GASKETING

A. Manufacturers:

1. Basis of Design: Reese.
 - a. Basis of Design for Sweeps: Reese 354C, clear anodized aluminum with nylon brush.
 - b. Basis of Design for Weatherstripping: Reese 657C, clear anodized aluminum with silicone insert.
 - c. Basis of Design for Smoke Seals: Reese 797B.
 - d. Basis of Design for Gasketing: Reese 797B.
 - e. Basis of Design for Automatic Door Bottoms: Reese 430, aluminum mill finish, neoprene insert, fire rated.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.

1. Head and Jamb Type: Self-adhesive.
2. Door Sweep Type: Encased in retainer.
3. Material: Aluminum, with neoprene weatherstripping.
4. Provide gasketing for smoke and draft control doors (Indicated as "S" on Drawings) that complies with local codes, requirements of assemblies tested in accordance with UL 1784.
5. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated; .
6. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.16. RAIN DRIPS:

A. Manufacturers:

1. Basis of Design: Reese, R201C, aluminum finish.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.17. SILENCERS

A. Manufacturers:

1. Basis of Design: Ives.

2. Substitutions: See Section 01 6000 - Product Requirements.

B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.

1. Single Door: Provide three on strike jamb of frame.
2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
3. Material: Rubber, gray color.

2.18. KEY CONTROL SYSTEMS

A. Key Control Systems: Comply with guidelines of BHMA A156.28.

1. Provide keying information in compliance with DHI (KSN) standards.
2. Keying: Grand master keyed.
3. Include construction keying and control keying with removable core cylinders.
4. Supply keys in following quantities:
 - a. 1 each Grand Master keys.
 - b. 6 each Sub Master keys.
 - c. 6 each Construction Master keys.
 - d. 15 each Construction keys.
 - e. 2 each Construction Control keys.
 - f. 2 each Control keys if new system.
5. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.
6. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."
7. Owner or Owner's agent install permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

2.19. POWER SUPPLY

A. Manufacturers:

1. Securitron; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

B. Power Supply: Hard wired, with multiple zones providing eight (8) breakers for each output panel with individual control switches and LED's; UL (DIR) Class 2 listed.

1. Power: 24 VAC, 10 Amp; with 120 VAC power supply.
2. Operating Temperature: 32 to 110 degrees F.
3. Provide with emergency release terminals that release devices upon activation of fire alarm system.

2.20. FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.

1. Finish: 652; satin chromium plated over nickel, with steel base material (formar US equivalent US26D); BHMA A156.18.
2. Exceptions:
 - a. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.

- b. Hinges for Fire-Rated Doors: Steel base material with painted finish, in compliance with NFPA 80.
- c. Hardware for Aluminum Storefront Doors: Finished to match door panel finish, except at hand contact surfaces provide stainless steel with satin finish, unless otherwise indicated.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.
- C. Install hardware for smoke and draft control doors in accordance with NFPA 105.
- D. Use templates provided by hardware item manufacturer.
- E. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
- F. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.2. ADJUSTING

- A. Adjust work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.3. CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.
- C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.4. PROTECTION

- A. Protect finished Work under provisions of Section 01 7000 - Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08 8000 - GLAZING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Insulating glass units for exterior use.
- B. Glazing, for interior use.
- C. Plastic films.
- D. Glazing compounds and accessories.

1.2. RELATED REQUIREMENTS

- A. Section 08 1416 - Flush Wood Doors: Information regarding glazed lites in doors to receive glazing.
- B. Section 08 4229 - Automatic Entrances: Information regarding door assemblies to receive glazing.
- C. Section 08 4313 - Aluminum-Framed Storefronts: Information regarding storefront assemblies to receive glazing.

1.3. REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.
- C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- F. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- H. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.
- I. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- J. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.
- K. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2012a.
- L. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- M. GANA (GM) - GANA Glazing Manual; 2009.
- N. GANA (SM) - GANA Sealant Manual; 2008.
- O. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- P. IGMATM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2004).
- Q. ITS (DIR) - Directory of Listed Products; current edition.
- R. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.
- S. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2012.
- T. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2014.
- U. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014.

- V. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2014.
- W. UL (DIR) - Online Certifications Directory; Current Edition.
- X. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data on Insulating Glass Unit, Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch in size of glass units.
- E. Samples: Submit 12 inch long bead of glazing sealant, color as selected.
- F. Samples: Submit one sample 12 by 12 inch in size of plastic film.
- G. Certificate: Certify that products of this section meet or exceed specified requirements.
- H. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- I. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- J. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation

1.6. QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.7. MOCK-UPS

- A. See Section 01 4000 - Quality Requirements, for additional mock-up requirements.
- B. Provide mock-up of one window assembly including glass, air/vapor barrier, and flashing.
- C. Locate as indicated by Architect.
- D. Mock-ups may remain as part of the Work.

1.8. DELIVERY, STORAGE, AND HANDLING

- A. 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
- B. 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.
- C. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9. FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.10. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Insulating Glass Units: Provide a ten (10) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Glass Fabricators:
 - 1. GGI - General Glass International: www.generalglass.com/#sle.
 - 2. JE Berkowitz, LP: www.jeberkowitz.com/#sle.
 - 3. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
 - 4. Viracon, Inc: www.viracon.com/#sle.
 - 5. Insulite Glass Company.
 - 6. Substitutions: Refer to Section 01 6000 - Product Requirements.
- B. Float Glass Manufacturers:
 - 1. AGC Glass North America, Inc: www.agcglass.com/#sle.
 - 2. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
 - 3. Guardian Glass, LLC: www.guardianglass.com/#sle.
 - 4. Pilkington North America Inc: www.pilkington.com/na/#sle.
 - 5. Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com/#sle.
 - 6. Substitutions: Refer to Section 01 6000 - Product Requirements.
- C. Fire-Resistance-Rated Glass: Provide products as required to achieve indicated fire-rating period.
 - 1. Manufacturers:
 - 2. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.
 - 3. Technical Glass Products; Pilkington Pyrostop: www.fireglass.com/#sle.
 - 4. Vetrotech North America; Contraflam: www.vetrotechusa.com/#sle.
 - 5. Substitutions: Refer to Section 01 6000 - Product Requirements.
- D. Plastic Films Manufacturers:
 - 1. Basis of Design: 3M Window Film; Fasara: www.3m.com.

2. Other Acceptable Manufacturers:
 - a. Decorative Films; Solyx: www.decorativefilm.com
 - b. Flexvue Films: www.flexvuefilms.com.
 - c. Llumar, an Eastman Chemical Company: www.llumar.com/#sle.
3. Substitutions: Refer to Section 01 6000 - Product Requirements.

2.2. PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

- A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
 1. Design Pressure: Calculated in accordance with ASCE 7.
 2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
 3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
 4. Glass thicknesses listed are minimum.
- B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.
 1. In conjunction with vapor retarder and joint sealer materials described in other sections.
- C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
 1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
 3. Solar Optical Properties: Comply with NFRC 300 test method.

2.3. GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
 2. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
 3. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design and for interior butt jointed glass installations.

2.4. INSULATING GLASS UNITS

- A. Manufacturers:
 1. Any of the manufacturers specified for float glass.
 2. Fabricator certified by glass manufacturer for type of glass, coating, and treatment involved and capable of providing specified warranty.
 3. Basis of Design: Insulite (Vitro) Solarban 70xl(3), bronze insulated glass unit.
 4. Substitutions: Refer to Section 01 6000 - Product Requirements.
- B. Insulating Glass Units: Types as indicated.
 1. Durability: Certified by an independent testing agency to comply with ASTM E2190.

2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
 3. Metal Edge Spacers: Aluminum, bent and soldered corners.
 4. Spacer Color: Black.
 5. Edge Seal:
 - a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
 6. Color: Black.
 7. Purge interpane space with dry air, hermetically sealed.
 8. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
 - a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.
 - b. Inert gas may be installed in the field into air space in accordance with insulating glass fabricator's and installer's requirements.
- C. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.
1. Applications: Exterior glazing unless otherwise indicated.
 2. Space between lites filled with argon.
 3. Outboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Bronze.
 - b. Coating: Low-E (passive type), on #2 surface.
 4. Inboard Lite: Fully tempered float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 5. Total Thickness: 1 inch.
 6. Thermal Transmittance (U-Value), Summer - Center of Glass: 0.21, maximum.
 7. Visible Light Transmittance (VLT): 38 percent, minimum.
 8. Solar Heat Gain Coefficient (SHGC): 0.26, maximum.
 9. Visible Light Reflectance, Outside: 8 percent, nominal.
- 2.5. GLAZING UNITS
- A. Type G-1 - Monolithic Interior Vision Glazing:
1. Applications: Interior glazing unless otherwise indicated.
 2. Glass Type: Fully tempered float glass.
 3. Tint: Clear.
 4. Thickness: 1/4 inch, nominal at typical locations.
 - a. 3/8 inch at reception counter locations.
- B. Type G-2 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-ratings.
1. Applications:

- a. Glazing in fire-rated door assembly.
 - b. Other locations as indicated on drawings.
2. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
3. Safety Glazing Certification: 16 CFR 1201 Category II.
4. Fire-Rating Period: As indicated on drawings.
5. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
 - a. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
 - b. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
 - c. "T" - meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
 - d. "XXX" - placeholder that represents fire-rating period, in minutes.

2.6. PLASTIC FILMS

- A. Decorative Plastic Architectural Film (AF-1): Vinyl type.
 1. Application: Locations as indicated on drawings.
 2. Series Type: as indicated on drawings.
 3. Color: as indicated on drawings.

2.7. GLAZING COMPOUNDS

- A. Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.
- B. Manufacturers:
 1. BASF Corporation: www.basf.com/us/en.html.
 2. Bostik Inc: www.bostik-us.com.
 3. Dow Corning Corporation: www.dowcorning.com/construction.
 4. Pecora Corporation: www.pecora.com.
 5. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
 6. Substitutions: Refer to Section 01 6000 - Product Requirements.

2.8. ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- D. Rolling Door Assemblies: See specification section 08 5659 Service and Teller Window Units.

2.9. SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.

PART 3 EXECUTION

3.1. VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- C. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3. INSTALLATION, GENERAL

- A. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.4. INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.5. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- C. Monitor and report installation procedures and unacceptable conditions.

3.6. CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove non-permanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.7. PROTECTION

- A. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 0561 - COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Resilient tile and sheet.
 - 2. Carpet tile.
 - 3. Thin-set ceramic tile..
- B. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- C. Testing of concrete floor slabs for moisture and alkalinity (pH).
- D. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.
 - 1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.
- E. Patching compound.
- F. Remedial floor coatings.

1.2. RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

1.3. REFERENCE STANDARDS

- A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens); 2013.
- B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete; 1999 (Reapproved 2014).
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.

1.4. SUBMITTALS

- A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Moisture and alkalinity (pH) limits and test methods.
 - 2. Manufacturer's required bond/compatibility test procedure.
- B. Testing Agency's Report:
 - 1. Description of areas tested; include floor plans and photographs if helpful.
 - 2. Summary of conditions encountered.
 - 3. Moisture and alkalinity (pH) test reports.
 - 4. Copies of specified test methods.
 - 5. Recommendations for remediation of unsatisfactory surfaces.

6. Product data for recommended remedial coating.
 7. Submit report to Architect.
 8. Submit report not more than two business days after conclusion of testing.
 - C. Adhesive Bond and Compatibility Test Report.
 - D. Copy of RFCI (RWP).
 - E. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
 1. Manufacturer's qualification statement.
 2. Manufacturer's statement of compatibility with types of flooring applied over remedial product.
 3. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
 4. Manufacturer's installation instructions.
- 1.5. QUALITY ASSURANCE
- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.
 - B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
 1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
 - C. Contractor's Responsibility Relating to Independent Agency Testing:
 1. Provide access for and cooperate with testing agency.
 2. Confirm date of start of testing at least 10 days prior to actual start.
 3. Allow at least 4 business days on site for testing agency activities.
 4. Achieve and maintain specified ambient conditions.
 5. Notify Architect when specified ambient conditions have been achieved and when testing will start.
- 1.6. DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
 - B. Deliver materials in manufacturer's packaging; include installation instructions.
 - C. Keep materials from freezing.
- 1.7. FIELD CONDITIONS
- A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
 - B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
3. Products:
 - a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
 - b. TEC, an H.B. Fuller Construction Products Brand; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.
- C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.
 1. Thickness: As required for application and in accordance with manufacturer's installation instructions.
 2. Use product recommended by testing agency.

PART 3 EXECUTION

3.1. CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
 1. Preliminary cleaning.
 2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
 3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
 5. Specified remediation, if required.
 6. Patching, smoothing, and leveling, as required.
 7. Other preparation specified.
 8. Adhesive bond and compatibility test.
 9. Protection.
- B. Remediations:
 1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
 2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
 3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is

available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.2. PRELIMINARY CLEANING

- A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.
- B. Do not use solvents or other chemicals for cleaning.

3.3. MOISTURE VAPOR EMISSION TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F1869 and as follows.
- D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
- F. Report: Report the information required by the test method.

3.4. INTERNAL RELATIVE HUMIDITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.
- C. Test in accordance with ASTM F2170 Procedure A and as follows.
- D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.
- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.
- F. Report: Report the information required by the test method.

3.5. ALKALINITY TESTING

- A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
- B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.
- C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.
- D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

- E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.6. PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

3.7. ADHESIVE BOND AND COMPATIBILITY TESTING

- A. Comply with requirements and recommendations of floor covering manufacturer.

3.8. APPLICATION OF REMEDIAL FLOOR COATING

- A. Comply with requirements and recommendations of coating manufacturer.

3.9. PROTECTION

- A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 2116 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Gypsum sheathing.
- F. Gypsum wallboard.
- G. Joint treatment and accessories.

1.2. RELATED REQUIREMENTS

- A. Section 05 4000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.
- B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

1.3. REFERENCE STANDARDS

- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.
- D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.
- E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.
- F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.
- G. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.
- H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.
- I. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- J. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing Board; 2013.
- K. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.
- L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.
- M. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- N. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- O. GA-216 - Application and Finishing of Gypsum Board; 2013.
- P. GA-600 - Fire Resistance Design Manual; 2015.

- Q. UL (FRD) - Fire Resistance Directory; current edition.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.5. QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of experience.
- B. 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.

PART 2 PRODUCTS

2.1. GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions: Provide completed assemblies with the following characteristics:
 - 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies complying with applicable code.
 - 1. Fire Rated Partitions: As indicated.
 - 2. Head of Fire Rated Partitions: As indicated.
 - 3. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.
 - 4. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.2. METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. Basis of Design: ClarkDietrich Building Systems: www.clarkdietrich.com/#sle.
 - 2. Substitutions: See Section 01 6000 - Product Requirements.
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
 - 1. Studs: "C" shaped with flat or formed webs.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Ceiling Channels: C-shaped.
 - 4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
 - 5. Resilient Furring Channels: 1/2 inch depth, for attachment to substrate through one leg only.
 - a. Products:
 - 1) Basis of Design: ClarkDietrich; RC Deluxe; www.clarkdietrich.com.
 - 2) Substitutions: See Section 01 6000 - Product Requirements.
- C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

- D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.
 - 3. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems of fire rating and movement required.
 - 4. Deflection and Firestop Track:
 - a. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-rating of the wall assembly.

2.3. BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
 - 1. American Gypsum Company.
 - 2. CertainTeed Corporation.
 - 3. LaFarge North America, Inc.
 - 4. National Gypsum Company.
 - 5. USG Corporation.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required at wet locations not scheduled to receive ceramic tile.
 - 3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 - c. Edges: Tapered.
- C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Ceilings, unless otherwise indicated.
 - 2. Thickness: 5/8 inch.
 - 3. Edges: Tapered.
- D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.
 - 1. Application: Exterior sheathing, unless otherwise indicated.
 - 2. Edges: Square.
 - 3. Glass Mat Faced Products:
 - a. American Gypsum Company; M-Glass Exterior Sheathing Type X.

- b. American Gypsum Company; M-Glass Exterior Sheathing.
- c. Continental Building Products; Weather Defense Platinum Exterior Sheathing.
- d. Continental Building Products; Weather Defense Platinum Sheathing Type X.
- e. Georgia-Pacific Gypsum; DensGlass Sheathing.
- f. Georgia-Pacific Gypsum; DensGlass Fireguard Sheathing.
- g. Substitutions: See Section 01 6000 - Product Requirements.

2.4. ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: _____ inch.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Water-Resistive Barrier: As specified in Section 07 2500.
- D. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
- E. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
 - 1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 - 2. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
 - 3. Ready-mixed vinyl-based joint compound.
 - 4. Chemical hardening type compound.
- F. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- G. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- H. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.2. FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
 - 1. Level ceiling system to a tolerance of 1/1200.
 - 2. Laterally brace entire suspension system.
 - 3. Install bracing as required at exterior locations to resist wind uplift.
- C. Studs: Space studs at 16 inches on center.
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations maximum spacing.
 - 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 - 3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in

accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

- D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- E. Standard Wall Furring: Install at existing former exterior walls walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
- F. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.
- G. Blocking: Install mechanically fastened sheet steel or fire treated wood blocking for support of:
 - 1. Wall mounted cabinets.
 - 2. Plumbing fixtures.
 - 3. Toilet accessories.
 - 4. Wall mounted door hardware.

3.3. ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 - 1. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.4. BOARD INSTALLATION

- A. Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.
- D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- E. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.
- F. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.5. INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
- B. Corner Beads: Install at external corners, using longest practical lengths.

3.6. JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 5: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

2. Level 1: Wall areas above finished ceilings, whether or not accessible in the completed construction.
 - D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 1. Feather coats of joint compound so that camber is maximum 1/32 inch.
 - E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.
 - F. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.
- 3.7. TOLERANCES
- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 3000 - TILING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Tile for counters.

1.2. REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.
- B. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).
- C. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).
- D. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
- E. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2013 (Revised).
- F. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).
- G. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2010 (Reaffirmed 2016).
- H. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.
- I. ANSI A137.2 - American National Standard Specifications for Glass Tile; 2013.
- J. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.
- K. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2017.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.
- D. 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 for each color and finish required.
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 3 percent of each size, color, and surface finish combination matching production runs and dyelots of products installed.

1.4. QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.6. FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.
- B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.1. TILE

- A. Manufacturers: All products by the same manufacturer.
 - 1. Dal-Tile Corporation: www.daltile.com/#sle.
- B. Porcelain Tile, Type T-1:
 - 1. Size: 12 by 24 inch, nominal.
 - 2. Thickness: 3/8 inch.
 - 3. Edges: Rectified.
 - 4. Surface Finish: Matte glazed.
 - 5. Color(s): As indicated on drawings.
 - 6. Pattern: As indicated on drawings.
 - 7. Trim Units, Type T-1: Matching bullnose shapes in sizes indicated.
 - a. Size: 3 by 12 inches.
 - b. Color: As indicated on drawings.

2.2. SETTING MATERIALS

- A. Provide setting and grout materials from same manufacturer.
- B. Manufacturers:
 - 1. Basis of Design: Mapei, Inc..
- C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
 - 1. Applications: Use this type of bond coat where indicated as outlined below.
 - 2. Products:
 - a. Mapei, Inc., Ultraflex 2.
 - 1) For general use, wall and floors.

2.3. GROUTS

- A. Manufacturers:
 - 1. Basis of Design: Mapei, Inc..
- B. Quartz Grout: ANSI A118.3 chemical resistant and water-cleanable color-coated quartz grout.
 - 1. Applications: Floors and walls.
 - 2. Color(s): As selected by Architect from manufacturer's full line.
 - 3. Products:
 - a. Basis of Design: Mapei, Inc., Flexcolor CQ.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.
- D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
 - 1. Moisture Emission Rate: Not greater than 3 lb per 1000 sq ft per 24 hours, test in accordance with ASTM F1869.
 - 2. Alkalinity (pH): Verify pH range of 5 to 9, test in accordance with ASTM F710.
- E. Verify that required floor-mounted utilities are in correct location.

3.2. PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.3. INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles with non-ceramic accessory trim pieces.
- F. Install thresholds where indicated.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Keep control and expansion joints free of mortar, grout, and adhesive.
- I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- J. Grout tile joints unless otherwise indicated. Use color-coated quartz grout as specified above.
- K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.4. INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with urethane grout, unless otherwise indicated.
 - 1. Where waterproofing membrane is indicated, install in accordance with TCNA (HB) Method F122, with latex-Portland cement grout.

3.5. INSTALLATION - WALL TILE

- A. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

3.6. CLEANING

- A. Clean tile and grout surfaces.

3.7. PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

SECTION 09 5100 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.

1.2. REFERENCE STANDARDS

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.
- C. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.
- D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2014.
- E. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.
- F. UL (FRD) - Fire Resistance Directory; current edition.

1.3. ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, mechanical and electrical items installed in the ceiling, and sprinklers installed in the ceiling.
- C. Product Data: Provide data on suspension system components.
- D. Samples: Submit two samples 6 by 6 inch in size illustrating material and finish of acoustical units.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: Quantity equal to 2 percent of total installed.

1.5. QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6. FIELD CONDITIONS

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Acoustic Tiles/Panels:

1. Armstrong World Industries, Inc: www.armstrong.com.
2. CertainTeed Corporation: www.certainteed.com/#sle.
3. USG: www.usg.com/#sle.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:

1. Armstrong World Industries, Inc; ____: www.armstrongceilings.com/#sle.
2. Substitutions: See Section 01 6000 - Product Requirements.

2.2. Performance Requirements

A. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category C and complying with the following:

1. Local authorities having jurisdiction.

2.3. ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer

C. Acoustical Tile Type ACT-1 (Typical): Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:

1. Size: 24 by 24 inches.
2. Thickness: 3/4 inches.
3. Composition: Nodular, cast or molded.
4. Light Reflectance: 0.83 percent, determined in accordance with ASTM E1264.
5. NRC Range: 0.60 or better, determined in accordance with ASTM E1264.
6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
7. Joint: Reveal sized to fit flange of exposed suspension-system members..
8. Edge: Beveled tegular.
9. Surface Color: White.
10. Surface Pattern: Non-directional fissured.
11. Products:
 - a. Basis-of-Design Product: Armstrong World Industries, Inc. Cirrus.
 - b. Or comparable from listed manufacturers meeting Basis of Design specifications.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.4. SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.

B. Exposed Steel Suspension System: Formed galvanized steel, commercial quality cold rolled; intermediate-duty.

1. Profile: Tee; 15/16 inch wide face.

2. Construction: Double web.
3. Finish: White painted.
4. Products:
 - a. Armstrong World Industries, Inc.; Prelude XL.
 - b. Or comparable from listed manufacturers.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.5. ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.
- C. Perimeter Moldings: Same material and finish as grid.
 1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
- D. Metal Edge Trim for "Cloud" Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
 1. Trim Height: 2 and 12 inch in locations as noted.
 2. Finish: Baked enamel.
 3. Color: White.
 4. Products:
 - a. Armstrong World Industries, Axiom.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- E. Acoustical Sealant For Perimeter Moldings: Non-hardening, non-skinning, for use in conjunction with suspended ceiling system.
- F. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.2. INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.
- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Locate system on room axis according to reflected plan.
- D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Seismic Suspension System, Seismic Design Category C: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Maintain a 3/8 inch clearance between grid ends and wall.
- G. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

- H. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- I. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- J. Do not eccentrically load system or induce rotation of runners.
- K. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Overlap and rivet corners.
- L. Install light fixture boxes constructed of gypsum board above light fixtures in accordance with fire rated assembly requirements and light fixture ventilation requirements.

3.3. INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Lay directional patterned units with pattern parallel to longest room axis.
- D. Fit border trim neatly against abutting surfaces.
- E. Install units after above-ceiling work is complete.
- F. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- G. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.

3.4. TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 09 6500 - RESILIENT FLOORING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Resilient sheet flooring.
- B. Resilient tile flooring.
- C. Resilient base.
- D. Installation accessories.

1.2. RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

1.3. REFERENCE STANDARDS

- A. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.
- D. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.
- E. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing; 2004 (Reapproved 2014).
- F. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans, floor patterns, and layout of grounding strips and connections to the building grounding system.
- D. Verification Samples: Submit two samples, 6 by 6 inch in size illustrating color and pattern for each resilient flooring product specified.
- E. Concrete Testing Standard: Submit a copy of ASTM F710.
- F. Concrete Sub-floor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- G. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Flooring Material: Quantity equivalent to 5 percent of each type and color in same production run/dyelot of material installed.
 - 3. Extra Wall Base: 10 linear feet of each type and color.
 - 4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.5. QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- D. Protect roll materials from damage by storing on end.
- E. Do not double stack pallets.

1.7. FIELD CONDITIONS

- A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.1. SHEET FLOORING

- A. Vinyl Sheet Flooring - SV-1: Homogeneous without backing, with color and pattern throughout full thickness.
 - 1. Manufacturers:
 - a. Basis of Design: Mannington Commercial, BioSpec MD.
 - 2. Minimum Requirements: Comply with ASTM F1913.
 - 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 4. Thickness: 0.080 inch nominal.
 - 5. Sheet Width: 78 inch minimum.
 - 6. Seams: Heat welded.
 - 7. Integral coved base with cap strip.
 - 8. Color: As indicated on drawings.
 - 9. Finish: Quantum Guard HP.
- B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color camouflaged to match field color.

2.2. TILE FLOORING

- A. Luxury Vinyl Tile (LVT-1): Printed film type, with transparent or translucent wear layer.
 - 1. Manufacturers:
 - a. Basis of Design: Mannington Commercial; Nature's Path.
 - 2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 - 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 - 4. Plank Tile Size: 4 by 36 inch.
 - 5. Wear Layer Thickness: 0.020 inch.
 - 6. Total Thickness: .098 inch.
 - 7. Color: As indicated on drawings.

8. Finish: Quantum Guard Elite.
9. Edge: Micro-bevel.
- B. Luxury Vinyl Tile (LVT-2): Printed film type, with transparent or translucent wear layer.
 1. Manufacturers:
 - a. Basis of Design: Mannington Commercial, Mannington Select.
 2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 4. Plank Tile Size: 5 by 36 inch.
 5. Wear Layer Thickness: 0.020 inch.
 6. Total Thickness: .98 inch.
 7. Color: As indicated on drawings.
 8. Finish: Quantum Guard Elite.
 9. Edge: Micro-bevel.
- C. Luxury Vinyl Tile (LVT-3): Printed film type, with transparent or translucent wear layer.
 1. Manufacturers:
 - a. Basis of Design: Mannington Commercial, Color Anchor Collection, Stride.
 2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 3. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 4. Plank Tile Size: 12 by 24 inch.
 5. Wear Layer Thickness: 0.020 inch.
 6. Total Thickness: .98 inch.
 7. Color: As indicated on drawings.
 8. Finish: Quantum Guard Elite.
 9. Edge: Micro-bevel.

2.3. RESILIENT BASE

- A. Resilient Base (RB-1): ASTM F1861, Type TP, rubber, thermoplastic; top set Style B, Cove.
 1. Manufacturers:
 - a. Johnsonite, a Tarkett Company; Traditional Vinyl Wall Base with Toe: www.johnsonite.com.
 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
 3. Height: 4 inch.
 4. Thickness: 0.125 inch.
 5. Finish: Satin.
 6. Length: Roll.
 7. Color: As indicated on drawings.
 8. Accessories: Premolded external corners and internal corners.
- B. Molded Wall Base (MB-1): ASTM F1861, Type TP, rubber thermoplastic; top set, profiled base.
 1. Manufacturers:

- a. Johnsonite, A Tarkett Company; Millwork Wall Base, www.johnsonite.com
2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648 or NFPA 253.
3. Height: 4-1/4 inch.
4. Thickness: 1/4 inch.
5. Finish: Satin.
6. Length: 8 feet.
7. Profile: Delineate.
8. Color: As indicated on drawings.
- a. Corners to be mitered.

2.4. ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
 1. Epoxy (non-water soluble) in Toilet Rooms.
- C. Moldings, Transition and Edge Strips: .
 1. Metal edge strip for exposed edges of flash cove base conditions.
 - a. Finish: Stainless Steel
 - b. Outside Corners: Preformed 6 inch return.
 - 1) Manufacturers:
 - (a) Basis of design: Flash Cove; www.flashcove.com.
 2. Rubber moldings, transition and edge strips:
 - a. Tarkett; www.tarkett.com.
 - 1) Profile: SLT-XX-B.
 - (a) LVT-1 to SV-1, Existing VCT to SV-1.
 - (b) Color: As selected by Architect from manufacturer's full range of colors.
 - 2) Profile: SLT-XX-A.
 - (a) CPT-1 to LVT-1, CPT-1 to Existing VCT.
 - (b) Color: As selected by Architect from manufacturer's full range of colors.
- D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
 1. Test in accordance with ASTM F710.
 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

- D. Verify that required floor-mounted utilities are in correct location.

3.2. PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is fully cured.
- D. Clean substrate.

3.3. Installation - General

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's written instructions.
- C. Adhesive-Applied Installation:
 - 1. Spread only enough adhesive to permit installation of materials before initial set.
 - 2. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26 0526 for grounding and bonding to building grounding system.
 - 3. Fit joints and butt seams tightly.
 - 4. Set flooring in place, press with heavy roller to attain full adhesion.
- D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
 - 1. Resilient Strips: Attach to substrate using adhesive.
- F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- G. At movable partitions, install flooring under partitions without interrupting floor pattern.

3.4. Installation - Sheet Flooring

- A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.
- B. Cut sheet at seams in accordance with manufacturer's instructions.
- C. Seal seams by heat welding where indicated on approved shop drawings, per manufacturer's written held welding instructions.
- D. Flash coved base: Install as detailed on drawings, using coved base filler as backing at floor to wall junction. Extend sheet flooring vertically to height indicated. Cap wall base with metal trim.

3.5. Installation - Tile Flooring

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.
- C. Install square tile to ashlar pattern. Allow minimum 1/2 full size tile width at room or area perimeter.
- D. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.6. Installation - Resilient Base

- A. Standard Wall Base:
 - 1. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

2. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.7. CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.8. PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6813 - TILE CARPETING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Carpet tile, fully adhered.

1.2. REFERENCE STANDARDS

- A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.
- B. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Shop Drawings: Indicate layout of joints and direction of carpet pile.
- D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Concrete Sub-floor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed or not less than one full carton of each color and pattern installed. Extra carpet tiles shall be from the same production run and dyelot as the carpet installed.

1.4. QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in installing carpet tile with minimum three years experience.

1.5. FIELD CONDITIONS

- A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Tile Carpeting:
 - 1. Basis of Design: Aladdin Commercial: www.aladdincommercial.com.

2.2. MATERIALS

- A. Tile Carpeting, Type CPT-1: Tufted, manufactured in one color dye lot.
 - 1. Aladdin Commercial, Onward Bound.
 - a. Tile Size: 24 by 24 inch, nominal.
 - b. Color: As shown on Product Finish Schedule.
 - c. Gage: 1/12 inch.
 - d. Stitches: 12.2 per inch.
 - e. Fiber System: Colorstrand SD Nylon.
 - f. Dye Method: 100% Solution Dyed.

- g. Primary Backing Material: Non-woven synthetic fiber.
- h. Secondary Backing: UltraSet
- i. Stain & Soil Protection: Mohawk Protection Plus Soil & Stain
- j. Installation Method: Monolithic.

2.3. ACCESSORIES

- A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: As specified in Section 09 6500.
- C. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
- B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
 - 1. Test in accordance with ASTM F710.
 - 2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.
- D. Verify that required floor-mounted utilities are in correct location.

3.2. PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.

3.3. INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Lay carpet tile in pattern as indicated on drawings.
- F. Locate change of color or pattern between rooms under door centerline.
- G. Trim carpet tile neatly at walls and around interruptions.
- H. Complete installation of edge strips, concealing exposed edges.

3.4. CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 9113 - EXTERIOR PAINTING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Materials for backpriming woodwork.
- D. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
 - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2. Exposed surfaces of steel lintels and ledge angles.
 - 3. Mechanical and Electrical:
 - a. On the roof and outdoors, paint equipment that is exposed to weather or to view, including factory-finished materials.
- E. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
 - 6. Floors, unless specifically indicated.
 - 7. Glass.
 - 8. Concealed pipes, ducts, and conduits.

1.2. RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting.

1.3. DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.4. REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2014.
- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2012).
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.
- E. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; Fourth Edition.
- F. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; Fourth Edition.
- G. SSPC-SP 1 - Solvent Cleaning; 2015.
- H. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).
- I. SSPC-SP 3 - Power Tool Cleaning; 1982 (Ed. 2004).

- J. SSPC-SP 6 - Commercial Blast Cleaning; 2007.
- K. SSPC-SP 13 - Surface Preparation of Concrete; (Reaffirmed 2015); 2003.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
 - 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
- D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 - 3. Label each container with color in addition to the manufacturer's label.

1.6. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.8. FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

- D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Paints:
 - 1. Basis of Design Manufacturer: PPG Paints: www.ppgpaints.com/#sle.
 - a. The Owner has identified the Basis of Design manufacturer as a requirement for this project.
- B. Primer Sealers: Same manufacturer as top coats.
- C. Substitutions: See Section 01 6000 - Product Requirements.

2.2. PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of the State in which the Project is located.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Colors: As indicated on drawings.
 - 1. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.
 - 2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.3. PAINT SYSTEMS - EXTERIOR

- A. Concrete, Opaque, Latex, 3 Coat:
 - 1. One coat of primer for smooth concrete/masonry; A24W8300 Loxon Concrete And Masonry Interior/Exterior Latex Primer.

2. Semi-gloss: Two coats of latex enamel; B66W651 Pro Industrial High Performance Acrylic Semi-Gloss.
 - B. Ferrous Metals, Unprimed, Latex, 3 Coat:
 1. One coat of alkyd primer.
 2. Semi-gloss: Two coats of water-based alkyd urethane; B53W01251 Pro Industrial Water-Based Alkyd Urethane Low Sheen.
 - C. Ferrous Metals, Primed, Latex, 2 Coat:
 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
 2. Semi-gloss: Two coats of water-based alkyd urethane; B53W01251 Pro Industrial Water-Based Alkyd Urethane Low Sheen.
 - D. Galvanized Metals, Latex, 3 Coat:
 1. One coat galvanize primer.
 2. Semi-gloss: Two coats of water-based alkyd urethane; B53W01251 Pro Industrial Water-Based Alkyd Urethane Low Sheen.
- 2.4. ACCESSORY MATERIALS
- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
 - B. Patching Material: Latex filler.
 - C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.

3.2. PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete:
 1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

2. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- H. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- I. Galvanized Surfaces:
 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
 2. Prepare surface according to SSPC-SP 2.
- J. Ferrous Metal:
 1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.3. APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.
- C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- F. Apply each coat to uniform appearance.
- G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- J. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4. CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5. PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9123 - INTERIOR PAINTING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1. Mechanical and Electrical:
 - a. In finished areas, paint wall mounted louvers to match adjacent wall finish, unless otherwise indicated.
 - b. In finished areas, paint shop-primed items.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
 - 6. Floors, unless specifically indicated.
 - 7. Ceramic and other tiles.
 - 8. Glass.
 - 9. Concrete masonry units in utility, mechanical, and electrical spaces.
 - 10. Acoustical materials, unless specifically indicated.
 - 11. Concealed pipes, ducts, and conduits.

1.2. RELATED REQUIREMENTS

- A. Section 09 9113 - Exterior Painting.

1.3. REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition, www.paintinfo.com.
- D. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; Fourth Edition.
- E. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; Fourth Edition.
- F. SSPC-SP 1 - Solvent Cleaning; 2015.
- G. SSPC-SP 2 - Hand Tool Cleaning; 1982 (Ed. 2004).
- H. SSPC-SP 3 - Power Tool Cleaning; 1982 (Ed. 2004).
- I. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

- J. SSPC-SP 13 - Surface Preparation of Concrete; (Reaffirmed 2015); 2003.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 2. MPI product number (e.g. MPI #47).
 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
 2. Allow 15 for approval process, after receipt of complete samples by Architect.
 3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as wood doors, have been approved.
- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Maintenance Data: Submit data including product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
 2. Extra Paint and Finish Materials: Furnish an additional 5 percent, but not less than 1 gallon of each color; from the same product run, store where directed.
 3. Label each container with color, type, and sheen in addition to the manufacturer's label.

1.5. QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience and approved by manufacturer.
- B. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.7. FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

- D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
- B. Paints:
 - 1. Basis of Design Manufacturer: PPG Paints: www.ppgpaints.com/#sle.
 - a. The Owner has identified the Basis of Design manufacturer as a requirement for this project.
- C. Primer Sealers: Same manufacturer as top coats.

2.2. PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
 - 1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 - 2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
 - 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of the State in which the Project is located.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Colors: As indicated on drawings.
 - 1. Extend colors to surface edges; colors may change at any edge as directed by Architect.
 - 2. In finished areas, finish pipes, ducts, conduit, louvers and equipment the same color as the wall/ceiling they are mounted on/under.
 - 3. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.3. PAINT SYSTEMS - INTERIOR

- A. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board.

1. Two top coats and one coat primer.
 2. Top Coat(s): Interior Latex; MPI #44.
 - a. Products:
 - 1) PPG Paints Speedhide Zero Interior Latex, 6-4110XI Series, Flat. (MPI #53)
 - 2) PPG Paints Speedhide Zero Interior Latex, 6-4310XI Series, Eggshell. (MPI #44)
 - B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:
 1. Medium duty applications include door frames.
 2. Two top coats and one coat primer.
 3. Top Coat(s): Interior Light Industrial Coating, Water Based; MPI #151, 153 or 154.
 - a. Products:
 - 1) PPG Paints Pitt-Glaze WB1 Pre-Catalyzed Water-Borne Acrylic Epoxy, 16-510 Series, Semi-Gloss. (MPI #153)
 4. Primer: As recommended by top coat manufacturer for specific substrate.
- 2.4. PRIMERS
- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 1. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
 - a. Products:
 - 1) PPG Paints Speedhide Zero Interior Latex Sealer, 6-4900XI. (MPI #149)
 - 2) Substitutions: Section 01 6000 - Product Requirements.
 2. Interior Rust-Inhibitive Water Based Primer; MPI #107.
 - a. Products:
 - 1) PPG Paints Pitt-Tech Plus Interior/Exterior DTM Waterborne Acrylic Primer/Finish, 4020 PF Series.
- 2.5. ACCESSORY MATERIALS
- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
 - B. Patching Material: Latex filler.
 - C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Gypsum Wallboard: 12 percent.
 2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.

3. Concrete Floors and Traffic Surfaces: 8 percent.

3.2. PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
- J. Galvanized Surfaces:
 - 1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- K. Ferrous Metal:
 - 1. Solvent clean according to SSPC-SP 1.
 - 2. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- L. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.3. APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4. CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5. PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

3.6. SCHEDULE - PAINT SYSTEMS

- A. Gypsum Board: Finish surfaces exposed to view.
 - 1. Interior Walls:
 - a. Prime Coat(s): Primer Sealer, Latex.
 - 1) PPG Paints Speedhide Zero Interior Latex Sealer, 6-4900XI. (MPI #149)
 - b. Intermediate Coat: Latex, Interior matching topcoat.
 - c. Top Coat: Latex, Interior Eggshell, (Gloss Level 3)
 - 1) PPG Paints Speedhide Zero Interior Latex, 6-4310XI Series, Eggshell. (MPI #44)
 - d. Locations: General use, U.N.O.
 - 2. Ceilings and Soffits:
 - a. Prime Coat(s): Primer Sealer, Latex.
 - 1) PPG Paints Speedhide Zero Interior Latex Sealer, 6-4900XI. (MPI #149)
 - b. Intermediate Coat: Latex, Interior matching topcoat.
 - c. Top Coat: Latex, Interior Flat
 - 1) PPG Paints Speedhide Zero Interior Latex, 6-4110XI Series, Flat. (MPI #53)
 - d. Locations: Ceilings and Soffits
- B. Steel Doors and Frames: Finish surfaces exposed to view.
 - 1. Prime Coat:
 - a. PPG Paints Pitt-Tech Plus Interior/Exterior DTM Waterborne Acrylic Primer/Finish, 4020 PF Series.
 - 2. Intermediate Coat: Latex interior, institutional low-odor/VOC, matching topcoat.
 - 3. Top Coat:
 - a. PPG Paints Pitt-Glaze WB1 Pre-Catalyzed Water-Borne Acrylic Epoxy, 16-510 Series, Semi-Gloss. (MPI #153)

END OF SECTION

SECTION 10 1401 - CODE-REQUIRED SIGNAGE

PART 1 GENERAL

1.1. SCOPE

- A. Signage listed in this section to be furnished and installed by Owner, unless noted otherwise.

1.2. SECTION INCLUDES

- A. Room identification signs.
- B. Directional / informational signs.
- C. Directional signs to accessible building elements.
- D. Non-illuminated exit door signs.
- E. Accessible toilet signs.
- F. Maximum occupancy signs.
- G. Fire and smoke partition identification.
- H. Fire and smoke damper access identification:
- I. Emergency evacuation maps.

1.3. SECTION EXCLUDES

- A. Illuminated exit signs.
- B. Site and parking signs.
- C. Identification for plumbing piping and equipment.
- D. Identification for electrical systems.
- E. Signage provided by elevator manufacturer.

1.4. REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- D. IAC - Illinois Accessibility Code; 1997.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
 - 1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
 - 2. When content of signs is indicated to be determined later, request such information from Owner at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
 - 3. Submit for approval by Owner prior to fabrication.
- D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

- F. Verification Samples: Submit samples showing colors specified.
- G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.6. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

1.8. FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1. SIGNAGE COMPONENTS

- A. See referenced standards for additional requirements for each component.
- B. Visual Characters:
 - 1. Character Height: 1 inch.
 - 2. Mounting Height: Baseline of lowest characters to be 40 inches minimum above the floor.
- C. Raised (Tactile) Characters:
 - 1. Comply with all requirements for Visual characters.
 - 2. Characters to be raised 1/32 inch minimum above their background.
 - 3. Mounting Height: Baseline of lowest characters to be 40 inches minimum above the floor. Baseline of highest characters to be 60 inches maximum above the floor.
 - 4. Mounting Location:
 - a. At single doors, mount on wall adjacent to latch side of door.
 - b. At double doors with an inactive leaf, mount on inactive leaf.
 - c. At double doors with two active leaves, mount on wall to the right of the right-hand door.
 - d. Where there is no wall space at the positions listed above, mount on the nearest adjacent wall.
 - e. Locate sign to provide an 18 inch x 18 inch minimum clear floor space centered on the sign and beyond the arc of any door swing between the closed position and 45 degree open position.
- D. Braille Characters:
 - 1. Locate below corresponding text.
 - 2. Mounting Height: Baseline of lowest characters to be 40 inches minimum above the floor. Baseline of highest characters to be 60 inches maximum above the floor.
- E. Pictograms:
 - 1. Height of pictogram field to be 6 inches minimum.

2. Characters or braille shall not be located in the pictogram field.
 3. Provide equivalent text description in Raised characters and Braille directly below the pictogram.
- F. International Symbol of Accessibility:
- G. Color and Font: Unless otherwise indicated:
1. Character Font: Helvetica, Arial, or other sans serif font.
 2. Character Case: Upper case only.
 3. Background Color: As selected by Architect from manufacturer's full range.
 4. Character/Pictogram Color: Contrasting color.
- 2.2. SIGNAGE APPLICATIONS
- A. Accessibility Compliance: Signs are required to comply with ADA Standards, ICC A117.1, IAC, and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room Identification Signs: Provide a sign for every doorway, whether it has a door or not, including corridors, lobbies, and similar open areas.
1. Sign Type: Flat signs with engraved panel media as specified.
 2. Provide Raised characters and Grade II Braille.
 3. Mounting Height: (IAC) Centerline of sign to be 60 inches above the floor.
- C. Toilet and Bathing Room Identification Signs:
1. Sign Type: Flat signs with engraved panel media as specified.
 2. Identify room as "MEN", "WOMEN", "FAMILY", or "UNISEX" as designated on drawings.
 3. Provide Raised characters and Grade II Braille and Pictograms.
 4. Provide international symbol of accessibility.
 5. Mounting Height: (IAC) Centerline of sign to be 60 inches above the floor.
 6. Non-Accessible Toilet and Bathing Rooms:
 - a. Omit international symbol of accessibility on identification sign.
 - b. Provide Accessible Directional Sign as described below.
- D. Directional Signs to Accessible Building Elements:
1. Indicates route to nearest like accessible element.
 2. Provide Visual characters.
 3. Provide international symbol of accessibility.
 4. Provide at the following locations:
 - a. Inaccessible building entrances.
 - b. Inaccessible toilet and bathing rooms.
 - c. Each separate-sex toilet and bathing room indicating location of nearest family or assisted-use toilet or bathing room.
 - d. Exits and exit stairways serving a required accessible space but not providing an approved accessible means of egress.
- E. Directional and Informational Signs (Not related to accessible or emergency signage):
1. Signs that provide direction to, or information about, permanent interior spaces (excluding building directories, personnel names, occupant names or logos, menus, and temporary signs).
 2. Provide Visual characters.

- F. Non-Illuminated Exit Signs:
 - 1. Provide adjacent to each door to an area of refuge, exterior area of rescue assistance, exit stairway, exit ramp, exit passageway, and exit discharge (excluding exterior doors clearly identifiable as exits).
 - 2. Provide Raised characters and Grade II Braille stating "EXIT".+
 - G. Accessible Entrance Signs: Signs required when not all building entrances are accessible.
 - 1. Provide international symbol of accessibility at accessible entrances.
 - H. Maximum Occupant Load Signs: Signs required at every room that is an Assembly occupancy.
 - 1. Provide Visual characters indicating the occupant load of the room or space.
 - 2. Mounting Location: Post in a conspicuous place, near the main exit from the room or space.
 - I. Fire and Smoke Partition Identification:
 - 1. Contractor to provide.
 - 2. Provide permanent identification, via signs or stenciling, on all fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions or any other wall required to have protected openings or penetrations. Such identification shall:
 - a. Be located in accessible concealed floor, floor-ceiling, or attic spaces.
 - b. Be located within 15 feet of the end of each wall and at intervals not exceeding 30 feet measured horizontally along the wall or partition.
 - c. Include lettering not less than 3 inches in height with a minimum 3/8 inch stroke in a contrasting color incorporating the suggested wording "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS".
 - J. Fire and Smoke Damper Access Identification:
 - 1. Contractor to provide.
 - 2. Provide permanent identifications on exterior of all access points to fire and smoke dampers.
 - 3. Label to have letters not less than 1/2 inch in height stating "FIRE/SMOKE DAMPER", "SMOKE DAMPER", or "FIRE DAMPER" as applicable.
 - K. Rooms containing controls for A/C systems, sprinkler risers and valves, or other fire detection, suppression elements shall be identified for use by the Fire Department.
 - L. Emergency Evacuation Maps:
 - 1. Map content to be provided by Owner.
 - 2. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.
- 2.3. SIGN TYPES
- A. Flat Signs: Signage media without frame.
 - 1. Edges: Square.
 - 2. Corners: Square.
 - 3. Wall Mounting of One-Sided Signs: Tape adhesive.
- 2.4. RAISED CHARACTER SIGNAGE MEDIA
- A. Raised characters to be raised 1/32 inch minimum above their background.
 - B. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
- 2.5. NON-TACTILE SIGNAGE MEDIA
- A. Silk Screened Plastic Panels: Letters and graphics silk screened onto reverse side of plastic surface:

1. Sign Color: Clear.
2. Total Thickness: 1/8 inch.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that substrate surfaces are ready to receive work.

3.2. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.
- D. Protect from damage until Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 10 2600 - WALL AND DOOR PROTECTION

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. Corner guards.
 - 2. Impact-resistant wall coverings.

1.3. SUBMITTALS

- A. Product Data: Include construction details, material descriptions, impact strength, fire-test-response characteristics, dimensions of individual components and profiles, and finishes for each impact-resistant wall protection unit.
- B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include sections, details, and attachments to other work.
- C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below. Include Samples of accent strips to verify color selected.
 - 1. Wall and Corner Guards: 12 inches long. Include examples of joinery, corners, end caps, top caps, and field splices.
 - 2. Impact-Resistant Wall Coverings: 6 by 6 inches square.
- D. Qualification Data: For qualified Installer.
- E. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.
 - 1. Include recommended methods and frequency of maintenance for maintaining optimum condition of plastic covers under anticipated traffic and use conditions. Include precautions against using cleaning materials and methods that may be detrimental to plastic finishes and performance.
- F. Warranty: Sample of special warranty.

1.4. QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain impact-resistant wall protection units from single source from single manufacturer.
- C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall protection units and are based on the specific system indicated. Refer to Division 01 Section "Quality Requirements."
- D. Surface-Burning Characteristics: Provide impact-resistant, plastic wall protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another qualified testing agency.
- E. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Store impact-resistant wall protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F during the period plastic materials are stored.
2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F.
 - a. Store corner-guard covers in a vertical position.
 - b. Store impact-resistant sheet in a horizontal position.

1.6. PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of the construction period.

1.7. WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of impact-resistant wall protection units that fail in materials or workmanship within specified warranty period.
 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Deterioration of plastic and other materials beyond normal use.
 2. Warranty Period: Five years from date of Substantial Completion.

1.8. EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Corner and Wall Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 4-foot- long units.
 2. Impact-Resistant Wall Coverings: Full-size sheets equal to 2 percent of each type, color, and texture of units installed, but no fewer than 2 full sheets.
- B. Include mounting and accessory components. Replacement materials shall be from same production run as installed units.

PART 2 PRODUCTS

2.1. MATERIALS

- A. PVC Plastic: ASTM D 1784, Class 1, textured, chemical- and stain-resistant, high-impact-resistant PVC or acrylic-modified vinyl plastic with integral color throughout; extruded and sheet material, thickness as indicated.
 1. Impact Resistance: Minimum 25.4 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.
 2. Chemical and Stain Resistance: Tested according to ASTM D 543.
 3. Self-extinguishing when tested according to ASTM D 635.
 4. Flame-Spread Index: 25 or less.
 5. Smoke-Developed Index: 450 or less.
- B. Polycarbonate Plastic Sheet: ASTM D 6098, S-PC01, Class 1 or 2, abrasion resistant; with a minimum impact-resistance rating of 15 ft-lbf/in. of notch when tested according to ASTM D 256, Test Method A.

- C. 100% pure vinyl, extruded, semi-rigid PVC sheet,
- D. Aluminum Extrusions: Alloy and temper recommended by manufacturer for type of use and finish indicated, but with not less than strength and durability properties specified in ASTM B 221 for Alloy 6063-T5.
- E. Particleboard: ANSI A208.1, Grade M-2; made with binder containing no urea formaldehyde.
- F. Fasteners: Aluminum, nonmagnetic stainless-steel, or other noncorrosive metal screws, bolts, and other fasteners compatible with items being fastened. Use security-type fasteners where exposed to view.
- G. Adhesive: As recommended by impact-resistant plastic wall protection manufacturer and with a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.2. CORNER GUARDS (CG-1, CG-2)

- A. Surface-Mounted, Resilient, Plastic Corner Guards: Assembly consisting of snap-on plastic cover installed over continuous retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition.
 - 1. Basis of Design: Subject to compliance with requirements, provide product listed below:
 - a. InPro, 150 Series Surface Mount Corner Guard.
 - b. InPro, 160 Series Surface Mount Corner Guard.
 - 2. Cover: Extruded rigid plastic, minimum .08-inch-thick wall thickness; as follows:
 - a. Profile: Nominal 3-inch- long leg.
 - b. Height: 8 feet.
 - c. Color and Texture: As indicated on Drawings/ Product Finish Schedule.
 - 3. Retainer: Minimum 0.070-inch- thick, one-piece, extruded aluminum.
 - 4. Retainer Clips: Manufacturer's standard impact-absorbing clips.
 - 5. Top and Bottom Caps: Prefabricated, injection-molded plastic; color matching cover; field adjustable for close alignment with snap-on cover.
- B. Fabricate impact-resistant wall protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.
- C. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
- D. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.3. IMPACT-RESISTANT WALL COVERINGS (WP-1)

- A. Impact-Resistant Sheet Wall Covering: Fabricated from plastic sheet wall-covering material.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide InPro, Palladium Rigid Sheet Wall Protection.
 - 2. Size: 48 by 96 inches for sheet.
 - 3. Sheet Thickness: 0.040 inch
 - 4. Color and Texture: As indicated on schedules and drawings.
 - 5. Height: As indicated on drawings.
 - 6. Trim and Joint Moldings: Seal with color matching caulk.
 - 7. Mounting: Adhesive.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine substrates and wall areas, with Installer present, for compliance with requirements for installation tolerances, fire rating, and other conditions affecting performance of work.
- B. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
 - 1. For impact-resistant wall protection units attached with adhesive or foam tape, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

- A. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
- B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3. INSTALLATION

- A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
 - 1. Provide splices, mounting hardware, anchors, and other accessories required for a complete installation.
 - a. Provide anchoring devices to withstand imposed loads.
 - b. Where splices occur in horizontal runs of more than 20 feet, splice aluminum retainers and plastic covers at different locations along the run, but no closer than 12 inches.
 - c. Adjust end and top caps as required to ensure tight seams.

3.4. CLEANING

- A. Immediately after completion of installation, clean plastic covers and accessories using a standard, ammonia-based, household cleaning agent.
- B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION

SECTION 10 2800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Commercial toilet accessories.
- B. Under-lavatory pipe supply covers.
- C. Diaper changing stations.
- D. Utility room accessories.

1.2. REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2011.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- F. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004 (Reapproved 2016).
- G. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- H. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.
- D. CLOSEOUT SUBMITTALS
 - 1. Maintenance Data: For toilet accessories to include in maintenance manuals.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. Subject to compliance with requirements, provide product indicated as Basis of Design or comparable product by one of the following:
 - a. AJW Architectural Products: www.ajw.com.
 - b. American Specialties, Inc: www.americanspecialties.com.
 - c. Bobrick Washroom Equipment, Inc.: www.bobrick.com.
 - d. Bradley Corporation: www.bradleycorp.com.
 - e. Georgia-Pacific Professional: www.blue-connect.com.
 - f. Substitutions: Section 01 6000 - Product Requirements.

- B. Under-Lavatory Pipe Supply Covers:
 - 1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
 - 2. Substitutions: Section 01 6000 - Product Requirements.
- C. Diaper Changing Stations:
 - 1. Subject to compliance with requirements, provide product indicated as Basis of Design or comparable product by one of the following:
 - a. American Specialties, Inc: www.americanspecialties.com.
 - b. Bradley Corporation: www.bradleycorp.com.
 - c. Diaper Deck & Company: www.diaperdeck.com.
 - d. Koala Kare Products: www.koalabear.com.
 - e. Safe-Strap Company, Inc: www.diaperdepot.com.
 - f. Substitutions: 01 6000 - Product Requirements.
- D. All items of each type to be made by the same manufacturer. Bariatric grab bars may be from different manufacturers based on availability of products.

2.2. MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- E. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

2.3. FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

2.4. Commercial Toilet Accessories

- A. [T4] (OFCl) Toilet Paper Dispenser
- B. [T5] (OFCl) Paper Towel Dispenser
- C. [T6] (OFCl) Wall Mounted Liquid Soap Dispenser
- D. [T7] Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.
 - 1. Size: 24" x 36".
 - 2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 - 3. Products:
 - a. Basis of Design: Bobrick; B-165 2436.
 - b. Substitutions: Section 01 6000 - Product Requirements.
- E. Grab Bars, Typical: Stainless steel, nonslip grasping surface finish.
 - 1. [T1-T3] Standard Duty Grab Bars:
 - a. Push/Pull Point Load: 250 pound-force, minimum.
 - b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, concealed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.

- c. Finish: Smooth, No. 4 finish (satin) on ends and slip-resistant texture in grip area.
 - d. Length and Configuration: As indicated on drawings.
 - e. Basis of Design Products:
 - 1) [T7] Bobrick; B-5806.99 x 42
 - 2) [T8] Bobrick; B-5806.99 x 36
 - 3) [T9] Bobrick; B-5806.99 x 18
 - 4) Substitutions: Section 01 6000 - Product Requirements.
 - F. [T11] Toiletry Shelf: 0.03 inch (0.8 mm) satin-finished stainless steel, with 1/4 inch (6 mm) rolled or 1/2 inch (12 mm) channel edge at shelf front, concealed mounting brackets.
 - 1. Size: 5-3/4 inches deep x 24 inches long, nominal.
 - 2. Products:
 - a. Basis of Design: Bobrick; B-683 x 24.
 - b. Substitutions: Section 01 6000 - Product Requirements.
 - G. [T20] Recessed Specimen Pass-Thru Cabinet: Stainless steel, self-closing doors, interlocking mechanism for sight barrier, removeable stainless steel tray, satin finish.
 - 1. Products:
 - a. Basis of Design: Bobrick; B-505.
 - b. Substitutions: Section 01 6000 - Product Requirements.
 - H. [T14] Clothes Hook: Heavy-duty stainless steel, single-prong, circular-shaped bracket and backplate for concealed attachment, satin finish.
 - 1. Capacity: 300 lbs
 - 2. Products:
 - a. Basis of Design: Bobrick; B-2116.
 - b. Substitutions: Section 01 6000 - Product Requirements.
- 2.5. UNDER-LAVATORY PIPE AND SUPPLY COVERS
- A. [T19] Under-Lavatory Pipe and Supply Covers:
 - 1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
 - 2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
 - 3. Construction: 1/8 inch flexible PVC.
 - a. Surface Burning Characteristics: Self extinguished 0 sec (ATB), 0 mm (AEB) when tested in accordance with ASTM-D-635.
 - b. Comply with ICC A117.1.
 - c. Microbial and Fungal Resistance: Comply with ASTM G21.
 - 4. Color: White.
 - 5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.
 - 6. Products:
 - a. Basis of Design: Truebro; Lav Guard 2.
 - b. Substitutions: Section 01 6000 - Product Requirements.

2.6. Diaper Changing Stations

- A. [T10] Horizontal Diaper Changing Station: Wall-mounted folding diaper changing station for use in commercial toilet facilities, meeting or exceeding ASTM F2285.
 - 1. Material: Polyethylene.
 - 2. Mounting: Surface. Projects not more than 4 inches from wall when closed.
 - 3. Color: Gray.
 - 4. Minimum Rated Load: 50 pounds.
 - 5. Products:
 - a. Basis of Design: Koala Kare; KB200-01SS.
 - b. Substitutions: 01 6000 - Product Requirements.

2.7. Utility Room Accessories

- A. [T21] Combination Utility Shelf/Mop and Broom Holder: 0.05 inch thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
 - 1. Drying rod: Stainless steel, 1/4 inch diameter.
 - 2. Hooks: 5, 0.06 inch stainless steel rag hooks at shelf front.
 - 3. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.
 - 4. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.

3.2. PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.3. INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Wall backing: Install concealed wall backing as required to support each item.
- D. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.4. PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400 - FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

1.2. REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; current edition.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2013.
- C. UL (DIR) - Online Certifications Directory; Current Edition.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide color and finish and installation instructions.
- C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.4. FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1. FIRE EXTINGUISHERS

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
 - 1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.
- B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
 - 1. Class: A:B:C type.
 - 2. Size: 10 pound.
 - 3. Temperature range: Minus 40 degrees F to ____ degrees F.

2.2. FIRE EXTINGUISHER CABINETS

- A. Cabinet Construction: Non-fire rated.
- B. Cabinet Configuration: Semi-recessed type.
 - 1. Size to accommodate accessories.
 - 2. Cabinet to project 4" maximum from face of wall.
 - 3. Project trim with rolled edge
- C. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with roller type catch. Hinge doors for 180 degree opening with two butt hinge.
- D. Door Glazing: Vertical window, Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.
 - 1. Vertical black "Fire Extinguisher" lettering.

- E. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.
- F. Weld, fill, and grind components smooth.
- G. Finish of Cabinet Exterior Trim and Door: Baked enamel, White color.
- H. Finish of Cabinet Interior: White colored enamel.

2.3. ACCESSORIES

- A. Lettering: 93 FIRE EXTINGUISHER 94 decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.2. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 42 inches from finished floor to top of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.

END OF SECTION

SECTION 12 3600 - COUNTERTOPS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Wall-hung counters and vanity tops.
- C. Window sills.

1.2. RELATED REQUIREMENTS

- A. Section 06 4100 - Architectural Wood Casework.
- B. Section 09 3000 - Tiling: Tile for countertops.
- C. Section 22 4000 - Plumbing Fixtures: Sinks.

1.3. REFERENCE STANDARDS

- A. ANSI A208.1 - American National Standard for Particleboard; 2009.
- B. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.
- D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.
- E. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- F. SEFA 3 - Work Surfaces; 2010.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.
- D. Verification Samples: For each finish product specified, minimum size 8 inches square, representing actual product, color, and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.5. QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- B. Quality Certification:
 - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.
 - 3. Provide designated labels on installed products as required by certification program.

4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7. FIELD CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1. COUNTERTOPS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
 1. Flat Sheet Thickness: 1/2 inch, minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Dupont: www.corian.com/#sle.
 - 2) Substitutions: See section 01 6000 - Product Requirements.
 - b. Other Components Thickness: 1/2 inch, minimum.
 - c. Back and End Splashes: Same sheet material, Square top; minimum 4 inches high.
 - 1) Adhesive and Grout: Materials and installation as specified in Section 09 3000.
 - 2) Back and End Splashes: Same material, coved joint, eased top edge.
- C. Solid Surfacing Window Sills: Solid surfacing sheet or plastic resin casting self-supporting over structural members.
 1. Flat Sheet Thickness: 1/2 inch, minimum.
 2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic resin, unfilled, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
 - a. Manufacturers:
 - 1) Dupont; Corian: www.corian.com.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: As indicated on drawings.
 3. Other Components Thickness: 1/2 inch, minimum.
 4. Exposed Edge Treatment: Minimum 1/2 inch thick; 1/8 inch radius edge.
 5. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Premium Grade.

2.2. ACCESSORY MATERIALS

- A. Wood-Based Components:
 - 1. Wood fabricated from old growth timber is not permitted.
- B. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 1/2 inch thick; join lengths using metal splines.
- C. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- D. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- E. Joint Sealant: Mildew-resistant silicone sealant, white.
- F. Support Brackets for countertops without base cabinets: Heavy-duty steel
 - 1. Provide where shown on plans and elevations and at 48" o.c. maximum.
 - a. Color: To be selected by Architect from Manufacturer's entire selection.
 - 2. Manufacturers:
 - a. Knappe and Vogt; 208 TI 550 Ultimate L-Bracket: www.kv.com.
 - b. A & M Hardware, Inc.; 18X24 Regular Brackets: www.aandmhardware.com.
 - c. Architect approved equal.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- G. Grommets: Round, 2" Dia, molded plastic and matching plastic caps with slot for wire passage.
 - 1. Basis of Design: Doug Mockett, TG1 Grommet Sleeve.
 - a. Color: To be selected by Architect from manufacturer's full range of colors.

2.3. FABRICATION

- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
 - 1. Join lengths of tops using best method recommended by manufacturer.
 - 2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
 - 3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back splash wherever counter edge abuts vertical surface unless otherwise indicated.
 - 1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
 - 2. Height: 4 inches, unless otherwise indicated.
- C. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2. PREPARATION

- A. Clean surfaces thoroughly prior to installation.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3. INSTALLATION

- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.
- C. Install tile as specified in Section 09 3000.
- D. Seal/caulk joint between back/end splashes and vertical surfaces.

3.4. TOLERANCES

- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.5. CLEANING

- A. Clean countertops surfaces thoroughly.

3.6. PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 21 0500 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Pipe, fittings, sleeves, escutcheons, seals, and connections for sprinkler systems.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 21 0523 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- C. Section 21 0553 - Identification for Fire Suppression Piping and Equipment: Piping identification.
- D. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.3. REFERENCE STANDARDS

- A. ASME A112.18.1 - Plumbing Supply Fittings; 2018.
- B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.
- C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- D. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- F. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- G. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).
- H. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2013 (Reapproved 2020).
- I. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.
- J. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- K. AWWA C606 - Grooved and Shouldered Joints; 2015.
- L. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.
- C. Manufacturer's Qualification Statement.
- D. Operation and Maintenance Data: Include installation instructions and spare parts lists.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
 - 1. Minimum three years experience.
- C. Comply with UL (DIR) requirements.

- D. Valves: Bear UL (DIR) product listing label or marking. Provide manufacturer's name and pressure rating marked on valve body.
 - E. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.
- 1.6. DELIVERY, STORAGE, AND HANDLING
- A. Deliver and store valves in shipping containers, with labeling in place.
 - B. Provide temporary protective coating on cast iron and steel valves.
 - C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- 1.7. WARRANTY
- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- PART 2 PRODUCTS
- 2.1. FIRE PROTECTION SYSTEMS
- A. Sprinkler Systems: Comply with NFPA 13.
 - B. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- 2.2. ABOVE GROUND PIPING
- A. Steel Pipe: ASTM A795 Schedule 10 or ASTM A53 Schedule 40, black.
 - 1. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
 - 2. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
- 2.3. PIPE SLEEVES
- A. Plastic, Sheet Metal, or Moisture-Resistant Fiber: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- 2.4. ESCUTCHEONS
- A. Manufacturers:
 - 1. Fire Protection Products, Inc: www.fppi.com.
 - 2. Tyco Fire Protection Products: www.tyco-fire.com.
 - 3. Viking Group Inc: www.vikinggroupinc.com.
 - B. Material:
 - 1. Metals and Finish: Comply with ASME A112.18.1.
 - C. Construction:
 - 1. One-piece for mounting on chrome-plated tubing or pipe and one-piece or split-pattern type elsewhere.
 - 2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.
- 2.5. PIPE HANGERS AND SUPPORTS
- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.
 - 1. Manufacturers:
 - a. AFCON, a brand of Anvil International: www.anvilintl.com.
 - b. Ferguson Enterprises Inc: www.fnw.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
 - B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

1. Manufacturers:
 - a. AFCON, a brand of Anvil International: www.anvilintl.com.
 - b. Ferguson Enterprises Inc: www.fnw.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- 2.6. MECHANICAL COUPLINGS
 - A. Manufacturers:
 1. Anvil International: www.anvilintl.com.
 2. Shurjoint Piping Products, Inc: www.shurjoint.com.
 3. Tyco Fire Protection Products: www.tyco-fire.com.
 4. Victaulic Company; FireLock Style 009H: www.victaulic.com.
 5. Substitutions: See Section 01 6000 - Product Requirements.
 - B. Rigid Mechanical Couplings for Grooved Joints:
 1. Dimensions and Testing: Comply with AWWA C606.
 2. Minimum Working Pressure: 300 psig.
 3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
 4. Housing Coating: Factory applied orange enamel.
 5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
 6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

PART 3 EXECUTION

3.1. PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2. INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
 1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 2. Place hangers within 12 inches of each horizontal elbow.
 3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- I. Provide sleeves when penetrating walls and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 - 1. Aboveground Piping:
 - a. Pack solid using mineral fiber complying with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
 - 2. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
- J. Escutcheons:
 - 1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
 - 2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
 - 3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
- K. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.
- L. Die-cut threaded joints with full-cut, standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

3.3. CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

SECTION 21 0513 - COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT

<<<< UPDATE NOTES

PART 1 GENERAL

2.1. SECTION INCLUDES

- A. General construction and requirements.
- B. Applications.
- C. Single phase electric motors.

2.2. RELATED REQUIREMENTS

- A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

2.3. REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

2.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- D. Operation Data: Include instructions for safe operating procedures.
- E. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

2.5. QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.6. DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

2.7. WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

3.1. APPLICATIONS

- A. Single phase motors for fans, blowers, and pumps: Capacitor start, capacitor run type.

3.2. SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.

- F. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve bearings.
- G. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

PART 3 EXECUTION

4.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

END OF SECTION

SECTION 21 0523 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Two-piece ball valves with indicators.
- B. Check valves.
- C. Bronze OS&Y gate valves.
- D. NRS gate valves.
- E. Trim and drain valves.

1.2. RELATED REQUIREMENTS

- A. Section 21 0500 - Common Work Results for Fire Suppression: Pipe and fittings.
- B. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.
- C. Section 21 1300 - Fire-Suppression Sprinkler Systems.
- D. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3. REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- B. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 48-In. (50-mm Through 1,200-mm) NPS; 2017.
- C. AWWA C606 - Grooved and Shouldered Joints; 2015.
- D. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL (DIR) - Online Certifications Directory; Current Edition.
- F. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- G. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.
- H. UL 1091 - Standard for Butterfly Valves for Fire-Protection Service; Current Edition, Including All Revisions.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of experience.
- B. Where listed products are specified, provide products listed, classified, and labeled by UL (DIR) as suitable for the purpose indicated.
- C. Installer Qualifications:

1. Company specializing in performing the work of this section with minimum five years documented experience.
2. Complies with manufacturer's certification requirements.

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, and weld ends.
- B. Use the following precautions during storage:
 1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
 2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors and maintain at higher than ambient dew point temperature.
 - b. If outdoor storage is unavoidable, store valves off the ground in watertight enclosures.

PART 2 PRODUCTS

2.1. GENERAL REQUIREMENTS

- A. UL Listed: Provide valves listed in UL (DIR) under following headings and bearing UL mark:
 1. Main Level: HAMV - Fire Main Equipment.
 - a. Level 3: HLUG - Ball Valves, System Control.
 - b. Level 3: HMER - Check Valves.
 - c. Level 3: HMRZ - Gate Valves.
- B. ASME Compliance:
 1. ASME B1.20.1 for threads on threaded-end valves.
- C. Comply with NFPA 13 for valves.
- D. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.
- E. Valve Sizes: Same as upstream piping unless otherwise indicated.
- F. Valve Actuator Types:
 1. Handwheel: For other than quarter-turn trim and drain valves.
 2. Hand-lever: For quarter-turn trim and drain valves 2 NPS and smaller.

2.2. TWO-PIECE BALL VALVES WITH INDICATORS

- A. UL 1091, except with ball instead of disc and FM (AG) standard listing for indicating valves (butterfly or ball type), Class Number 1112.
- B. Description:
 1. Minimum Pressure Rating: 175 psig.
 2. Body Design: Two piece.
 3. Body Material: Forged brass or bronze.
 4. Port Size: Full or standard.
 5. Seat: PTFE.
 6. Stem: Bronze or stainless steel.

- 7. Ball: Chrome-plated brass.
- 8. Actuator: Worm gear or traveling nut.

2.3. CHECK VALVES

- A. UL 312 and FM (AG) standard listing for check valves, Class Number 1045.
- B. AWWA C508 compliant check valves.
- C. Minimum Pressure Rating: 175 psig.
- D. Type: Center guided check valve.
- E. Body Material: Cast iron, ductile iron.
- F. Center guided check with elastomeric seal.
- G. Hinge Spring: Stainless steel.
- H. End Connections: Flanged, grooved, or threaded.

2.4. BRONZE OS&Y GATE VALVES

- A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).
- B. Minimum Pressure Rating: 175 psig.
- C. Body and Bonnet Material: Bronze or brass.
- D. Wedge: One-piece bronze or brass.
- E. Wedge Seat: Bronze.
- F. Stem: Bronze or brass.
- G. Packing: Non-asbestos PTFE.
- H. Supervisory Switch: External.
- I. End Connections: Threaded.

2.5. NRS GATE VALVES

- A. UL 262 and FM (AG) standard listing for fire-service water control valves (OS&Y and NRS-type gate valves).
- B. Minimum Pressure Rating: 175 psig.
- C. Body and Bonnet Material: Cast or ductile iron.
- D. Wedge: Cast or ductile iron with elastomeric coating.
- E. Stem: Brass or bronze.
- F. Packing: Non-asbestos PTFE.
- G. Supervisory Switch: External.
- H. End Connections: Flanged.

2.6. TRIM AND DRAIN VALVES

- A. Ball Valves:
 - 1. Description:
 - a. Pressure Rating: 175 psig.
 - b. Body Design: Two piece.
 - c. Body Material: Forged brass or bronze.
 - d. Port Size: Full or standard.

- e. Seat: PTFE.
 - f. Stem: Bronze or stainless steel.
 - g. Ball: Chrome-plated brass.
 - h. Actuator: Hand-lever.
 - i. End Connections for Valves 1 NPS through 2-1/2 NPS: Threaded ends.
 - j. End Connections for Valves 1-1/4 NPS and 2-1/2 NPS: Grooved ends.
- B. Angle Valves:
- 1. Description:
 - a. Pressure Rating: 175 psig.
 - b. Body Material: Brass or bronze.
 - c. Ends: Threaded.
 - d. Stem: Bronze.
 - e. Disc: Bronze.
 - f. Packing: Asbestos free.
 - g. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Confirm valve interior to be free of foreign matter and corrosion.
- B. Remove packing materials.
- C. Examine guides and seats by operating valves from the fully open position to the fully closed position.
- D. Examine valve threads and mating pipe for form and cleanliness.

3.2. INSTALLATION

- A. Comply with specific valve installation requirements and application in the following Sections:
 - 1. Section 21 1300 for application of valves in wet and dry pipe, fire-suppression sprinkler systems.
- B. Install listed fire protection shutoff valves supervised-open, located to control sources of water supply except from fire department connections.
- C. Valves in horizontal piping installed with stem at or above the pipe center.
- D. Position valves to allow full stem movement.
- E. Install valve tags. Comply with Section 21 0553 requirements for valve tags, schedules, and signs on surfaces concealing valves; and the appropriate NFPA standard applying to the piping system in which valves are installed.

END OF SECTION

SECTION 21 0553 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.

1.2. REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.

PART 2 PRODUCTS

2.1. IDENTIFICATION APPLICATIONS

- A. Control Panels: Nameplates.
- B. Piping: Pipe markers.
- C. Small-sized Equipment: Tags.
- D. Valves: Tags.

2.2. NAMEPLATES

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com.
 - 2. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
 - 3. Seton Identification Products, a Tricor Direct Company: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Laminated three-layer plastic with engraved letters.
 - 1. Letter Color: White.
 - 2. Letter Height: 1/4 inch.
 - 3. Background Color: Black.
 - 4. Thickness: 1/8 inch.
 - 5. Plastic: Comply with ASTM D709.

2.3. TAGS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com.
 - 2. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
 - 3. Seton Identification Products, a Tricor Direct Company: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4. PIPE MARKERS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com.
 - 2. Kolbi Pipe Marker Company: www.kolbipipemarkers.com.
 - 3. Seton Identification Products, a Tricor Company: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Color: Comply with ASME A13.1.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Color code as follows:
 - 1. Fire Quenching Fluids: Red with white letters.

PART 3 EXECUTION

3.1. PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2. INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- D. Use tags on piping 3/4 inch diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 21 1300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. System design, installation, and certification.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 21 0500 - Common Work Results for Fire Suppression: Pipe and fittings.
- C. Section 21 0523 - General-Duty Valves for Water-Based Fire-Suppression Piping.
- D. Section 21 0553 - Identification for Fire Suppression Piping and Equipment.
- E. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- F. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.3. REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; current edition.
- B. ITS (DIR) - Directory of Listed Products; current edition.
- C. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Shop Drawings:
 - 1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
 - 2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components and accessories. Indicate system controls. Design and calculations shall be performed by an individual having NICET III, or IV certification, &/or under the direct supervision of a Illinois Licensed Professional Engineer.
 - 3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.
- D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.
- E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
 - 3. Sprinkler Wrenches: For each sprinkler type.

1.5. QUALITY ASSURANCE

- A. Comply with UL (DIR) requirements.
- B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- C. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Sprinklers, Valves, and Equipment:
 - 1. Anvil International: www.anvilintl.com.
 - 2. Tyco Fire Protection Products: www.tyco-fire.com.
 - 3. Viking Corporation: www.vikinggroupinc.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

2.2. SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for building areas noted.
- B. Occupancy: Majority Light Hazard..
- C. Water Supply: See plans for previously obtained flow test data that may be utilized for design layout and calculations.
 - 1. Revise design when test data available prior to submittals.
- D. Storage Cabinet for Spare Sprinklers and Tools: Steel, locate next to main service riser assembly..

2.3. SPRINKLERS

- A. Suspended Ceiling Type: Concealed pendant type with matching push on escutcheon plate.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.
 - 3. Finish: Chrome plated.
 - 4. Cover Plate Finish: Enamel, color as selected.
 - 5. Fusible Link: Glass bulb type temperature rated for specific area hazard.
 - 6. Manufacturers:
 - a. Tyco Fire Protection Products: www.tyco-fire.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- B. Exposed Area Type: Upright type.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.
 - 3. Finish: Brass.
 - 4. Fusible Link: Glass bulb type temperature rated for specific area hazard.
- C. Flexible Drop System: Stainless steel, multiple use, open gate type.
 - 1. Application: Use to properly locate sprinkler heads.

2. Include all supports and bracing.
3. Provide braided type tube as required for the application.
4. Manufacturers:
 - a. FlexHead Industries, a brand of Anvil International: www.anvilintl.com.
 - b. Victaulic Company; Vic-Flex: www.victaulic.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.4. PIPING SPECIALTIES

- A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
 1. Activate electric alarm.
 2. Test and drain valve.
 3. Manufacturers:
 - a. Victaulic Company; Series 751 with Series 760 motor alarm: www.victaulic.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- B. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.
 1. Manufacturers:
 - a. Substitutions: See Section 01 6000 - Product Requirements.
- C. Supervisory Switches:
 1. Manufacturers:
 - a. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Locate outside alarm gong on building wall as indicated.
- D. Place pipe runs to minimize obstruction to other work.
- E. Place piping in concealed spaces above finished ceilings.
- F. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- G. Flush entire piping system of foreign matter.
- H. Hydrostatically test entire system.
- I. Require test be witnessed by Fire Marshal.

3.2. INTERFACE WITH OTHER PRODUCTS

- A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

SECTION 21 2200 - CLEAN-AGENT FIRE-EXTINGUISHING SYSTEM

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Total flooding extinguishing system for enclosed spaces.
- B. Fire detection system.
- C. Control and supervision systems.
- D. Extinguishing agent, containers, distribution and discharge system.
- E. System maintenance after closeout.

1.2. RELATED REQUIREMENTS

- A. Section 23 0913 - Instrumentation and Control Devices for HVAC: Dampers.
- B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.
- C. Section 28 4600 - Fire Detection and Alarm: Building fire alarm system and devices.

1.3. REFERENCE STANDARDS

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- B. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2015.
- C. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2009 (Reapproved 2014).
- D. ITS (DIR) - Directory of Listed Products; current edition.
- E. NEMA ICS 6 - Industrial Control and Systems: Enclosures; 1993 (R2011).
- F. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- G. NFPA 2001 - Standard on Clean Agent Fire Extinguishing Systems; 2018.
- H. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: To bear stamp of approval of Authority Having Jurisdiction. Provide for each piece of equipment comprising the system including detectors, release devices, discharge nozzles, manual controls, alarm devices, annunciators, extinguishing agent containers, manifolds, and control panel.
- C. Shop Drawings: To bear stamp of approval of Authority Having Jurisdiction. Indicate detailed layout of system, including piping and location of each component. Include control diagrams, wiring diagrams, and written sequence of operation.
- D. Maintenance Contract.

1.5. QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least five years of documented experience.

PART 2 PRODUCTS

2.1. APPLICATIONS

- A. Computer/IT Room: Type of devices and locations shall comply with NFPA 2001 Standards for related system.

2.2. FIRE SUPPRESSION SYSTEM

- A. Fire Suppression System: Complete fire detection and suppression system that totally floods protected area with fire extinguishing agent to extinguish fire.
 - 1. Fire Extinguishing Agent: Any allowed by NFPA 2001.
 - 2. Locate extinguishing agent supply and backup supply near each protected area.
 - 3. Locate manual release stations at each exit from protected area.
 - 4. Locate abort stations at each exit from protected area.
 - 5. Provide all manufactured system components from a single source and by a single manufacturer.
 - 6. Provide components listed and labeled by ITS (DIR) or UL (DIR) for the type of system required and for use with the other components of the system.
- B. Design Criteria: Provide total flooding of fire extinguishing agent at manufacturer's recommended concentration by volume, in maximum discharge time of 10 seconds, for period of 10 minutes and with 10 percent allowance for room leakage.
 - 1. Direct discharge parallel to ceiling; use 360 degree pattern nozzles except where obstructions would make 360 distribution inefficient.
 - 2. Provide sufficient amount of fire extinguishing agent. Consider the following when computing volume:
 - a. Volume of protected area.
 - b. Specific volume of fire extinguishing agent.
 - c. Additional quantities of fire extinguishing agent required to compensate for openings, pipe losses.
 - d. Other special conditions affecting extinguishing agent concentration.

2.3. PIPE AND PIPING SPECIALTIES

- A. Steel Pipe: ASTM A53/A53M or ASTM A106/A106M Schedule 40, or ASTM A135/A135M Schedule 10, galvanized as specified in ASTM A53/A53M.

2.4. EXTINGUISHING AGENT CONTAINERS

- A. Containers:
 - 1. Where multiple, replaceable containers are used, provide only containers of the same size and holding the same amount of extinguishing agent.
- B. Contents: Fill with required fire extinguishing agent.
- C. Identification: Permanent plate or marking, specifying agent, tare and gross weight, pounds of fire extinguishing agent, and pressurization level; installed so plate or marking is visible and readable.
- D. Safety Release: Equip with frangible disc safety device that operates when internal pressure exceeds 730 pounds per square inch.
- E. Safety Release: Equip with frangible disc safety device.
- F. Valves: Heavy duty forged brass, with safety pressure relief device, manual control, discharge valve, and pressure gauge.
- G. Actuator: Resettable electric or pneumatic with pressurized nitrogen cartridge. Explosive devices are NOT permitted.
- H. Pressure Gauge: Visual indicator of internal pressure.
- I. Low Pressure Switch: Electronic sensor; reports to control panel and provides audible and visual alarms when container pressure drops below 230 pounds per square inch.

- J. Manifold: Provide for systems with more than one container, with rack to secure each and check valves between each discharge and manifold.
- K. Wall Bracket: Manufacturer's standard; UL (DIR) listed, welded steel construction, modular design with saddle bottom and front bracket.

2.5. MANUAL STATIONS

- A. Manual Release Station: Semi-flush housing fitted with double action control fitted with "push in" tab and "pull down" lever that locks in position after releasing spring-loaded contact switch, for mounting on electrical outlet box; addressable using manufacturer's standard monitor module.
 - 1. Activate all audible and visual alarms.
 - 2. Override any abort station or time delay function.
 - 3. Activate all release and shutdown functions normally triggered by detectors or alarm system.
 - 4. Locate engraved label adjacent to each manual release station indicating area protected and that actuation will cause discharge of fire extinguishing agent.
- B. Manual System Abort Switch: Stainless steel plate with momentary contact push button, countdown timer, magnetic door holders manual release, for mounting on electrical outlet box; addressable using manufacturer's standard monitor module.
 - 1. Locate engraved label adjacent to each manual abort station, indicating area protected and that actuation will prevent discharge of fire extinguishing agent after automatic system is activated.

2.6. DETECTORS

- A. Ionization Smoke Detectors: UL (DIR) listed, NFPA 72, adjustable sensitivity, operating on ionization principle, activated by combustion products, plug-in, twist-lock unit easily removed from base.
- B. Photoelectric Smoke Detectors: UL (DIR) listed, NFPA 72, adjustable sensitivity, with LED light source including photocell, activated by smoke, plug-in, twist-lock unit easily removed from base.

2.7. DISCHARGE NOZZLES

- A. Nozzles: UL (DIR) listed; orifice size providing required rates of discharge and coverage and to distribute extinguishing agent uniformly throughout protected area.
- B. Construction: Two-piece chrome plated brass or aluminum nozzle with textured finish with female pipe thread integral on body; one-piece deflector plate.
- C. Identification: Permanently mark nozzles with manufacturer's part number, UL listing and equivalent single orifice diameter.

2.8. CONTROLS AND CONTROL PANEL

- A. Controls: Combination type approved as both alarm and releasing device, with solid state internal circuitry enclosed in NEMA ICS 6, Type 1 cabinet.
- B. Provide supervision to NFPA 72, Class A of following circuits for wire break or ground faults:
 - 1. Zone detection loops.
 - 2. Suppression system solenoid valves.
 - 3. Power supply and circuit wiring and fuse.
 - 4. Battery interconnecting wires and fuse.
 - 5. Alarm in abort mode.
- C. Conceal control switches and indicators, with exception of Power On, Master Trouble, Supervisory Trouble, Circuit 1 Alarm, Circuit 2 Alarm and Release Indicators.
- D. Equip panel with following standard features:
 - 1. Visual and audible annunciation of trouble or alarm signals.

2. Panel reset switch.
3. Trouble alarm silence switch with ring back feature.
4. Battery test meter and switch.
5. Manual discharge switch.
6. Deadman abort switch.
7. Programmable timers for pre-discharge and discharge, 0 to 60 second cycle.
8. Isolated relay contactors for external alarm or equipment and ventilation shutdown.
9. Relay contactors for general trouble signal.
10. Relay contactor activated by detector zone board in alarm or trouble mode.

E. Annunciation: Provide the following annunciation:

1. Power On: Green.
2. System Trouble: Amber.
3. Battery Trouble: Amber.
4. Ground Fault: Amber.
5. Release trouble: Amber.
6. Agent Release: Red.
7. Alarm Output Trouble: Amber.
8. Supervisory Trouble: Amber.

F. Batteries: Provide nickel cadmium batteries and charger for continuous operation of detection, alarm, actuation and supervision functions for 24 hours. Provide automatic battery switch-over upon failure of primary power supply.

2.9. MISCELLANEOUS EQUIPMENT

- A. Mounting Height: Mount miscellaneous equipment listed above 80 inches above floor or 72 inches, whichever is lower.
- B. Alarm Bells: 24 volts, with supervision of circuit wiring, of modular design, red baked enamel finish, with minimum sound level of 84 dba at 10 feet, for mounting on 4 inch electrical outlet box.
- C. Alarm Horns: 24 volts, with supervision of circuit wiring, with minimum sound level of 90 dba at 10 feet, for mounting on 4 inch electrical outlet box.
- D. Strobe Beacon: Manufacturer's standard design, 24 volts, with system identification on strobe lens.

2.10. OPERATING SEQUENCE

- A. Actuation of one detector in either zone circuit:
 1. Illuminate zone indicator.
 2. Energize alarm bell.
 3. Shut down air-conditioning system and close dampers.
 4. Close doors to area.
 5. Signal building fire alarm system.
- B. Actuation of second detector on second zone circuit:
 1. Illuminate zone indicator.
 2. Energize alarm horn.
 3. Shut down power to protected equipment.

4. Actuate time delay for up to 30 seconds.
 5. Release extinguishing agent into protected area.
 6. If abort switch is engaged, delay release.
 7. Upon abort switch disengagement release extinguishing agent unless system cleared and reset.
- C. Discharge of Extinguishing Agent:
1. Sounds alarm bells and horns.
 2. Operates strobes.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that enclosing walls are continuous above ceilings and below raised floors to enable required concentration to be built up and maintained for required time to ensure fire is extinguished.

3.2. INSTALLATION

- A. Install in accordance with referenced standards in PART 2 of this section and NFPA 2001.
- B. Route piping in orderly manner, concealed, plumb and parallel to building structure, and maintain gradient. Install piping to conserve building space, and not interfere with use of space and other work.
- C. Identify in accordance with requirements of referenced standard.
- D. Install wiring in accordance with Section 26 0583 requirements.

3.3. INTERFACE WITH OTHER PRODUCTS

- A. Provide interlock with motorized dampers. Refer to Section 23 0913.
- B. Provide signal to building fire alarm system. Refer to Section 28 4600.

3.4. FIELD QUALITY CONTROL

- A. Manufacturer Services: Provide experienced manufacturer's field engineer to supervise installation and performance testing of the system.
- B. Perform field inspection and testing in accordance with Section 01 4000 - Quality Requirements.
- C. Test distribution piping and valving, prior to nozzle installation, to 50 psi air pressure test. Inspect joints using soap water solution or halide torch or lamp. Repair leaks and retest. Maintain test pressure for four hours.
- D. Upon completion of installation provide final checkout inspection by factory trained representative of manufacturer to ascertain proper system operation. Leave system in a fully commissioned and automatic readiness state with circuitry energized and supervised.
- E. Test circuits including automatic discharge, manual discharge, equipment shut-down, alarm devices, and storage container pressure. Test supervision of each circuit.
- F. Check each ionization detector with a sensitivity meter, adjust. Record sensitivity, and include record in test report.
- G. Submit original copies of tests, indicating that factory trained technical representatives of the manufacturer have inspected and tested systems and are satisfied with methods of installation, connections and operation.
- H. Pressure test entire enclosure with test fan, pressurizing protected area both under positive and negative conditions. Confirm that leakage is within system design allowance.

3.5. DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate that components, except discharge assemblies, are functioning properly and in conjunction with controls system.

- B. Submit integrated step-by-step test procedure for approval 10 business days prior to start of demonstration.
 - 1. Arrange meeting prior to demonstration with representatives of Owner, Owner's underwriter, and the installer.

3.6. MAINTENANCE

- A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide a separate maintenance contract for specified maintenance service.
- C. Provide inspections and maintenance performed by competent personnel in the employ of the system installer.
- D. Conduct inspections at 6 months and 12 months from Date of Substantial Completion to verify proper operation of system, check agent container weight and pressure, and a thorough check of controls, detection and alarm systems.
- E. Remedy of all deficiencies shall be included at no extra cost to Owner except for replacement of agent due to discharge under normal use or damage due to abuse.
- F. Submit documents certifying satisfactory system conditions. Include manufacturer's certificate of acceptance of inspector's qualifications.

END OF SECTION

SECTION 22 0519 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Thermometers and thermometer wells.

1.2. REFERENCE STANDARDS

- A. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.
- B. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014, with Editorial Revision (2017).

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

1.4. FIELD CONDITIONS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 PRODUCTS

2.1. STEM TYPE THERMOMETERS

- A. Manufacturers:
 - 1. Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2. Omega Engineering, Inc: www.omega.com.
 - 3. Weksler Glass Thermometer Corp: www.wekslerglass.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.
 - 1. Size: 9 inch scale.
 - 2. Window: Clear Lexan.
 - 3. Accuracy: 2 percent, per ASTM E77.
 - 4. Calibration: Degrees F.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install thermometers on domestic hot water supply leaving water heater, and HWC upstream heat trap. Locate where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- B. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.2. SCHEDULES

- A. Stem Type Thermometers, Location and Scale Range:
 - 1. Domestic hot water supply and recirculation, 0 to 140 degrees F.

END OF SECTION

SECTION 22 0523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Ball valves.
- D. Check valves.
- E. Gate valves.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 08 3100 - Access Doors and Panels.

1.3. ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.

1.4. REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- C. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2017.
- D. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- E. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2017.
- F. ASME B31.9 - Building Services Piping; 2014.
- G. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- H. AWWA C606 - Grooved and Shouldered Joints; 2015.
- I. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- J. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- K. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- L. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

1.6. QUALITY ASSURANCE

- A. Manufacturer:

1. Obtain valves for each valve type from single manufacturer.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Use the following precautions during storage:
 1. Maintain valve end protection and protect flanges and specialties from dirt.
 2. Store valves in shipping containers and maintain in place until installation.

PART 2 PRODUCTS

2.1. APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:
 1. Shutoff: Ballgate.
 2. Throttling: Provide TACO AccuFlo Series..
 3. Swing Check (Pump Outlet):
 - a. 2 NPS and Smaller: Bronze swing check valves with bronze disc.
- B. Required Valve End Connections for Non-Wafer Types:
 1. Copper Tube:
 - a. 2 NPS and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
- C. Domestic, Hot and Cold Water Valves:
 1. 2 NPS and Smaller:
 - a. Bronze and Brass: Provide with solder-joint or threaded ends.
 - b. Ball: Two piece, full port, bronze with brass trim.
 - c. Bronze Swing Check: Class 125, bronze disc.

2.2. GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 1. Hand Lever: Quarter-turn valves 6 NPS and smaller.
- D. Valves in Insulated Piping: With 2 NPS stem extensions and the following features:
 1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 2. Memory Stops: Fully adjustable after insulation is installed.
- E. Valve-End Connections:
 1. Threaded End Valves: ASME B1.20.1.
 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 3. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 2. Solder-joint Connections: ASME B16.18.
 3. Building Services Piping Valves: ASME B31.9.
- G. Valve Materials for Potable Water: NSF 61 and NSF 372.

2.3. BRONZE BALL VALVES

- A. Two Piece, Full Port with Bronze Trim:
 - 1. Comply with MSS SP-110.
 - 2. SWP Rating: 150 psig.
 - 3. CWP Rating: 600 psig.
 - 4. Body: Bronze.
 - 5. Ends: Threaded.
 - 6. Seats: PTFE or TFE.
 - 7. Stem: Bronze.
 - 8. Ball: Chrome plated brass.
 - 9. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com.
 - b. Viega LLC: www.viega.us.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

2.4. BRONZE SWING CHECK VALVES

- A. Class 125: CWP Rating: 200 psig (1380 kPa) and Class 150: CWP Rating: 300 psig (2070 kPa).
 - 1. Comply with MSS SP-80, Type 3.
 - 2. Design: Horizontal flow.
 - 3. Body: Bronze, ASTM B62.
 - 4. Ends: Threaded as indicated.
 - 5. Disc: Bronze.
 - 6. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.

2.5. BRONZE GATE VALVES

- A. Non-Rising Stem (NRS):
 - 1. Comply with MSS SP-80, Type I.
 - 2. Class 125: CWP Rating: 200 psig.
 - 3. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
 - 4. Ends: Threaded or solder joint joint.
 - 5. Stem: Bronze.
 - 6. Disc: Solid wedge; bronze.
 - 7. Packing: Asbestos free.
 - 8. Handwheel: Malleable iron, bronze, or aluminum.
 - 9. Manufacturers:
 - a. Apollo Valves: www.apollovalves.com.
 - b. Ferguson Enterprises Inc: www.fnw.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.2. INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Install check valves where necessary to maintain direction of flow as follows:
 - 1. Swing Check: Install horizontal maintaining hinge pin level.

END OF SECTION

SECTION 22 0529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Support and attachment components for equipment, piping, and other plumbing work.

1.2. REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping; 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- G. MFMA-4 - Metal Framing Standards Publication; 2004.
- H. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.4. QUALITY ASSURANCE

- A. Comply with applicable building code.

PART 2 PRODUCTS

2.1. SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

- B. Metal Channel (Strut) Framing Systems:
 - 1. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Thomas & Betts Corporation: www.tnb.com.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 - e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
 - 2. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 3. Comply with MFMA-4.
 - 4. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - 5. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
 - 6. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
 - b. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
 - c. Trapeze Support for Multiple Pipes: 3/8 inch diameter.
- D. Pipe Supports:
 - 1. Liquid Temperatures Up To 122 degrees F:
 - a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
 - b. Support From Below: MSS SP-58 Types 35 through 38.
- E. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
 - 1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
 - 2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- F. Pipe Hangers: For a given pipe run use hangers of the same type and material.
 - 1. Manufacturers:
 - a. Ferguson Enterprises Inc: www.fnw.com.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
 - 2. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
 - 3. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- G. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- H. Non-Penetrating Rooftop Supports for Low-Slope Roofs:
 - 1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - 2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
- I. Anchors and Fasteners:
 1. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc: www.us.hilti.com.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com.
 - c. Powers Fasteners, Inc: www.powers.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 5. Hollow Masonry: Use toggle bolts.
 6. Hollow Stud Walls: Use toggle bolts.
 7. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 8. Sheet Metal: Use sheet metal screws.
 9. Wood: Use wood screws.
 10. Plastic and lead anchors are not permitted.
 11. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that mounting surfaces are ready to receive support and attachment components.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- G. Secure fasteners according to manufacturer's recommended torque settings.
- 3.3. FIELD QUALITY CONTROL
- A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
 - B. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 22 0553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Tags.
- B. Pipe markers.

1.2. REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.

PART 2 PRODUCTS

2.1. IDENTIFICATION APPLICATIONS

- A. Piping: Pipe markers.
- B. Valves: Tags.

2.2. TAGS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com.
 - 2. Craftmark Pipe Markers: www.craftmarkid.com.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.3. PIPE MARKERS

- A. Manufacturers:
 - 1. Brimar Industries, Inc: www.pipemarker.com.
 - 2. Craftmark Pipe Markers: www.craftmarkid.com.
 - 3. Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install tags with corrosion resistant chain.
- B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

- C. Use tags on piping 3/4 inch diameter and smaller.
 - 1. Identify service, flow direction, and pressure.
 - 2. Install in clear view and align with axis of piping.
 - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION

SECTION 22 0719 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.

1.3. REFERENCE STANDARDS

- A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- B. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2017.
- C. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2017, with Editorial Revision (2018).
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5. QUALITY ASSURANCE

- A. Applicator Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

PART 2 PRODUCTS

2.1. REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2. GLASS FIBER

- A. Manufacturers:
 - 1. CertainTeed Corporation: www.certainteed.com.
 - 2. Johns Manville Corporation: www.jm.com.
 - 3. Knauf Insulation; Earthwool 1000 Degree Pipe Insulation: www.knaufinsulation.com.
 - 4. Owens Corning Corporation; Fiberglas Pipe Insulation ASJ: www.ocbuildingspec.com.
 - 5. Owens Corning Corporation; VaporWick Pipe Insulation: www.ocbuildingspec.com.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K Value: ASTM C177, 0.24 at 75 degrees F.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.

- C. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D. Vapor Barrier Lap Adhesive: Compatible with insulation.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. Glass fiber insulated pipes conveying fluids below ambient temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
 - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- D. Glass fiber insulated pipes conveying fluids above ambient temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- E. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
- F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.
- G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

3.3. SCHEDULES

- A. Plumbing Systems:
 - 1. Domestic Cold, Hot and Circulating Hot Water:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: 1-inch and larger.
 - 2) Thickness: 1-inch.
 - 3) Pipe Size Range: 3/4" and smaller (and within standard stud walls)
 - 4) Thickness: 1/2-inch
 - 2. Roof/Storm Drainage - horizontal only:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: All Sizes.

2) Thickness

END OF SECTION

SECTION 22 1005 - PLUMBING PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
 - 1. Sanitary sewer.
 - 2. Domestic water.
 - 3. Storm water.
 - 4. Flanges, unions, and couplings.
 - 5. Strainers.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 22 0553 - Identification for Plumbing Piping and Equipment.
- C. Section 22 0719 - Plumbing Piping Insulation.
- D. Section 33 0110.58 - Disinfection of Water Utility Piping Systems.

1.3. REFERENCE STANDARDS

- A. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2018.
- C. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012.
- D. ASME B31.1 - Power Piping; 2018.
- E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- F. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2017.
- G. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2018a.
- H. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- I. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2015a.
- J. ASTM B68/B68M - Standard Specification for Seamless Copper Tube, Bright Annealed; 2011.
- K. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- L. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.
- M. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.
- N. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- P. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.
- Q. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).
- R. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Inside Diameter; 2012a.

- S. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012 (Reapproved 2018).
- T. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2015.
- U. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
- V. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2015.
- W. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.
- X. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2012.
- Y. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.
- Z. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017.
- AA. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; 2009 (Revised 2012).
- AB. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2011 (Revised 2012).
- AC. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- AD. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- AE. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- AF. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5. QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

PART 2 PRODUCTS

2.1. GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.2. SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.
- B. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.3. SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.
- B. PVC Pipe: ASTM D2665.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.4. DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
 - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
 - 2. Joints: ASTM B32, alloy Sn95 solder.
 - 3. Mechanical Press Sealed Fittings (As manufactured by Viega only): Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.
 - a. Manufacturers:
 - 1) Anvil International: www.anvilintl.com.
 - 2) Apollo Valves: www.apollovalves.com.
 - 3) Grinnell Products: www.grinnell.com.
 - 4) Viega LLC: www.viega.us.
 - 5) Substitutions: See Section 01 6000 - Product Requirements.

2.5. STORM WATER PIPING, ABOVE GRADE

- A. PVC Pipe: ASTM D2665 or ASTM D3034.
 - 1. Fittings: PVC.
 - 2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.6. FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
 - 1. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.
- B. No-Hub Couplings:
 - 1. Gasket Material: Neoprene complying with ASTM C564.
 - 2. Band Material: Stainless steel.
 - 3. Eyelet Material: Stainless steel.
 - 4. Manufacturers:
 - a. MIFAB, Inc; ____: www.mifab.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.7. STRAINERS

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com.
 - 2. WEAMCO: www.weamco.com.

3. Substitutions: See Section 01 6000 - Product Requirements.
- B. Size 2 inch and Under:
 1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
 2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2. PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- G. Install vent piping penetrating roofed areas to maintain integrity of roof assembly_____.
- H. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- I. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

3.4. DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect domestic water distribution piping as outlined in the Illinois State Plumbing Code.

END OF SECTION

SECTION 22 1006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Sill Cocks.
- D. Water hammer arrestors.
- E. Mixing valves.

1.2. RELATED REQUIREMENTS

- A. Section 22 1005 - Plumbing Piping.
- B. Section 22 4000 - Plumbing Fixtures.

1.3. REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASME A112.6.3 - Floor and Trench Drains; 2016.
- C. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- D. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- E. PDI-WH 201 - Water Hammer Arresters; 2010.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- D. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

PART 2 PRODUCTS

2.1. GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2. DRAINS

- A. Description: Refer to the plumbing drawings for floor drain requirements.

2.3. CLEANOUTS

- A. Description: Refer to the plumbing drawings for cleanout requirements.

2.4. Sill Cocks

- A. Description: Refer to the plumbing drawings for sillcock requirements.

2.5. WATER HAMMER ARRESTORS

- A. Manufacturers:
 - 1. Cash Acme, a brand of Reliance Worldwide Corporation: www.cashacme.com.
 - 2. Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 - 3. Watts Regulator Company, a part of Watts Water Technologies: www.wattsregulator.com.
 - 4. Zurn Industries, LLC: www.zurn.com.

5. Substitutions: See Section 01 6000 - Product Requirements.

B. Water Hammer Arrestors:

1. Copper construction, piston type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

2.6. MIXING VALVES

A. Description: Refer to the plumbing drawings for mixing valve requirements.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Install floor cleanouts at elevation to accommodate finished floor.
- D. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- E. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks.

END OF SECTION

SECTION 22 4000 - PLUMBING FIXTURES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Sinks.
- B. Under-lavatory pipe supply covers.

1.2. RELATED REQUIREMENTS

- A. Section 06 4100 - Architectural Wood Casework: Preparation of counters for sinks and lavatories.
- B. Section 07 9200 - Joint Sealants: Sealing joints between fixtures and walls and floors.
- C. Section 22 1005 - Plumbing Piping.
- D. Section 22 1006 - Plumbing Piping Specialties.
- E. Section 22 3000 - Plumbing Equipment.

1.3. REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011.
- C. ASME A112.18.1 - Plumbing Supply Fittings; 2018.
- D. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011.
- E. ASME A112.19.3 - Stainless Steel Plumbing Fixtures; 2017.
- F. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks; 2017.
- G. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2015.
- H. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- J. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- K. NSF 372 - Drinking Water System Components - Lead Content; 2016.
- L. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.7. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1. GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

2.2. REGULATORY REQUIREMENTS

- A. Comply with The Illinois State Plumbing Code codes for installation of plumbing systems.
- B. Comply with UL (DIR) requirements.
- C. Perform work in accordance with local health department regulations.

2.3. SINKS

- A. Description: Refer to the plumbing drawings for sink requirements.

2.4. UNDER-LAVATORY PIPE SUPPLY COVERS

- A. Basis of Design: Plumberex Specialty Products, Inc; www.plumberex.com.
- B. General:
 - 1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
 - 2. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
 - a. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
 - b. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
 - c. Comply with ICC A117.1.
 - 3. Color: High gloss white.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Confirm that millwork is constructed with adequate provision for the installation of counter top sinks.

3.2. PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3. INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.

3.4. INTERFACE WITH WORK OF OTHER SECTIONS

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5. ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6. CLEANING

- A. Clean plumbing fixtures and equipment.

3.7. PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 0517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.

1.3. REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2016.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified this section.
- C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

PART 2 PRODUCTS

2.1. PIPE SLEEVES

- A. Manufacturers:
 - 1. Flexicraft Industries; Pipe Wall Sleeve: www.flexicraft.com.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Clearances:
 - 1. Provide allowance for insulated piping.
 - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
 - 3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.2. MANUFACTURED SLEEVE-SEAL SYSTEMS

- A. Manufacturers:
 - 1. Advance Products & Systems, LLC; Innerlynx: www.apsonline.com.
 - 2. Flexicraft Industries; PipeSeal: www.flexicraft.com.
- B. Modular/Mechanical Seal:
 - 1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.

2. Provide watertight seal between pipe and wall/casing opening.
3. Elastomer element size and material in accordance with manufacturer's recommendations.
4. Glass reinforced plastic pressure end plates.

PART 3 EXECUTION

3.1. PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

3.2. INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Structural Considerations:
 1. Do not penetrate building structural members unless indicated.
- E. Provide sleeves when penetrating walls and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 1. Aboveground Piping:
 - a. Pack solid using mineral fiber in compliance with ASTM C592.
 - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
 2. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
- F. Manufactured Sleeve-Seal Systems:
 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
 3. Locate piping in center of sleeve or penetration.
 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
 5. Tighten bolting for a water-tight seal.
 6. Install in accordance with manufacturer's recommendations.
- G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.3. CLEANING

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 23 0517

SECTION 23 0529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

1.2. RELATED REQUIREMENTS

- A. Section 05 5000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

1.3. REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping; 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2018).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- G. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2018.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- J. MFMA-4 - Metal Framing Standards Publication; 2004.
- K. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- L. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.5. QUALITY ASSURANCE

- A. Comply with applicable building code.

PART 2 PRODUCTS

2.1. SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Do not use wire, chain, or perforated pipe strap for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Materials for Metal Fabricated Supports: Comply with Section 05 5000.
- C. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 1. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation; : www.cooperindustries.com.
 - b. Ferguson Enterprises Inc; : www.fnw.com.
 - c. Thomas & Betts Corporation; : www.tnb.com.
 - d. Unistrut, a brand of Atkore International Inc; : www.unistrut.com.
 2. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 3. Comply with MFMA-4.
 4. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 5. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
 6. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
- D. Fiberglass Channel (Strut) Framing Systems: Factory-fabricated continuous-slot fiberglass channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 1. Manufacturers:
 - a. Enduro Composites; : www.endurocomposites.com.
 2. Channel Material: Use polyester resin or vinyl ester resin.
 3. Minimum Channel Dimensions: 1-5/8 inch width by 1 inch height.
 4. Flammability: Fire retardant with NFPA 101, Class A flame spread index (maximum of 25) when tested in accordance with ASTM E84; self-extinguishing in accordance with ASTM D635.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
 - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
 - d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

- F. Steel Cable:
 - 1. Manufacturers:
 - a. Ductmate Industries, Inc, a DMI Company; Clutcher Cable Hanging System: www.ductmate.com.
- G. Thermal Insulated Pipe Supports:
 - 1. Manufacturers:
 - a. Aeroflex USA, Inc: www.aeroflexusa.com.
 - b. KB Enterprises; : www.snappitz.com.
 - 2. General Construction and Requirements:
 - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
 - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
 - c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
 - d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
 - 3. PVC Jacket:
 - a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
 - b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
 - c. Thickness: 60 mil.
- H. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
 - 1. Manufacturers:
 - a. Ferguson Enterprises Inc; : www.fnw.com/#sle.
 - 2. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
 - 3. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- I. Riser Clamps:
 - 1. Manufacturers:
 - a. Ferguson Enterprises Inc; : www.fnw.com.
 - 2. Provide copper plated clamps for copper tubing support.
- J. Pipe Hangers: For a given pipe run use hangers of the same type and material.
 - 1. Manufacturers:
 - a. Ferguson Enterprises Inc; : www.fnw.com.
 - 2. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
 - 3. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- K. Non-Penetrating Rooftop Supports for Low-Slope Roofs:
 - 1. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation; : www.cooperindustries.com.
 - b. Erico International Corporation, a brand of Pentair; : www.erico.com.
 - c. Ferguson Enterprises Inc; : www.fnw.com.

- d. PHP Systems/Design; : www.phpsd.com.
 - e. Unistrut, a brand of Atkore International Inc; : www.unistrut.com.
 - 2. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
 - 3. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - 4. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
 - 5. Mounting Height: match existing clearance under supported ductwork to top of roofing.
- L. Anchors and Fasteners:
 - 1. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc; : www.us.hilti.com/#sle.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc; : www.itwredhead.com/#sle.
 - c. Powers Fasteners, Inc; : www.powers.com/#sle.
 - d. Simpson Strong-Tie Company Inc; : www.strongtie.com/#sle.
 - 2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 3. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 - 4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 - 5. Hollow Masonry: Use toggle bolts.
 - 6. Hollow Stud Walls: Use toggle bolts.
 - 7. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 - 8. Sheet Metal: Use sheet metal screws.
 - 9. Wood: Use wood screws.
 - 10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
- H. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

3.3. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 23 0529

SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Nameplates.
- B. Tags.

1.2. REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

PART 2 PRODUCTS

2.1. IDENTIFICATION APPLICATIONS

- A. Piping: Pipe markers.
- B. Small-sized Equipment: Nameplates.

2.2. NAMEPLATES

- A. Manufacturers:
 - 1. Advanced Graphic Engraving, LLC; : www.advancedgraphicengraving.com.
 - 2. Brimar Industries, Inc; : www.pipemarker.com.
 - 3. Craftmark Pipe Markers; : www.craftmarkid.com.
 - 4. Kolbi Pipe Marker Co; : www.kolbipipemarkers.com.
 - 5. Seton Identification Products, a Tricor Direct Company; : www.seton.com.
- B. Letter Color: White.
- C. Letter Height: 1/4 inch.
- D. Background Color: Black.

2.3. PIPE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation; : www.bradycorp.com.
 - 2. Brimar Industries, Inc; : www.pipemarker.com.
 - 3. Craftmark Pipe Markers; : www.craftmarkid.com.
 - 4. Kolbi Pipe Marker Co; : www.kolbipipemarkers.com.
 - 5. MIFAB, Inc; : www.mifab.com.
 - 6. Seton Identification Products, a Tricor Company; : www.seton.com.
- B. Color: Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.1. PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2. INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

END OF SECTION 23 0553

SECTION 23 0593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic systems.

1.2. RELATED REQUIREMENTS

- A. Section 01 2100 - Allowances: Inspection and testing allowances.
- B. Section 01 9113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.
- C. Section 23 0800 - Commissioning of HVAC.

1.3. REFERENCE STANDARDS

- A. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.
- B. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to the Architect.
 - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
 - 3. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
 - 4. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - d. Final test report forms to be used.
 - e. Procedures for formal deficiency reports, including scope, frequency and distribution.
- C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in I-P (inch-pound) units only.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1. GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
 - 1. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 2. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Having minimum of three years documented experience.
 - 3. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2. EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Access doors are closed and duct end caps are in place.
 - 9. Air outlets are installed and connected.
 - 10. Duct system leakage is minimized.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C. Beginning of work means acceptance of existing conditions.

3.3. PREPARATION

- A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
 - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B. Provide additional balancing devices as required.

3.4. ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5. RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.6. AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- E. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

3.7. MINIMUM DATA TO BE REPORTED

- A. Heating Coils:
 - 1. Identification/number.
 - 2. Air flow, design and actual {new heating coils only}.
 - 3. Water flow, design and actual {all heating coils in scope of project}.
 - 4. Entering water temperature, design and actual {new heating coils only}.
 - 5. Leaving water temperature, design and actual {all heating coils in scope of project}.
 - 6. Leaving air temperature, design and actual {all heating coils in scope of project}.
- B. Air Distribution Tests:
 - 1. Room number/location.
 - 2. Terminal type.
 - 3. Terminal size.
 - 4. Design air flow.
 - 5. Test (final) air flow.

6. Percent of design air flow.

END OF SECTION 23 0593

SECTION 23 0713 - DUCT INSULATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Duct insulation.
- B. Insulation jackets.

1.2. RELATED REQUIREMENTS

- A. Section 23 0553 - Identification for HVAC Piping and Equipment.
- B. Section 23 3100 - HVAC Ducts and Casings: Glass fiber ducts.

1.3. REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- C. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.
- E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- H. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience and approved by manufacturer.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7. FIELD CONDITIONS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1. REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2. GLASS FIBER, FLEXIBLE

- A. Manufacturer:
 - 1. Johns Manville; : www.jm.com.
 - 2. JP Lamborn Co; Thermal Sleeve MT: www.jpflex.com.
 - 3. Knauf Insulation; Atmosphere Duct Wrap: www.knaufinsulation.com.
 - 4. Owens Corning Corporation; : www.ocbuildingspec.com.
 - 5. CertainTeed Corporation; : www.certainteed.com.
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
 - 1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 850 degrees F.
 - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure sensitive tape.
- D. Indoor Vapor Barrier Mastic:
 - 1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.3. GLASS FIBER, RIGID

- A. Manufacturer:
 - 1. Johns Manville; : www.jm.com.
 - 2. Knauf Insulation; : www.knaufinsulation.com.
 - 3. Owens Corning Corporation; 700 Series FIBERGLAS Insulation: www.ocbuildingspec.com.
 - 4. CertainTeed Corporation; : www.certainteed.com.
- B. Insulation: ASTM C612; rigid, noncombustible blanket.
 - 1. 'K' Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
 - 2. Maximum Service Temperature: 450 degrees F.
 - 3. Maximum Water Vapor Absorption: 5.0 percent.
 - 4. Maximum Density: 8.0 lb/cu ft.
- C. Vapor Barrier Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
 - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
 - 3. Secure with pressure sensitive tape.
- D. Vapor Barrier Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.4. JACKETS

- A. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M).
 - 1. Thickness: Between 0.020 inch and 0.032 inch thick sheet.

2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch laps.
4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
6. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

3.2. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Insulated ducts conveying air below ambient temperature:
 1. Provide insulation with vapor barrier jackets.
 2. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 3. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ducts conveying air above ambient temperature:
 1. Provide with or without standard vapor barrier jacket.
 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

3.3. SCHEDULES

- A. Outdoor Rectangular Supply and Return air ductwork shall be insulated as follows:
 1. R-12 value, installed. Rigid Glass Fiber Duct Insulation.
 2. Install with aluminum jacket. Paint white to match existing external ductwork.
- B. Indoor, Concealed Rectangular Supply and Return air ductwork shall be insulated as follows:
 1. 2" thick, 1 lb/cf density Flexible Glass Fiber Duct Insulation.
 2. 2" thick, 1 lb/cf density Rigid Glass Fiber Duct Insulation.
- C. Indoor, Concealed Round Supply and Return air ductwork shall be insulated as follows:
 1. 2" thick, 1lb/cf density Flexible Glass Fiber Duct Insulation.
- D. Rectangular Supply ducts After Terminal Boxes:
 1. 2" thick, 1 lb/cf density Flexible Glass Fiber Duct Insulation.
 2. 2" thick 1 lb/cf density Rigid Fiber Duct Insulation.
- E. Round Supply ducts after Terminal Boxes:
 1. 2" thick, 1 lb/cf density Flexible Glass Fiber Duct Insulation.

END OF SECTION 23 0713

SECTION 23 0719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.

1.3. REFERENCE STANDARDS

- A. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- C. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 PRODUCTS

2.1. REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2. FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturer:
 - 1. Aeroflex USA, Inc; Aerocel ULP: www.aeroflexusa.com.
 - 2. Armacell LLC; AP Armaflex: www.armacell.us.
 - 3. K-Flex USA LLC; K-Flex Titan: www.kflexusa.com.
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
 - 1. Minimum Service Temperature: Minus 40 degrees F.
 - 2. Maximum Service Temperature: 180 degrees F.
 - 3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.
 - 1. Manufacturers:
 - a. Aeroflex USA, Inc; Aero seal: www.aeroflexusa.com.
 - b. Armacell LLC; Armaflex 520 Adhesive.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that piping has been tested before applying insulation materials.

- B. Verify that surfaces are clean and dry, with foreign material removed.

3.2. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- F. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- G. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- H. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 8400.
- I. Installation of Flexible Elastomeric Insulation:
 - 1. 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.
 - 2. Insulation Installation on Pipe Fittings and Elbows:
 - a. Install mitered sections of pipe insulation.
 - b. 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.
 - 3. Insulation Installation on Valves and Pipe Specialties:
 - a. Install preformed valve covers manufactured of same material as pipe insulation when available.
 - b. 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.
 - c. Install insulation to flanges as specified for flange insulation application.
 - d. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings that allow passage of air to surface being insulated.

3.3. SCHEDULE

- A. Heating and Cooling Systems:
 - 1. Heating Water Supply and Return: 1.5" thick elastomeric insulation.

END OF SECTION 23 0719

SECTION 23 0913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Control Valves:
 - 1. Ball valves and actuators.
 - 2. Electronic operators.
- B. Dampers.
- C. Thermostats:
 - 1. Electric room thermostats.
 - 2. Room thermostat accessories.

1.2. RELATED REQUIREMENTS

- A. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.
- B. Section 26 2726 - Wiring Devices: Elevation of exposed components.

1.3. REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
- B. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2013.
- C. NEMA DC 3 - Residential Controls - Electrical Wall-Mounted Room Thermostats; 2013.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.

PART 2 PRODUCTS

2.1. EQUIPMENT - GENERAL

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.2. CONTROL VALVES

- A. Ball Valves and Actuators:
 - 1. Manufacturers:
 - a. Belimo Aircontrols (USA), Inc: www.belimo.com.
 - b. Johnson Controls International, PLC: www.johnsoncontrols.com.
 - c. Schneider Electric: www.schneider-electric.us.
 - 2. Flow Characteristic: Include 3-way diverting operation configured to fail normally closed (NC).
 - 3. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
 - 4. Body Size:
 - a. Service Temperature:
 - 1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.
 - 2) Ambient Side: From minus 40 to 131 degrees F.
 - 5. Actuator Requirements:
 - a. Assembly: Factory-mounted.

- b. Input: 24 VAC configured for proportional control.
 - c. Accessories: Provide with valve position indicator and manual override.
 - B. Electronic Operators:
 - 1. Manufacturers:
 - a. Schneider Electric: www.schneider-electric.us.
 - b. Belimo.
 - 2. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
- 2.3. DAMPERS
 - A. Performance: Test in accordance with AMCA 500-D.
 - B. Frames: Galvanized steel, welded or riveted with corner reinforcement, minimum 12 gage, 0.1046 inch.
 - C. Blades: Galvanized steel, maximum blade size 8 inches wide, 48 inches long, minimum 22 gage, 0.0299 inch, attached to minimum 1/2 inch shafts with set screws.
 - D. Blade Seals: Synthetic elastomeric, inflatable, mechanically attached, field replaceable.
 - E. Jamb Seals: Spring stainless steel.
 - F. Shaft Bearings: Oil impregnated sintered bronze.
 - G. Linkage Bearings: Oil impregnated sintered bronze.
 - H. Leakage: Less than one percent based on approach velocity of 2000 ft per min and 4 inches wg.
 - I. Maximum Pressure Differential: 6 inches wg.
 - J. Temperature Limits: Minus 40 to 200 degrees F.
- 2.4. DAMPER OPERATORS
 - A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
 - 1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
 - 2. Provide one operator for maximum 36 sq ft damper section.
- 2.5. THERMOSTATS
 - A. Electric Room Thermostats:
 - 1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.
 - 2. Service: Cooling and heating.
 - 3. Covers: Locking with setpoint indication, without thermometer.
 - B. Room Thermostat Accessories:
 - 1. Thermostat Guards: Locking transparent plastic mounted on separate base.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.

- D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F. Ensure installation of components is complementary to installation of similar components.
- G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.2. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 60 inches above floor. Align with lighting switches. Refer to Section 26 2726.
- C. Connect thermostat to existing building automation system.
- D. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of .

3.3. MAINTENANCE

- A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

END OF SECTION 23 0913

SECTION 23 0993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other sections.
- B. Sequence of operation for:
 - 1. Heating coils.

1.2. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.
- B. Sequence of Operation Documentation: Submit written sequence of operation for entire HVAC system and each piece of equipment.
 - 1. Preface: 1 or 2 paragraph overview narrative of the system describing its purpose, components and function.
 - 2. Include at least the following sequences:
 - a. Normal operating mode.
 - b. Sequences for all alarms and emergency shut downs.
 - c. Interactions and interlocks with other systems.
 - 3. Include initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1. HEATING COILS

- A. Single temperature thermostat set at 72 degrees F maintains constant space temperature by modulating three-way control heating valve with spring range of 3 to 7 psig.

END OF SECTION 23 0993

SECTION 23 3100 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Metal ductwork.

1.2. RELATED REQUIREMENTS

- A. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
- B. Section 23 0713 - Duct Insulation: External insulation and duct liner.
- C. Section 23 3300 - Air Duct Accessories.
- D. Section 23 3700 - Air Outlets and Inlets.

1.3. REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018b.
- D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for duct materials.

1.5. FIELD CONDITIONS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

PART 2 PRODUCTS

2.1. DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply and Return : 2 inch w.g. pressure class, galvanized steel.
- D. General Exhaust: 1 inch w.g. pressure class, galvanized steel.

2.2. MATERIALS

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - 1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - 2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
 - 3. For Use With Flexible Ducts: UL labeled.
 - 4. Manufacturers:
 - a. Carlisle HVAC Products; Hardcast Iron-Grip 601 Water Based Duct Sealant: www.carlislehvac.com.

- b. Ductmate Industries, Inc, a DMI Company; : www.ductmate.com.
- C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.3. DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.4. MANUFACTURED DUCTWORK AND FITTINGS

- A. Round Ducts: Round lockseam duct with galvanized steel outer wall.
 - 1. Manufacture in accordance with SMACNA (DCS).
 - 2. Manufacturers:
 - a. EHG, a DMI Company; : www.ehgduct.com.
 - b. Linx Industries, Inc, a DMI Company; : www.li-hvac.com.
 - c. MKT Metal Manufacturing; : www.mktduct.com.
- B. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
 - 1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
 - 2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 - 3. Maximum Velocity: 4000 fpm.
 - 4. Temperature Range: Minus 10 degrees F to 160 degrees F.
 - 5. Manufacturers:
 - a. Hart & Cooley, Inc: www.hartandcooley.com.
 - b. JP Lamborn Co; Black Jacket PR: www.jpflex.com.
- C. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
 - 1. Manufacturers:
 - a. Carlisle HVAC Products; Nexus Flange Connectors with Sealant Pocket: www.carlislehvac.com.
 - b. Ductmate Industries, Inc, a DMI Company; : www.ductmate.com.
 - c. Elgen Manufacturing; : www.elgenmfg.com.
 - d. MKT Metal Manufacturing; : www.mktduct.com.
- D. Round Duct Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).
 - 1. Manufacturers:
 - a. Ductmate Industries, Inc, a DMI Company; : www.ductmate.com.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install in accordance with manufacturer's instructions.

- C. Flexible Ducts: Connect to metal ducts with adhesive.
- D. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

END OF SECTION 23 3100

SECTION 23 3300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Volume control dampers.

1.2. RELATED REQUIREMENTS

- A. Section 23 3100 - HVAC Ducts and Casings.

1.3. REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1. AIR TURNING DEVICES/EXTRACTORS

- A. Manufacturers:
 - 1. Carlisle HVAC Products; Dynair Hollow Vane and Rail (Double Wall Vane): www.carlislehvac.com.
 - 2. Ruskin Company; : www.ruskin.com.
 - 3. Titus HVAC, a brand of Johnson Controls; : www.titus-hvac.com.
- B. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2. VOLUME CONTROL DAMPERS

- A. Manufacturers:
 - 1. AireTechnologies, Inc, a DMI Company; : www.airetechnologies.com.
 - 2. NCA, a brand of Metal Industries Inc; : www.ncamfg.com.
 - 3. Ruskin Company; : www.ruskin.com.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 for duct construction and pressure class.
- B. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

END OF SECTION 23 3300

SECTION 23 3700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Diffusers.
- B. Slot ceiling diffusers.
- C. Registers/grilles.
 - 1. Ceiling-mounted, exhaust and return register/grilles.

1.2. REFERENCE STANDARDS

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2012.
- B. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (Reaffirmed 2011).

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittal procedures.

1.4. QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.
- C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Price Industries; : www.price-hvac.com.
- B. Ruskin Company; _____: www.ruskin.com.
- C. Titus, a brand of Air Distribution Technologies; : www.titus-hvac.com.

2.2. SCHEDULE OF DIFFUSERS, REGISTERS, AND GRILLES

- A. Refer to AIR DEVICE SCHEDULE on drawings for description of diffusers, registers, grilles and associated accessories.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

END OF SECTION 23 3700

SECTION 23 8216 - AIR COILS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Water heating coils.

1.2. REFERENCE STANDARDS

- A. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Aerofin Corporation: www.aerofin.com.
- B. Trane, a brand of Ingersoll Rand: www.trane.com.
- C. Greenheck.

2.2. WATER HEATING COILS

- A. Fins: Aluminum or copper continuous plate type with full fin collars.
- B. Casing: Die formed channel frame of 16 gage, 0.0598 inch galvanized steel with mounting holes on 6 inch centers. Provide tube supports for coils longer than 36 inches.
- C. Headers: Seamless copper tube with silver brazed joints.
- D. Testing: Air test under water to 350 psi for working pressure of 200 psi and 220 degrees F.
- E. Configuration: Drainable, with threaded plugs in headers for drain and vent.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with manufacturer's written instructions.
- B. Install in ducts and casings in accordance with SMACNA (DCS).
 - 1. Support coil sections independent of piping on steel channel or double angle frames and secure to casings.
- C. Protect coils to prevent damage to fins and flanges. Comb out bent fins.
- D. Install coils level.
- E. Hydronic Coils:
 - 1. Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
 - 2. Ensure water coils are drainable and provide drain connection at low points.

END OF SECTION 23 8216

SECTION 26 0010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. This Section supplements Division 1, General Requirements.
- B. Where contradictions occur between this Section and Division 1, the more stringent of the two shall apply. Architect and Engineer shall decide which is most stringent.
- C. Provisions of this section shall also apply to all sections of Division 26 and Division 28.
- D. The specifications are complementary to the drawings and their requirements shall have the same priority as the drawings

1.2. COORDINATION WITH OTHER TRADES

A. Contract Documents:

- 1. General: The Contract Documents are diagrammatic, showing certain physical relationships which must be established within the electrical work and its interface with other work. Such establishment is the exclusive responsibility of the Contractor. Drawings shall not be scaled for the purpose of establishing material quantities.
- 2. Work out all conditions in advance of installation. If necessary, and before work proceeds in those areas, prepare coordination drawings showing all work in congested areas. Provide additional work necessary to overcome congested conditions at no increase in contract sum.
- 3. Coordinate the electrical work to the progress of the work of other trades.
- 4. Complete the entire installation as soon as the condition of the building will permit.
- 5. Coordinate ceiling cavity space carefully with all trades. In the event of conflict, install electrical and electric systems within the cavity space allocation in the following order:
 - a. Lighting.
 - b. Steam and condensate piping.
 - c. Plumbing piping.
 - d. Mechanical ductwork.
 - e. Fire sprinkler piping.
 - f. Air diffusers.
 - g. Domestic water piping.
 - h. Hydronic piping.
 - i. Pneumatic control piping.

B. Discrepancies:

- 1. Examine Drawings and Specifications.
- 2. Report any discrepancies to the Architect and obtain written instructions before proceeding.
- 3. Should there be a conflict within or between the Specifications or Drawings, the more stringent or higher quality requirements shall apply. The determination of the more stringent or higher quality shall lie with the Architect.
- 4. Items called for in either specifications or drawings shall be required as if called for in both.
- 5. Be responsible for providing proper documentation of equipment product data and shop drawings to all entities providing service.

1.3. COORDINATION WITH EXISTING OCCUPIED AREAS

- A. Minimize disruptions to operation of electrical systems in occupied areas.

- B. Coordinate any required disruptions with the Owner, one week in advance.
- C. Provide temporary connections to prevent long disruptions.

1.4. DELEGATED DESIGN BY CONTRACTOR

- A. The construction of this building requires the Contractor to design several systems or subsystems. All such designs shall be the complete responsibility of the Contractor.
- B. Systems or subsystems which require engineering responsibility by the Contractor include, but are not limited to:
 - 1. Any system not fully detailed.
 - 2. Equipment supports, not fully detailed.
 - 3. Conduit hangers and anchors not specified in these documents, or catalogued by the manufacturer.
 - 4. Fire Alarm Systems, and conduit systems.

1.5. REGULATORY REQUIREMENTS

- A. Codes: Comply with the codes adopted by authority having jurisdiction (which shall include but not be limited to):
 - 1. Applicable editions of NFPA.
 - 2. Requirements of Fire Departments serving the project.
 - 3. Regulations of the Health Department having jurisdiction.
 - 4. Regulations of the Office of State Fire Marshal or its equivalent.
 - 5. Americans with Disabilities Act (ADA).
- B. Contradictions: Where Codes are contradictory, follow the most stringent, unless otherwise indicated in Plans or Specifications. Architect shall determine which is most stringent.
- C. Codes are a minimum requirement approved by the AHJ, in many cases the Project Documents will exceed the minimum requirements of the codes, Project Documents must be followed.
- D. Inspections and Tests:
 - 1. Inspections and tests required shall be completed by a third party NETA Testing Agency/Contractor. Contractor shall arrange for all required inspections and testing.
 - 2. Contractor shall pay all inspections and testing charges.
 - 3. Notify Architect two (2) business days before tests.
 - 4. Inspections reports and Test Reports shall be provided to the Architect for review and shall be included in the final Record Documents.

1.6. INSTALLATION GENERAL REQUIREMENTS

- A. Furnish, apply, install, connect, erect, clean, and condition manufactured materials and equipment as recommended in manufacturer's printed directions (maintained on job site during installation).
- B. Provide all attachment devices and materials necessary to secure materials together or to other materials.
- C. Make allowance for ample and normal expansion and contraction for all building components and piping systems that are subject to such.
- D. Install materials only when conditions of temperature, moisture, humidity, and conditions of adjacent building components are conducive to achieving the best installation results.
- E. Erect, install, and secure components in a structurally sound and appropriate manner.

- F. Where necessary, temporarily brace, shore, or otherwise support members until final connections are installed.
- G. Leave all temporary bracing, shoring, or other structural supports in place as long as practical for safety and to maintain proper alignment.
- H. Handle materials in a manner to prevent scratching, abrading, distortion, chipping, breaking, or other disfigurement.
- I. Conduct work in a manner to avoid injury or damage to previously placed work. Any work so impaired or damaged shall be replaced at no expense to Owner.
- J. Fabricate and install materials true to line, plumb, and level.
- K. Leave finished surfaces smooth and flat, free from wrinkles, warps, scratches, dents, and other imperfections.
- L. Furnish materials in longest practical lengths and largest practical sizes to avoid all unnecessary jointing.
- M. Make all joints secure, tightly fitted, and as inconspicuous as possible by the best accepted practice in joining and fabricating.
- N. Contact Architect for mounting height or position of any unit not specifically indicated or located on Drawings or specified in Specifications.
- O. Job mixed multi-component materials used in the work shall be mixed in such regulated and properly sized batches that material can be used before it begins to "set."
- P. Mixing of a partially "set" batch with another batch of fresh materials will not be accepted and entire batch shall be discarded and removed from site.
- Q. Clean all mixing tools and appliances that can be contaminated prior to mixing of fresh materials.
- R. In addition to the above, refer to each Section of the Specifications for additional installation requirements for the proper completion of all work.

PART 2 - PRODUCTS

2.1. GENERAL

- A. Certain products are specified without equals. Substitutions for these will not be considered.
- B. Follow substitution instructions in Front End Documents for any manufacturer not listed in the Project Manual or the drawings that the contractor may want considered for substitution. .
- C. Coordination of general equivalents and substitutions: Where Contract Documents permit selection from several general equivalents, or where substitutions are authorized, coordinate clearance and other interface requirements with electrical and other work.
 - 1. Provide necessary additional items so that selected or substituted item operates equivalent to the basis of design and properly fits in the available space allocated for the basis of design.
 - 2. Provide all features which are standard and specified on the basis of design.
 - 3. Contractor is responsible for assuring that piping, conduit, duct, flue, and other service locations for general equivalents or substitutions do not cause access, service, or operational difficulties any greater than would be encountered with the basis of design. Acceptance by the Architect does not imply acceptance of any deviations from contract documents requirements.
 - 4. Confirm if modifications to electrical, structural or architectural requirements for substituted or general equivalents are needed such as: wire size, conduit size, MCA, MOCP, weight, support, etc. Coordinate with General and Electrical Contractors prior to bid.

PART 3 – EXECUTION

3.1. COORDINATION OF ELECTRICAL INSTALLATION.

A. Inspection and Preparation:

1. Examine the work interfacing with electrical work, and the conditions under which the work will be performed, and notify the Architect of conditions detrimental to the proper completion of the work.
2. Do not proceed with the work until unsatisfactory conditions have been corrected. Lack of notifying Architect of conditions is in no way cause for change order request.

B. Layout:

1. Layout the electrical work in conformity with the Contract Drawings, Coordination Drawings and other Shop Drawings, product data and similar requirements so that the entire electrical plant will perform as an integrated system, properly interfaced with other work, recognizing that portions of the work are shown only in diagrammatic form.
2. Where coordination requirements conflict with individual system requirements, comply with the Architect's decision on resolution of the conflict.
3. Take necessary field measurements to determine space and connection requirements.
4. Provide sizes and shapes of equipment so the final installation conforms to the intent of the Contract Documents.

C. Integrate electrical work in ceiling spaces with suspension system, light fixtures and other work so that required performances of each will be achieved.

3.2. PRODUCT INSTALLATION

A. Manufacturer's Instructions:

1. Except where more stringent requirements are indicated, comply with the product manufacturer's instructions and recommendations.
2. Consult with manufacturer's technical representatives, who are recognized as technical experts, for specific instructions on special project conditions.
3. If a conflict exists, notify the Architect / Engineer in writing and obtain his instruction before proceeding with the work in question.

B. Movement of Equipment:

1. Wherever possible, arrange for the movement and positioning of equipment so that enclosing partitions, walls and roofs will not be delayed or need to be removed.
2. Otherwise, advise Contractor of opening requirements to be maintained for the subsequent entry of equipment.

C. Heavy Equipment:

1. Coordinate the movement of heavy items with shoring and bracing so that the building structure will not be overloaded during the movement and installation.
2. Where electrical products to be installed on an existing roof are too heavy to be hand-carried, do not transport across the existing roof deck; position by crane or other device so as to avoid overloading the roof deck.

D. Return Air Path: Coordinate electrical work in return air plenum to avoid obstructing return air path.

1. Do not make changes in layout which will reduce return air path cross-sectional areas.
2. Report any obstructions by work of other Divisions to Architect.

E. Support:

1. Anchor and secure all equipment to the building substrate and structure.
- F. Clearances:
 1. Install conduit and cables:
 - a. Straight and true.
 - b. Aligned with other work and with general lines of the building.
 - c. Concealed, where possible, in occupied spaces.
 - d. Out-of-the-way with maximum passageway and headroom remaining in each space.
 2. Except as otherwise indicated, arrange electrical services and overhead equipment with a minimum of:
 - a. 7'6" headroom in storage spaces. Do not obstruct windows, doors or other openings.
 3. Give the right-of-way to piping systems required to slope for drainage (over other service lines and ductwork).
- 3.3. PROTECTION OF WORK
 - A. All conduit ends, panelboards, motor controls, disconnecting means, and equipment left unconnected shall be capped, plugged or otherwise properly protected to prevent damage or the intrusion of foreign matter.
 - B. Any equipment or conduit system found to have been damaged or contaminated shall be replaced or cleaned to the Engineer's satisfaction.
- 3.4. ADJUSTING
 - A. Adjust all equipment and system components as shown or as otherwise required to result in intended system operation.
 - B. At completion of work, provide written certification that all systems are functioning properly without defects.
- 3.5. START-UP
 - A. Assign a Start-Up Coordinator to this project.
 - B. The Start-Up Coordinator shall develop detailed start-up procedures, equipment checkout procedure and data forms for recording compliance with contract document performance criteria, and will assist in developing schedules for checkout and Owner acceptance.
 - C. The Start-Up Coordinator shall be responsible for maintaining documentation of Start-Up activities until final acceptance of the project.
 - D. The documentation shall be kept current by the Start-Up Coordinator and shall be available for inspection at all times. At the time of acceptance of the project, the Start-Up Coordinator shall surrender 3 completed copies of the documentation to the Owner's representative.
 1. Coordinate with the mechanical installation the requirements for the startup of mechanical and plumbing systems:
 - a. All equipment, components, and systems have been set, started-up, and adjusted including checking the following: proper equipment electrical rotation, control connections, factory trained technician startup, etc.
 - b. All electric power connections, disconnects, fuses, circuit breakers, etc. are properly sized and installed.
- 3.6. TRAINING
 - A. Refer to Division 1 sections of the specifications regarding requirements of Record Drawings, Operation and Maintenance Manual submittal and systems training.

1. Demonstrate that each system operates properly.
 2. Explain the operation of each system to the Owner's Representative.
 3. Explain use of O&M manual in operating and maintaining systems.
 4. Date, time, and duration of training will be determined by Owner.
 5. Training agendas and schedules shall be developed and approved by Owner, Commissioning Authority, Engineer, and Architect prior to training.
 6. Document and turn over to owner the training sessions on DVD and placed in O&M Manuals. At the end of all sessions, compile all sessions on a single DVD and turn over to owner as part of the O & M manuals.
- B. For specific systems requiring extended instruction, refer to individual Division 26 sections.

END OF SECTION

SECTION 26 0505 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Electrical demolition.

1.2. RELATED REQUIREMENTS

- A. Section 01 7000 - Execution and Closeout Requirements: Additional requirements for alterations work.

1.3. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Sustainable Design Documentation: Submit certification of removal and appropriate disposal of abandoned cables containing lead stabilizers.

PART 2 PRODUCTS

2.1. MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation and existing record documents.
- D. Report discrepancies to Architect before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

3.2. PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

3.3. DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
 - 1. PCB- and DEHP-containing lighting ballasts.
 - 2. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4. CLEANING AND REPAIR

- A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- D. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Heat shrink tubing.
- E. Oxide inhibiting compound.
- F. Wire pulling lubricant.
- G. Cable ties.

1.2. RELATED REQUIREMENTS

- A. Section 26 0505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 28 4600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.3. REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013.
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2010.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- H. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.
- I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

Q. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.6. QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.8. FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.1. CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Underground feeder and branch-circuit cable is not permitted.
- E. Service entrance cable is not permitted.
- F. Armored cable is not permitted.
- G. Metal-clad cable is not permitted.

2.2. CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.
- H. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.
- I. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- J. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- K. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
 - 2) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
 - 2. Control Circuits: 14 AWG.
- L. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- M. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 - 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.
 - c. Travelers for 3-Way and 4-Way Switching: Pink.

- d. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
- e. For control circuits, comply with manufacturer's recommended color code.

2.3. SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
 - 1. Copper Building Wire:
 - a. Cerro Wire LLC: www.cerrowire.com.
 - b. Encore Wire Corporation: www.encorewire.com.
 - c. Southwire Company: www.southwire.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Installed Underground: Type XHHW-2.

2.4. WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 - 3. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors where connectors are required.
 - 4. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
- F. Mechanical Connectors: Provide bolted type or set-screw type.
- G. Compression Connectors: Provide circumferential type or hex type crimp configuration.

- H. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.5. ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
 - 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
 - 3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
 - 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
 - 5. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2. PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3. INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
 - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
9. Provide oversized neutral/grounded conductors where indicated and as specified below.
 - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
 - b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Installation in Raceway:
 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 2. Pull all conductors and cables together into raceway at same time.
 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- G. Install conductors with a minimum of 12 inches of slack at each outlet.
- H. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- K. Make wiring connections using specified wiring connectors.
 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 3. Do not remove conductor strands to facilitate insertion into connector.
 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

- L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
 - 3. Wet Locations: Use heat shrink tubing.
 - M. Insulate ends of spare conductors using vinyl insulating electrical tape.
 - N. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
 - O. Identify conductors and cables in accordance with Section 26 0553.
 - P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
 - Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
- 3.4. FIELD QUALITY CONTROL
- A. See Section 01 4000 - Quality Requirements, for additional requirements.
 - B. Inspect and test in accordance with NETA ATS, except Section 4.
 - C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
 - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
 - D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.

1.2. RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
 - 1. Includes oxide inhibiting compound.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 5600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.3. REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Field quality control test reports.
- E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6. QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1. GROUNDING AND BONDING REQUIREMENTS

- A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- D. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 - 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 - 7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
 - 8. Provide bonding for interior metal air ducts.
- E. Pole-Mounted Luminaires: Also comply with Section 26 5600.

2.2. GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
 - 1. Use insulated copper conductors unless otherwise indicated.
- C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use mechanical connectors for accessible connections.
3. Manufacturers - Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Burndy LLC: www.burndy.com.
 - c. Harger Lightning & Grounding: www.harger.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
4. Manufacturers - Exothermic Welded Connections:
 - a. Burndy LLC: www.burndy.com.
 - b. Cadweld, a brand of Erico International Corporation: www.erico.com.
 - c. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 26 0553.

3.3. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2. RELATED REQUIREMENTS

- A. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- B. Section 26 0533.16 - BOXES: Additional support and attachment requirements for boxes.
- C. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

1.3. REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

- D. Installer's Qualification Statement: Include evidence of compliance with specified requirements.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6. QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- E. Installer Qualifications for Field-Welding: As specified in Section 05 5000.
- F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1. SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Materials for Metal Fabricated Supports: Comply with Section 05 5000.
- C. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
 - 2. Conduit Clamps: Bolted type unless otherwise indicated.
 - 3. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.

- b. Erico International Corporation: www.erico.com.
 - c. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
 - 1. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Erico International Corporation: www.erico.com.
 - c. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - d. Thomas & Betts Corporation: www.tnb.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 - 1. Comply with MFMA-4.
 - 2. Channel Material:
 - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 - 3. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
 - 4. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
 - 5. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Thomas & Betts Corporation: www.tnb.com.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 - e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 - 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
 - c. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
 - d. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
 - e. Outlet Boxes: 1/4 inch diameter.
 - f. Luminaires: 1/4 inch diameter.
- G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
 - 1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 - 2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
 4. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Erico International Corporation: www.erico.com.
 - c. PHP Systems/Design: www.phpsd.com.
 - d. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- H. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 4. Hollow Masonry: Use toggle bolts.
 5. Hollow Stud Walls: Use toggle bolts.
 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 7. Sheet Metal: Use sheet metal screws.
 8. Wood: Use wood screws.
 9. Plastic and lead anchors are not permitted.
 10. Powder-actuated fasteners are permitted only as follows:
 - a. Where approved by Architect.
 - b. Use only threaded studs; do not use pins.
 11. Hammer-driven anchors and fasteners are permitted only as follows:
 - a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction (when specified).
 - b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction (when specified).
 12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
 13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.
 14. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc: www.us.hilti.com.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com.
 - c. Powers Fasteners, Inc: www.powers.com.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com.

- e. Substitutions: See Section 01 6000 - Product Requirements.
- 15. Manufacturers - Powder-Actuated Fastening Systems:
 - a. Hilti, Inc: www.us.hilti.com.
 - b. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com.
 - c. Powers Fasteners, Inc: www.powers.com.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com.
 - e. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Field-Welding (where approved by Architect): Comply with Section 05 5000.
- I. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.
 - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- J. Conduit Support and Attachment: Also comply with Section 26 0533.13.
- K. Cable Tray Support and Attachment: Also comply with Section 26 0536.
- L. Box Support and Attachment: Also comply with Section 26 0533.16.
- M. Busway Support and Attachment: Also comply with Section 26 2513.
- N. Interior Luminaire Support and Attachment: Also comply with Section 26 5100.

- O. Secure fasteners according to manufacturer's recommended torque settings.
- P. Remove temporary supports.
- Q. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.3. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26 0533.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. Flexible metal conduit (FMC).
- D. Electrical metallic tubing (EMT).
- E. Conduit fittings.
- F. Accessories.

1.2. RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.
- D. Section 26 0533.16 - BOXES.
- E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3. REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
- I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
- J. NEMA TC 13 - Electrical Nonmetallic Tubing (ENT); 2014.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- N. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- R. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- S. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- T. UL 1653 - Electrical Nonmetallic Tubing; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5. SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Shop Drawings:

1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
2. Include proposed locations of roof penetrations and proposed methods for sealing.

D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.6. QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1. CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

- C. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- D. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- E. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- F. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- G. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
- H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
 - 1. Locations subject to physical damage include, but are not limited to:
 - a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
 - b. Where exposed below 20 feet in warehouse areas.
- I. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- J. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
 - 1. Maximum Length: 6 feet.
- K. Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit.
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - 3. Maximum Length: 6 feet unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:
 - a. Motors.

2.2. CONDUIT REQUIREMENTS

- A. Fittings for Grounding and Bonding: Also comply with Section 26 0526.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
 - 3. Control Circuits: 3/4 inch (21 mm) trade size.
 - 4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3. GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 - 1. Allied Tube & Conduit: www.alliedeg.com.
 - 2. Republic Conduit: www.republic-conduit.com.
 - 3. Wheatland Tube Company: www.wheatland.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

- C. Fittings:

- 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
- 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
- 4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4. INTERMEDIATE METAL CONDUIT (IMC)

- A. Manufacturers:

- 1. Allied Tube & Conduit: www.alliedeg.com.
- 2. Republic Conduit: www.republic-conduit.com.
- 3. Wheatland Tube Company: www.wheatland.com.
- 4. Substitutions: See Section 01 6000 - Product Requirements.

- B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

- C. Fittings:

- 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
- 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
- 4. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
- 5. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.5. FLEXIBLE METAL CONDUIT (FMC)

- A. Manufacturers:

- 1. AFC Cable Systems, Inc: www.afcweb.com.
- 2. Electri-Flex Company: www.electriflex.com.
- 3. International Metal Hose: www.metalhose.com.

4. Substitutions: See Section 01 6000 - Product Requirements.
 - B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
 - C. Fittings:
 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
- 2.6. LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)
- A. Manufacturers:
 1. AFC Cable Systems, Inc: www.afcweb.com.
 2. Electri-Flex Company: www.electriflex.com.
 3. International Metal Hose: www.metalhose.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
 - B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
 - C. Fittings:
 1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
- 2.7. ELECTRICAL METALLIC TUBING (EMT)
- A. Manufacturers:
 1. Allied Tube & Conduit: www.alliedeg.com.
 2. Republic Conduit: www.republic-conduit.com.
 3. Wheatland Tube Company: www.wheatland.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
 - B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
 - C. Fittings:

1. Manufacturers:
 - a. Bridgeport Fittings Inc: www.bptfittings.com.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - c. Thomas & Betts Corporation: www.tnb.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel or malleable iron.
 - a. Do not use die cast zinc fittings.
 4. Connectors and Couplings: Use set-screw type.
 - a. Do not use indenter type connectors and couplings.
 5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
- 2.8. ACCESSORIES
- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
 - B. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
 - C. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
 - D. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Conduit Routing:
 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 2. When conduit destination is indicated without specific routing, determine exact routing required.
 3. Conceal all conduits unless specifically indicated to be exposed.
 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.

- d. Across building exterior surfaces.
 - 6. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 7. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 8. Arrange conduit to provide no more than 150 feet between pull points.
 - 9. Route conduits above water and drain piping where possible.
 - 10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 11. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
 - 12. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
 - 13. Group parallel conduits in the same area together on a common rack.
- F. Conduit Support:
- 1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 - 4. Use conduit strap to support single surface-mounted conduit.
 - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 - 5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 - 6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 - 7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 - 8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
 - 9. Use of spring steel conduit clips for support of conduits is not permitted.
 - 10. Use of wire for support of conduits is not permitted.
 - 11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- G. Connections and Terminations:
- 1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 - 3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
 7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
 8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
- H. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
 7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
 9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
 10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- I. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 3. Where conduits are subject to earth movement by settlement or frost.
- J. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- K. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- L. Provide grounding and bonding in accordance with Section 26 0526.
- M. Identify conduits in accordance with Section 26 0553.

3.3. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

3.4. CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.5. PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

SECTION 26 0533.16 - BOXES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

1.2. RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0533.13 - Conduit for Electrical Systems:
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 2726 - Wiring Devices:
- F. Section 26 2813 - Fuses: Spare fuse cabinets.

1.3. REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
 - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
 - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
 - 6. Coordinate the work with other trades to preserve insulation integrity.

7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures and floor boxes.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, and floor boxes.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 6000 - Product Requirements, for additional provisions.
 2. Keys for Lockable Enclosures: Two of each different key.

1.6. QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1. BOXES

- A. General Requirements:
 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
 4. Use shallow boxes where required by the type of wall construction.

5. Do not use "through-wall" boxes designed for access from both sides of wall.
 6. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 7. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 8. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 9. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
 - b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
 10. Wall Plates: Comply with Section 26 2726.
 11. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com.
 - c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com.
 - d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com.
 - e. Thomas & Betts Corporation: www.tnb.com.
 - f. Substitutions: See Section 01 6000 - Product Requirements.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - b. Outdoor Locations: Type 3R, painted steel.
 3. Junction and Pull Boxes Larger Than 100 cubic inches:
 - a. Provide hinged-cover enclosures unless otherwise indicated.
 - b. Boxes 6 square feet and Larger: Provide hinged-cover enclosures.
 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
 - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
 - b. Back Panels: Painted steel, removable.
 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
 6. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com.
 - b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com.
 - c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
 - 2. Unless dimensioned, box locations indicated are approximate.
 - 3. Locate boxes as required for devices installed under other sections or by others.
 - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
 - 4. Locate boxes so that wall plates do not span different building finishes.
 - 5. Locate boxes so that wall plates do not cross masonry joints.
 - 6. Install flush-mounted boxes on opposite sides of walls in different stud spaces, boxes shall not be installed back to back.
 - 7. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 8. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Install in sperate stud cavities, if not possible, provide minimum 6 inches horizontal separation unless otherwise indicated.
 - 9. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
 - 10. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
 - 11. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.
 - 12. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.

- c. Electrical rooms.
 - d. Mechanical equipment rooms.
 - I. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 - 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
 - J. Install boxes plumb and level.
 - K. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
 - L. Install boxes as required to preserve insulation integrity.
 - M. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
 - N. Close unused box openings.
 - O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
 - P. Provide grounding and bonding in accordance with Section 26 0526.
 - Q. Identify boxes in accordance with Section 26 0553.
- 3.3. CLEANING
- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.
- 3.4. PROTECTION
- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Floor marking tape.
- F. Warning signs and labels.

1.2. RELATED REQUIREMENTS

- A. Section 09 9113 - Exterior Painting.
- B. Section 09 9123 - Interior Painting.
- C. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- D. Section 26 0536 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.
- E. Section 26 0573 - Power System Studies: Arc flash hazard warning labels.
- F. Section 26 2300 - Low-Voltage Switchgear: Factory-installed mimic bus.
- G. Section 26 2726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.3. REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2015.
- E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.6. QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

1.7. FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1. IDENTIFICATION REQUIREMENTS

- A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Switchgear:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location.
 - 4) Use identification nameplate to identify main and tie devices.
 - 5) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
 - b. Switchboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location.
 - 4) Use identification nameplate to identify main overcurrent protective device.
 - 5) Use identification nameplate to identify load(s) served for each branch device. Identify spares and spaces.
 - c. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location.
 - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
 - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - d. Transformers:
 - 1) Identify kVA rating.
 - 2) Identify voltage and phase for primary and secondary.
 - 3) Identify power source and circuit number. Include location.
 - 4) Identify load(s) served. Include location when not within sight of equipment.

- e. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location.
 - 3) Identify load(s) served. Include location.
- f. Time Switches:
 - 1) Identify load(s) served and associated circuits controlled. Include location.
- g. Enclosed Contactors:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
 - 4) Identify coil voltage.
 - 5) Identify load(s) and associated circuits controlled. Include location.
- 2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
- 3. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
- 4. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
- 5. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
- 6. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
- 7. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
- 8. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
 - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Section 09 9123 and 09 9113.
- 9. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70, including but not limited to the following.
 - a. Service equipment.
 - b. Industrial control panels.
 - c. Motor control centers.
 - d. Elevator control panels.
 - e. Industrial machinery.
- 10. Arc Flash Hazard Warning Labels: Comply with Section 26 0573.
- 11. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.

C. Identification for Raceways:

1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
 - 1) Color Code:
 - (a) Emergency Power System: Red.
 - (b) Fire Alarm System: Red.
 - 2) Field-Painting: Comply with Section 09 9123 and 09 9113.
 - 3) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.

D. Identification for Cable Tray: Comply with Section 26 0536.

E. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color coded boxes to identify systems other than normal power system.
 - a. Color-Coded Boxes: Field-painted in accordance with Section 09 9123 and 09 9113 per the same color code used for raceways.
3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
 - a. For exposed boxes in public areas, use only identification labels.
4. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

F. Identification for Devices:

1. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
2. Use identification label to identify fire alarm system devices.
3. Use engraved wallplate to identify serving branch circuit for all receptacles.

4. Use engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.

2.2. IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
 - a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:
 - a. Brady Corporation: www.bradyid.com.
 - b. Brother International Corporation: www.brother-usa.com.
 - c. Panduit Corp: www.panduit.com.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - a. Use only for indoor locations.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
 - a. System designation where applicable:
 - 1) Emergency Power System: Identify with text "EMERGENCY".
 - 2) Fire Alarm System: Identify with text "FIRE ALARM".
 - b. Equipment designation or other approved description.
 - c. Other information as indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
 - a. System Designation: 1 inch.
 - b. Equipment Designation: 1/2 inch.

- c. Other Information: 1/4 inch.
 - d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
- 5. Color:
 - a. Normal Power System: White text on black background.
 - b. Emergency Power System: White text on red background.
- D. Format for General Information and Operating Instructions:
 - 1. Minimum Size: 1 inch by 2.5 inches.
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/4 inch.
 - 5. Color: Black text on white background unless otherwise indicated.
- E. Format for Caution and Warning Messages:
 - 1. Minimum Size: 2 inches by 4 inches.
 - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 1/2 inch.
 - 5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
 - 1. Minimum Size: 3/8 inch by 1.5 inches.
 - 2. Legend: Power source and circuit number or other designation indicated.
 - a. Include voltage and phase for other than 120 V, single phase circuits.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch.
 - 5. Color: Black text on clear background.
- G. Format for Control Device Identification:
 - 1. Minimum Size: 3/8 inch by 1.5 inches.
 - 2. Legend: Load controlled or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch.
 - 5. Color: Black text on clear background.
- H. Format for Fire Alarm Device Identification:
 - 1. Minimum Size: 3/8 inch by 1.5 inches.
 - 2. Legend: Designation indicated and device zone or address.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch.
 - 5. Color: Red text on white background.

2.3. WIRE AND CABLE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. HellermannTyton: www.hellermannntyton.com.
 - 3. Panduit Corp: www.panduit.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
 - 1. Do not use handwritten text.
- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.

2.4. VOLTAGE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. Brimar Industries, Inc: www.brimar.com.
 - 3. Seton Identification Products: www.seton.com.
 - 4. Substitutions: See Section 01 6000 - Product Requirements.
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
 - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
 - 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- E. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
 - a. Emergency Power System: Text "EMERGENCY".
 - b. Other Systems: Type of service.
- F. Color: Black text on orange background unless otherwise indicated.

2.5. FLOOR MARKING TAPE

- A. Manufacturers:
 - 1. Brady Corporation: www.bradyid.com.
 - 2. Brimar Industries, Inc: www.brimar.com/#sle.

3. Seton Identification Products: www.seton.com.
 4. Substitutions: See Section 01 6000 - Product Requirements.
 - B. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches wide, with alternating black and white stripes.
- 2.6. WARNING SIGNS AND LABELS
- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
 - B. Warning Signs:
 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 3. Minimum Size: 7 by 10 inches unless otherwise indicated.
 - C. Warning Labels:
 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - a. Do not use labels designed to be completed using handwritten text.
 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1. PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2. INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing.

- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Secure rigid signs using stainless steel screws.
- G. Mark all handwritten text, where permitted, to be neat and legible.

3.3. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 26 0800 - ELECTRICAL COMMISSIONING REQUIREMENTS

PI GENERAL

1.1. RELATED SECTIONS

- A. General Commissioning Requirements Related Sections
- B. Division 01

1.2. SECTION INCLUDES

- A. Contractor's Cx Submittal Requirements
- B. Included Systems
- C. Schedule Requirements
- D. Commissioning Team
- E. Commissioning Meetings
- F. Commissioning Plan
- G. Notifications
- H. Field Observation and Issues Log
- I. O&M Manuals
- J. Functional Performance Testing

1.3. SUMMARY

- 1.4. This section contains the commissioning requirements that are in addition to section 01 9100, General Commissioning Requirements.

1.5. DOCUMENTATION

- A. The commissioning process utilizes formal documentation for quality control, which includes submittal review, equipment checklists, field observation reports, O&M Manual review comments, Training Information review comments, Test, Adjust and Balance Verification, Functional Performance Testing, and other forms necessary for this project.

1.6. CONTRACTOR'S CX SUBMITTAL REQUIREMENTS

- A. Refer to section 01 9100, General Commissioning Requirements

1.7. INCLUDED SYSTEMS

- A. Refer to section 01 9100, General Commissioning Requirements

1.8. SCHEDULE REQUIREMENTS

- A. Refer to section 01 9100, General Commissioning Requirements

1.9. PII PRODUCTS

1.10. Not used

1.11. PIII EXECUTION

1.12. COMMISSIONING TEAM

- A. Refer to section 01 9100, General Commissioning Requirements

1.13. COMMISSIONING MEETINGS

- A. Refer to section 01 9100, General Commissioning Requirements

1.14. COMMISSIONING PLAN

- A. Refer to section 01 9100, General Commissioning Requirements

1.15. NOTIFICATIONS

- A. Refer to section 01 9100, General Commissioning Requirements

1.16. FIELD OBSERVATIONS

- A. Refer to section 01 9100, General Commissioning Requirements

1.17. O&M MANUALS

- A. Refer to section 01 9100, General Commissioning Requirements

1.18. FUNCTIONAL PERFORMANCE TESTING

- A. Refer to section 01 9100, General Commissioning Requirements

END OF SECTION

SECTION 26 0923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Occupancy sensors.
- B. Outdoor photo controls.
- C. Daylighting controls.

1.2. RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0533.16 - BOXES.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
- F. Section 26 5100 - Interior Lighting.

1.3. REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices; current edition.
- B. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2010.
- C. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2004 (R2010).
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- E. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
- G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.
- J. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- K. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- L. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.
- M. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.
5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
 1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.
- C. Shop Drawings:
 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
 2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
- D. Samples (if requested):
 1. Occupancy Sensors: One for each type and color specified.
 2. In-Wall Time Switches: One for each type and color specified.
 3. In-Wall Interval Timers: One for each type and color specified.
 4. Daylighting Control Photo Sensors: One for each type and color specified.
- E. Field Quality Control Reports.
- F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data: Include detailed information on device programming and setup.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 6000 - Product Requirements, for additional provisions.
 2. Extra Locking Receptacle-Mounted Outdoor Photo Controls: Five percent of total quantity installed for each type, but not less than two of each type.
- I. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6. QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7. DELIVERY, STORAGE, AND PROTECTION

- A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.8. FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.
- C. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.
- D. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.1. LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.
- C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.2. OCCUPANCY SENSORS

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com.
 - 2. Lutron Electronics Company, Inc: www.lutron.com.
 - 3. Sensor Switch Inc: www.sensorswitch.com.
 - 4. WattStopper: www.legrand.us/wattstopper.aspx.
 - 5. Acuity Controls: www.Acuitybrands.com
 - 6. Eaton (Cooper) Controls: www.Cooperindustries.com/content/public/en/lighting_lighting.html
 - 7. Leviton .
 - 8. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. All Occupancy Sensors:
 - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 - 2. Sensor Technology:
 - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
 - b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
 - c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.

3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
 6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
 7. Turn-Off Delay: Field adjustable, , with time delay up to 20 minutes.
 8. Sensitivity: Field adjustable.
 9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
 10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above the selected level.
 11. Compatibility (Non-Dimming Sensors): Suitable for controlling LED lighting with electronic drivers, and fractional motor loads, with no minimum load requirements.
 12. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.
 13. Where wired sensors are indicated, wireless sensors are not acceptable without prior approval of Architect.
- C. Wall Switch Occupancy Sensors:
1. All Wall Switch Occupancy Sensors:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. Unless otherwise indicated or required to control the load indicated on drawings, provide line voltage units with self-contained relay.
 - c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
 - d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - f. Provide selectable audible alert to notify occupant of impending load turn-off.
 - g. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.
 - h. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.
 2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.
 3. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

D. Wall Dimmer Occupancy Sensors:

1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
 - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
 - e. Provide field adjustable dimming preset for occupied state.
 - f. Provide fade-to-off operation to notify occupant of impending load turn-off.
 - g. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.
2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

E. Ceiling Mounted Occupancy Sensors:

1. All Ceiling Mounted Occupancy Sensors:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 - b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - c. Provide field selectable setting for disabling LED motion detector visual indicator.
 - d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
 - e. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
 - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
3. Ultrasonic Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 500 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
 - b. Medium Range Sensors: Capable of detecting motion within an area of 1,000 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.
 - c. Extended Range Sensors: Capable of detecting motion within an area of 2,000 square feet at a mounting height of 9 feet.
4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

- b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

F. Directional Occupancy Sensors:

1. All Directional Occupancy Sensors: Designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
 - a. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - b. Provide field selectable setting for disabling LED motion detector visual indicator.
 - c. Finish: White unless otherwise indicated.
2. Passive Infrared (PIR) Directional Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.
 - b. Long Range Sensors: Capable of detecting motion within a distance of 80 feet at a mounting height of 10 feet.
 - c. High Bay Sensors: Capable of detecting motion within a distance of 50 feet at a mounting height of 30 feet.
3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within a distance of 40 feet at a mounting height of 10 feet.

G. Power Packs for Low Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: As required to control the load indicated on drawings.

2.3. OUTDOOR PHOTO CONTROLS

A. Manufacturers:

1. Intermatic, Inc: www.intermatic.com.
2. Tork, a division of NSI Industries LLC: www.tork.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

B. Stem-Mounted Outdoor Photo Controls:

1. Description: Direct-wired photo control unit with threaded conduit mounting stem and field-adjustable swivel base, listed and labeled as complying with UL 773A.
2. Housing: Weatherproof, impact resistant polycarbonate.
3. Photo Sensor: Cadmium sulfide.
4. Provide external sliding shield for field adjustment of light level activation.
5. Light Level Activation: 1 to 5 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
6. Voltage: As required to control the load indicated on the drawings.
7. Failure Mode: Fails to the on position.
8. Load Rating: As required to control the load indicated on the drawings.
9. Provide accessory wall-mounting bracket where indicated or as required to complete installation.

2.4. DAYLIGHTING CONTROLS

- A. Manufacturers:
 - 1. Hubbell Control Solutions: www.hubbell.com/hubbellcontrolsolutions/en/#sle.
 - 2. Lutron Electronics Company, Inc: www.lutron.com.
 - 3. Acuity Controls: www.Acuitybrands.com.
 - 4. Eaton (Cooper) Controls: www.Cooperindustries.com/content/public/en/lighting.html
 - 5. WattStopper: www.legrtand.us/wattstopper.aspx.
 - 6. Substitutions: See Section 01 6000 - Product Requirements.
 - 7. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.
- B. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.
- C. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
 - 1. Sensor Type: Filtered silicon photo diode.
 - 2. Sensor Range:
 - a. Indoor Photo Sensors: 5 to 100 footcandles.
 - b. Outdoor Photo Sensors: 5 to 250 footcandles.
 - 3. Finish: White unless otherwise indicated.
 - 4. Where wired sensors are indicated, wireless sensors are not acceptable without prior approval of Architect.
 - 5. Wireless Daylighting Control Photo Sensors:
 - a. RF Range: 30 feet through typical construction materials.
 - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
 - c. Power: Battery-operated with minimum ten-year battery life.
- D. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming driver, for direct continuous dimming of up to 50 drivers.
- E. Daylighting Control Switching Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors, for switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
 - 1. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
 - 2. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
 - 3. Control Capability:
 - a. Single Zone Switching Modules: Capable of controlling one programmable channel.
 - b. Multi-Zone Switching Modules: Capable of controlling up to three separately programmable channels.
- F. Daylighting Control Switching Modules for Wireless Sensors:

1. Description: Plenum rated, self-contained relay compatible with specified wireless photo sensors for switching of line voltage loads in response to changes in measured light levels according to selected settings.
 2. Operation: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with a no switching dead band between set points to prevent unwanted cycling.
 3. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.
 4. Control Capability: Capable of controlling one programmable channel.
 5. Input Supply Voltage: Dual rated for 120/277 V ac.
 6. Load Rating: As required to control the load indicated on drawings.
 7. Provide auxiliary contact closure output where indicated.
 8. Rated Life of Relay: One million cycles.
- G. Daylighting Control Dimming Modules for Low Voltage Sensors: Low voltage class 2 control unit compatible with specified photo sensors and with specified dimming ballasts, for both continuous dimming of compatible dimming ballasts and switching of compatible power packs, contactors, or relays in response to changes in measured light levels according to selected settings.
1. Operation: Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
 2. Load to be turned off when available daylight is sufficient to fully dim the load, after the selected time delay.
 3. Control Capability: Capable of controlling up to three separately programmable channels, with up to 50 ballasts per channel.
 4. Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
 5. Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.
 6. Output Voltage: Compatible with specified dimming ballasts.
- H. Power Packs for Low Voltage Daylighting Control Modules:
1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage daylighting control modules for switching of line voltage loads. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 2. Input Supply Voltage: Dual rated for 120/277 V ac.
 3. Load Ratings: As required to control the load indicated on drawings.
 4. Load Ratings:
- I. Accessories:
1. Where indicated, provide compatible accessory wall switches for manual override control.
 2. Where indicated, provide compatible accessory wireless controls for manual override control.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.2. PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3. INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.
 - 1. Mounting Heights: As indicated on the drawings.
 - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
 - 3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.
- G. Provide required supports in accordance with Section 26 0529.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- I. Identify lighting control devices in accordance with Section 26 0553.
- J. Occupancy Sensor Locations:
 - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
 - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- K. Outdoor Photo Control Locations:
 - 1. Where possible, locate outdoor photo controls with photo sensor facing north. If north facing photo sensor is not possible, install with photo sensor facing east, west, or down.

2. Locate outdoor photo controls so that photo sensors do not face artificial light sources, including light sources controlled by the photo control itself.
 - L. Install outdoor photo controls so that connections are weatherproof. Do not install photo controls with conduit stem facing up in order to prevent infiltration of water into the photo control.
 - M. Daylighting Control Photo Sensor Locations:
 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
 2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
 3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.
 - N. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
 - O. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.
 - P. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.
- 3.4. FIELD QUALITY CONTROL
- A. See Section 01 4000 - Quality Requirements, for additional requirements.
 - B. Inspect each lighting control device for damage and defects.
 - C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
 - D. Test time switches to verify proper operation.
 - E. Test outdoor photo controls to verify proper operation, including time delays where applicable.
 - F. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
 - G. Correct wiring deficiencies and replace damaged or defective lighting control devices.
- 3.5. ADJUSTING
- A. Adjust devices and wall plates to be flush and level.
 - B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
 - C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
 - D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
 - E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect. Record settings in written report to be included with submittals.
 - F. Adjust external sliding shields on outdoor photo controls under optimum lighting conditions to achieve desired turn-on and turn-off activation as indicated or as directed by Architect.

- G. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.6. CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7. CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. See Section 01 7900 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.
- D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of two hours of training.
 - 3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
 - 4. Location: At project site.

END OF SECTION

SECTION 26 2726 - WIRING DEVICES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Fan speed controllers.
- D. Receptacles.
- E. Wall plates.
- F. Floor box service fittings.
- G. Poke-through assemblies.

1.2. RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0533.16 - BOXES.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 0923 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

1.3. REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (R 2010).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2012.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- K. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.

4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.
 - B. Sequencing:
 1. Do not install wiring devices until final surface finishes and painting are complete.
- 1.5. SUBMITTALS
- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
 - B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
 - C. Samples: One sample of each color available for thermoplastic cover plates.
 - D. Operation and Maintenance Data:
 1. Wall Dimmers: Include information on operation and setting of presets.
 2. GFCI Receptacles: Include information on status indicators.
 - E. Project Record Documents: Record actual installed locations of wiring devices.
 - F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 01 6000 - Product Requirements, for additional provisions.
- 1.6. QUALITY ASSURANCE
- A. Comply with requirements of NFPA 70.
 - B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
 - C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
 - D. Products: Listed, classified, and labeled as suitable for the purpose intended.
 - E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- 1.7. DELIVERY, STORAGE, AND PROTECTION
- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1. WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- D. Provide tamper resistant receptacles for receptacles installed as shown on drawings.
- E. Provide GFCI protection for receptacles installed within 6 feet of sinks.
- F. Provide GFCI protection for receptacles installed in kitchens.
- G. Unless noted otherwise, do not use combination switch/receptacle devices.

2.2. WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.

- B. Wiring Devices Installed in Finished Spaces: Consult with Architect during shop drawing phase for selection of color with matching nylon wall plate.
- C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

2.3. ALL WIRING DEVICES

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Finishes:

2.4. WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us.
 - 4. Acuity Controls, www.acuity.com.
- B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- D. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.

2.5. WALL DIMMERS

- A. Manufacturers:
 - 1. Leviton Manufacturing Company, Inc: www.leviton.com.
 - 2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com.
 - 3. Eaton (Copper) :
http://www.cooperindustries.com/content/public/en/wiring_devices/products/lighting_controls/dimmers.html :
 - 4. Wattstopper: www.legrand.us/wattstopper.aspx
 - 5. Substitutions: See Section 01 6000 - Product Requirements.
- B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- C. Control: Slide control type with separate on/off switch.
- D. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:
- E. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.6. RECEPTACLES

- A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/wiringdevice-kellems/en.
 2. Leviton Manufacturing Company, Inc: www.leviton.com.
 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/passandseymour.aspx.
 4. Substitutions: See Section 01 6000 - Product Requirements.
 5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
 2. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - a. Provide test and reset buttons of same color as device.
 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 3. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that conditions are satisfactory for installation prior to starting work.

3.2. PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3. INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights to top of box: As indicated on the drawings.
 - 2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
 - 3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 - 4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
- J. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- K. Install wall switches with OFF position down.
- L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- M. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- Q. Identify wiring devices in accordance with Section 26 0553.

3.4. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch and wall dimmer with circuit energized to verify proper operation.

- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5. ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.6. CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 5100 - INTERIOR LIGHTING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Interior luminaires.
- B. Exit signs.
- C. Drivers.
- D. Accessories.

1.2. RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0533.16 - BOXES.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 0918 - Remote Control Switching Devices: Remote controls for lighting, including network lighting controls, programmable relay panels, and remote control switching relays.
- E. Section 26 0923 - Lighting Control Devices.
- F. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.
- G. Section 26 5600 - Exterior Lighting.

1.3. REFERENCE STANDARDS

- A. ANSI C82.4 - American National Standard for Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (Multiple-Supply Type); 2002.
- B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; 2011.
- C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- D. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- E. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- F. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- H. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
- I. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- J. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.
- K. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- O. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.

- P. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- Q. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
 - 4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.
 - 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
 - 3. LED's: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
- D. Samples:
 - 1. Provide one sample(s) of each specified luminaire where indicated.
 - 2. Provide one sample(s) of each luminaire proposed for substitution upon request.
 - 3. Provide one sample(s) of each product finish illustrating color and texture upon request.
- E. Certificates for Dimming Drivers: Manufacturer's documentation of compatibility with dimming controls to be installed.
- F. Field quality control reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

- H. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
 - I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.
 - 2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
 - 3. Extra LED drivers: Ten percent of total quantity installed for each type of driver, but not less than two of each type..
 - J. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.
- 1.6. QUALITY ASSURANCE
- A. Comply with requirements of NFPA 70.
 - B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
 - C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
 - D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- 1.7. DELIVERY, STORAGE, AND PROTECTION
- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
 - B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- 1.8. FIELD CONDITIONS
- A. Maintain field conditions within manufacturer's required service conditions during and after installation.
- 1.9. WARRANTY
- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
 - B. Provide three year manufacturer warranty for LED luminaires, including drivers.
- PART 2 PRODUCTS
- 2.1. MANUFACTURERS - LUMINAIRES
- A. Furnish products from the Manufacturers listed in the Luminaire Schedule found on the drawings.
- 2.2. LUMINAIRE TYPES
- A. Furnish products as indicated in luminaire schedule included on the drawings.
 - B. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid..
- 2.3. LUMINAIRES
- A. Manufacturers:
 - 1. Acceptable Manufacturers for each type of luminaire are listed on the luminaire schedule on the drawings..
 - 2. Substitutions: Proposed substitutions shall be made in electronic format using the proper form found in the front end documents and must be submitted to the Architect 10 business days prior to Bid..

- B. Provide products that comply with requirements of NFPA 70.
- C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Unless otherwise indicated, provide complete luminaires including LED's, reflectors, lenses, drivers, housings and other components required to position, energize and protect the light source and distribute the light.
- F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- H. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
- I. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- J. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.4. EXIT SIGNS

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Number of Faces: Single- or double-face as indicated or as required for installed location.
 - 2. Directional Arrows: As indicated or as required for installed location.
- B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

2.5. DRIVERS

- A. Manufacturers:
- B. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.
 - a. Wall Dimmers: See Section 26 2726.
 - b. Daylighting Controls: See Section 26 0923.

2.6. ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2. PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3. INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- D. Provide required support and attachment in accordance with Section 26 0529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
 - 4. Secure pendant-mounted luminaires to building structure.
 - 5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 - 6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gage, connected from opposing corners of each recessed luminaire to building structure.
 - 7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- G. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
 - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- H. Suspended Luminaires:
 - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
 - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.

3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.
 4. Install canopies tight to mounting surface.
 5. Unless otherwise indicated, support pendants from swivel hangers.
 - I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
 - J. Install accessories furnished with each luminaire.
 - K. Bond products and metal accessories to branch circuit equipment grounding conductor.
 - L. Emergency Lighting Units:
 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
 - M. Exit Signs:
 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
 - N. Install lamps in each luminaire.
- 3.4. FIELD QUALITY CONTROL
- A. See Section 01 4000 - Quality Requirements, for additional requirements.
 - B. Inspect each product for damage and defects.
 - C. Operate each luminaire after installation and connection to verify proper operation.
 - D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
 - E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.
- 3.5. ADJUSTING
- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
 - B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
 - C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.
- 3.6. CLEANING
- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
- 3.7. CLOSEOUT ACTIVITIES
- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
 - B. See Section 01 7900 - Demonstration and Training, for additional requirements.
 - C. Demonstration: Demonstrate proper operation of luminaires to Architect, and correct deficiencies or make adjustments as directed.
 - D. Just prior to Substantial Completion, replace all lamps that have failed.

3.8. PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 28 4600 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.
- C. Maintenance of fire alarm system under contract for specified warranty period.

1.2. RELATED REQUIREMENTS

- A. Section 08 7100 - Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system.
- B. Section 23 3300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

1.3. REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. IFC - International Fire Code; Most Recent Edition Adopted by the Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4. SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Drawings must be prepared as DXF-format CAD drawings.
 - 1. Architect will provide CAD floor plan drawings for Contractor's use upon Contractor's completion of Waiver of Liability Agreement form.
- C. Evidence of designer qualifications. Design must be completed by a NICET level IV designer, minimum.
- D. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 - 4. System zone boundaries and interfaces to fire safety systems.
 - 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.

6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
7. List of all devices on each signaling line circuit, with spare capacity indicated.
8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
12. Certification by Contractor that the system design complies with Contract Documents.
- E. Evidence of installer qualifications. Installer must hold a NICET level III certificate, minimum.
- F. Evidence of instructor qualifications; training lesson plan outline.
- G. Evidence of maintenance contractor qualifications, if different from installer.
- H. Inspection and Test Reports:
 1. Submit inspection and test plan prior to closeout demonstration.
 2. Submit documentation of satisfactory inspections and tests.
 3. Submit NFPA 72 "Inspection and Test Form," filled out.
- I. Operating and Maintenance Data: See Section 01 7800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
 1. Original copy of NFPA 72 with portions that are not relevant to this project neatly crossed out by hand; label with project name and date.
 2. Complete set of specified design documents, as approved by authority having jurisdiction.
 3. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 4. Contact information for firm that will be providing contract maintenance and trouble call-back service.
 5. List of recommended spare parts, tools, and instruments for testing.
 6. Replacement parts list with current prices, and source of supply.
 7. Detailed troubleshooting guide and large scale input/output matrix.
 8. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
 9. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- J. Project Record Documents: See Section 01 7800 for additional requirements; have one set available during closeout demonstration:
 1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- K. Closeout Documents:

1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
 3. Certificate of Occupancy.
 4. Maintenance contract.
- L. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
 2. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
 3. In addition to the items in quantities indicated in PART 2, furnish the following:
 - a. All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
 - b. One copy, on CD-ROM, of all software not resident in read-only-memory.
 - c. Extra Fuses: Two for each installed fuse; store inside applicable control cabinet.

1.5. QUALITY ASSURANCE

- A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.
- B. Designer Qualifications: NICET Level IV (4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- C. Installer Qualifications: Installer with a minimum NICET Level III (3) and three years experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 2. Installer Personnel: At least 3 years of experience installing fire alarm systems.
 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
 4. Contract maintenance office located within 50 miles of project site.
 5. Certified in the State in which the Project is located as fire alarm installer.
- D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
- E. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.
- F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

- B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- C. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Fire Alarm Control Units and Accessories - Basis of Design: Potter Electric Signal Company, as indicated under product descriptions below; www.pottersignal.com/#sle.
- B. Existing fire alarm system is Notifier by FE Moran. Verify existing configuration.
- C. Initiating Devices and Notification Appliances:
 - 1. Honeywell Security & Fire Solutions/Notifier: www.notifier.com.
 - 2. Same manufacturer as control unit.
 - 3. All devices and equipment added to the existing fire alarm system shall be 100% compatible with the existing system. All new devices and equipment shall be U.L. listed and shall conform to NFPA 72.
 - 4. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

2.2. EXISTING FIRE ALARM SYSTEM

- A. All devices and equipment added to the existing fire alarm system shall be 100% compatible with the existing system. All new devices and equipment shall be U.L. listed and shall conform to NFPA 72.
- B. All new wiring shall be 100% compatible with the existing fire alarm system and shall be as directed by the manufacturer of the existing fire alarm system. The Electrical Contractor is to provide all fire alarm cable under this contract.
- C. Provide hardware and programming modifications required to the existing alarm control panel and associated accessories to expand the existing system as indicated on the drawings. All modifications shall be complete by the manufacturer's authorized technician.
- D. All wiring shall be verified with the fire alarm equipment supplier as to quantity, size, routing, conduit, junction box requirements, etc.
- E. New visual alarm devices shall be 100% compatible with the existing fire alarm control panel; shall comply with ADA requirements; shall be listed and labeled per U.L. standard 1971; 15/75 cd. type strobe, unless otherwise noted. Surface mount devices at 80" above finished floor or at 6" below ceiling, whichever is lower. Provide associated back box and rough-in to above accessible ceiling space.
- F. New booster power supply (BPS) shall be 100% compatible with the existing fire alarm control panel. Provide BPS unit(s) if existing control panel does not have capacity for additional alarm indicating devices. BPS shall be a single unit or multiple units as required to meet the specified requirements. BPS unit shall be housed in an enclosure with lockable door. BPS shall be equipped to allow activation from an existing notification appliance circuit. BPS unit shall provide 4 amps of notification appliance power distributed between two appliance circuits. BPS unit shall operate from a 120 VAC input and be equipped with a battery back up with associated battery charger. BPS shall be supervised for ground fault, overcurrent, open circuits and low battery conditions. Occurrence of any of these conditions shall create a trouble signal on the fire alarm control panel. BPS shall be U.L. listed and labeled as a fire alarm accessory for use with U.L. listed fire alarm control panel.
- G. Fire alarm system modifications and expansion shall be installed and fully tested under the supervision of the manufacturer's specifications and the appropriate NFPA requirements. Reports of all testing during the installation shall be submitted to the Owner and Engineer upon request.

- H. Before requesting final approval of tech installation, the installing contractor shall furnish a written statement to the effect that the system has been installed and tested in accordance with the manufacturer's specifications and the appropriate NFPA requirements.
- I. Provide demonstration of the modified fire alarm systems to the Owner. Perform all the functions specified.
- J. Submit a certificate of completion per NFPA 72.

2.3. FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
 - 1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
 - 2. Protected Premises: Renovated spaces.
 - 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.
 - b. The requirements of the State Fire Marshal.
 - c. The requirements of the local authority having jurisdiction, which is Fire Marshall State of Illinois.
 - d. Applicable local codes.
 - e. Contract Documents (drawings and specifications).
 - f. NFPA 101.
 - g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
 - h. International Fire Code.
 - 4. Fire-alarm signal initiation shall be by one or more of the following devices[and systems]:
 - a. Manual stations.
 - b. Smoke detectors.
 - c. Duct smoke detectors.
 - d. Automatic sprinkler system water flow.
 - e. Fire standpipe system.
 - 5. Fire-alarm signal shall initiate the following actions:
 - a. Continuously operate alarm notification appliances[, including voice evacuation notices].
 - b. Identify alarm and specific initiating device at fire-alarm control unit[, connected network control panels, off-premises network control panels,][and remote annunciators].
 - c. Transmit an alarm signal to the remote alarm receiving station.
 - d. Unlock electric door locks in designated egress paths.
 - e. Release fire and smoke doors held open by magnetic door holders.
 - f. Activate voice/alarm communication system.
 - g. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 - h. Activate smoke-control system (smoke management) at firefighters' smoke-control system panel.
 - i. Activate stairwell and elevator-shaft pressurization systems.

- j. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 - k. Activate preaction system.
 - l. Coordinate first subparagraph below with "Elevator Recall" Paragraph in "Fire-Alarm Control Unit" Article.
 - m. If supplies are not essential to life safety, retain first subparagraph below for shutoffs installed in supplies that may be hazardous.
 - n. Activate emergency shutoffs for gas and fuel supplies.
 - o. Record events in the system memory.
 - p. Record events by the system printer.
 - q. Indicate device in alarm on the graphic annunciator.
 - r. Signal from a carbon monoxide detector shall shut down all fuel-burning appliances, fuel-burning fireplaces, and gas-fired furnaces.
6. Supervisory signal initiation shall be by one or more of the following devices and actions:
- a. Retain only those devices and actions in subparagraphs below applicable to Project. Coordinate with requirements in other Sections that specify devices and systems.
 - b. Valve supervisory switch.
 - c. High- or low-air-pressure switch of a dry-pipe or preaction sprinkler system.
 - d. Fire-pump power phase reversal.
 - e. Independent fire-detection and -suppression systems.
 - f. User disabling of zones or individual devices.
 - g. Loss of communication with any panel on the network.
7. System trouble signal initiation shall be by one or more of the following devices and actions:
- a. Open circuits, shorts, and grounds in designated circuits.
 - b. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 - c. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
 - d. Ground or a single break in internal circuits of fire-alarm control unit.
8. System Supervisory Signal Actions:
- a. Initiate notification appliances.
 - b. Identify specific device initiating the event at fire-alarm control unit[, connected network control panels, off-premises network control panels,][and remote annunciators].
 - c. Record the event on system printer.
 - d. Transmit system status to building management system.
 - e. Display system status on graphic annunciator.
- B. Circuits:
- 1. Initiating Device Circuits (IDC): Class B, Style A.
 - 2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
 - 3. Notification Appliance Circuits (NAC): Class B, Style W.

2.4. EXISTING COMPONENTS

- A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.
- B. Clearly label components that are "Not In Service."
- C. Remove unused existing components and materials from site and dispose of properly.

2.5. FIRE SAFETY SYSTEMS INTERFACES

- A. HVAC:
 - 1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.
- B. Doors:
 - 1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 7100.
 - 2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 08 7100.

2.6. COMPONENTS

- A. General:
 - 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 - 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Initiating Devices:
 - 1. Addressable Systems:
 - a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
 - b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
 - 2. Manual Pull Stations: Provide 1 extra.
 - 3. Smoke Detectors: Provide 1 extra.
 - 4. Duct Smoke Detectors: Provide 1 extra.
 - 5. Heat Detectors: Provide 1 extra.
 - 6. Addressable Interface Devices: Provide 1 extra..
- D. Notification Appliances:
 - 1. Horns: Provide 1 extra.
 - 2. Strobes: Provide 1 extra.
- E. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.
- F. Locks and Keys: Deliver keys to Owner.

1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, the International Fire Code, and Contract Documents.
- B. Install all cabling in conduit.
- C. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- D. Obtain Owner's approval of locations of devices, before installation.
- E. Install instruction cards and labels.

3.2. INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.3. CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
 1. Be prepared to conduct any of the required tests.
 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
 3. Have authorized technical representative of control unit manufacturer present during demonstration.
 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
 5. Repeat demonstration until successful.
- B. Occupancy of the project will not occur prior to Substantial Completion.
- C. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
 1. Specified diagnostic period without malfunction has been completed.
 2. Approved operating and maintenance data has been delivered.
 3. Spare parts, extra materials, and tools have been delivered.
 4. All aspects of operation have been demonstrated to Owner.
 5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
 6. Occupancy permit has been granted.

7. Specified pre-closeout instruction is complete.

D. Perform post-occupancy instruction within 3 months after Substantial Completion.

3.4. MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.

C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:

1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
3. Record keeping required by NFPA 72 and authorities having jurisdiction.

D. Provide trouble call-back service upon notification by Owner:

1. Provide on-site response within 2 hours of notification.
2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

G. Comply with Owner's requirements for access to facility and security.

END OF SECTION