



PROJECT MANUAL

Upgrades and Renovations Missouri Veterans Home Cape Girardeau, Missouri

Designed By: Farnsworth Group
20 Allen Avenue, Suite 200
St. Louis, MO 63119

Date Issued: August 15, 2024

Project No.: U1805-01
FAI No. 29-043

STATE *of* MISSOURI

OFFICE *of* ADMINISTRATION
Facilities Management, Design and Construction

SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

**PROJECT NUMBER: (#U1805-01) Missouri Veterans Home
2400 Veterans Memorial Dr.
Cape Girardeau, Missouri**

THE FOLLOWING DESIGN PROFESSIONALS HAVE SIGNED AND SEALED THE ORIGINAL PLANS AND SPECIFICATIONS FOR THIS PROJECT, WHICH ARE ON FILE WITH THE DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION:

1.1 DESIGN PROFESSIONALS OF RECORD

A. Civil Engineer:

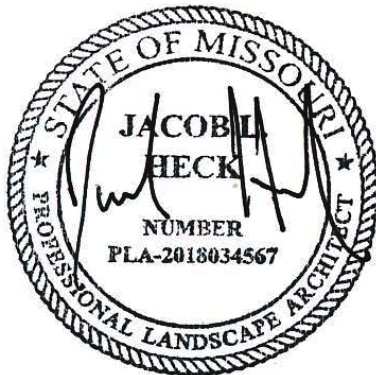
1. Farnsworth Group, Inc.
2. Missouri State Certificate of Authority 001321. Engineering.
3. Stephen Stumpf
4. License # 2020000089
5. Responsible for Divisions 31-33 Sections except where indicated as prepared by other design professionals of record.



Dated: 08/14/2024
Expiration Date: 12/31/2024

B. Landscape Architect:

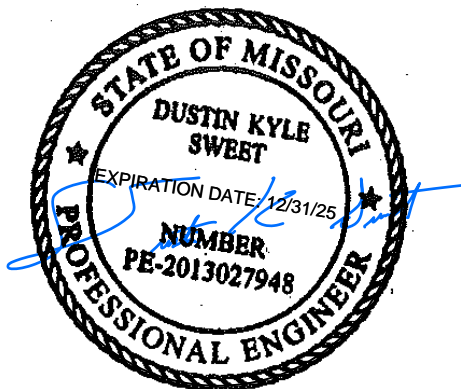
1. Farnsworth Group, Inc.
2. Missouri State Certificate of Authority 000744. Architecture
3. Jacob L. Heck
4. License # 2018034567
5. Responsible for Divisions 32 Sections except where indicated as prepared by other design professionals of record.



Expiration Date: 12/31/2024

C. Structural Engineer:

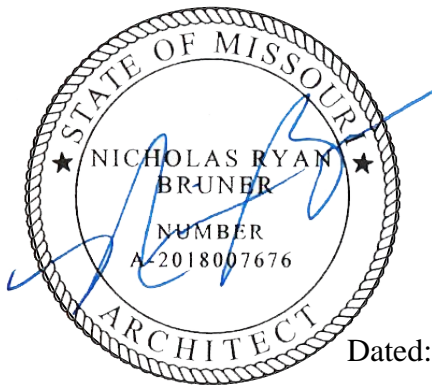
1. Farnsworth Group, Inc.
2. Missouri State Certificate of Authority 001321. Engineering.
3. Dustin Kyle Sweet
4. License # 2013027948
5. Responsible for Divisions 03-06 Sections except where indicated as prepared by other design professionals of record.



SEALED DATE: 08/13/2024
Expiration Date: 12/31/2025

D. Architect:

1. Farnsworth Group, Inc.
2. Missouri State Certificate of Authority 000744. Architecture
3. Nicholas Ryan Bruner
4. License # 2018007676
5. Responsible for Divisions 01-12 Sections except where indicated as prepared by other design professionals of record.

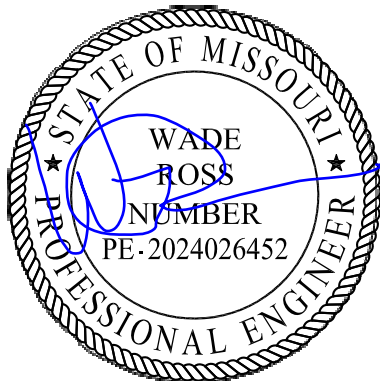


Dated: 08/15/2024

Expiration Date: 12/31/2024

E. Mechanical, Plumbing, and Fire Protection Engineer:

1. Farnsworth Group, Inc.
2. Missouri State Certificate of Authority 001321. Engineering.
3. Wade Ross
4. License # 2024026452
5. Responsible for Division 21, 22 and 23 as applicable to Mechanical and Plumbing.



DATED: 08.15.2024

Expiration Date: 12/31/2024

F. Electrical Engineer:

1. Farnsworth Group, Inc.
2. Missouri State Certificate of Authority 001321. Engineering.
3. Warren Kohm
4. License #029041
5. Responsible for Division 26 as applicable to Electrical.



Dated 8/15/2024

Expiration Date: 12/31/2024

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<p>The following procurement forms can be found on our website at: https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans and shall be submitted with your bid to FMDCBids@oa.mo.gov</p>		
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1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section provides a comprehensive list of the drawings that comprise the Bid Documents for this project.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

- A. The following list of drawings is a part of the Bid Documents:

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E-109	SYSTEMS DEMOLITION PLAN - CORE	08-15-2024
E-110	SYSTEMS DEMOLITION PLAN - WING A	08-15-2024
E-111	SYSTEMS DEMOLITION PLAN - WING B	08-15-2024
E-112	SYSTEMS DEMOLITION PLAN - WING C	08-15-2024
E-113	ELECTRICAL SITE PLAN	08-15-2024
E-114	LIGHTING PLAN - CORE	08-15-2024
E-115	LIGHTING PLAN - WING A	08-15-2024
E-116	LIGHTING PLAN - WING B	08-15-2024
E-117	LIGHTING PLAN - WING C	08-15-2024
E-118	NOT USED	
E-119	POWER PLAN - CORE	08-15-2024
E-120	POWER PLAN - WING A	08-15-2024
E-121	POWER PLAN - WING B	08-15-2024
E-122	POWER PLAN - WING C	08-15-2024
E-123	POWER PLAN – ALTERNATE 1 INFECTIOUS DISEASE	08-15-2024
E-124	ELECTRICAL ROOF PLAN	08-15-2024
E-125	SYSTEMS PLAN - CORE	08-15-2024
E-126	SYSTEMS PLAN - WING A	08-15-2024
E-127	SYSTEMS PLAN - WING B	08-15-2024
E-128	SYSTEMS PLAN - WING C	08-15-2024
E-501	ELECTRICAL DETAILS	08-15-2024
E-601	ONE-LINE DIAGRAM	08-15-2024
E-602	ELECTRICAL SCHEDULES	08-15-2024
E-603	ELECTRICAL SCHEDULES	08-15-2024
E-604	ELECTRICAL SCHEDULES WING A	08-15-2024
E-605	ELECTRICAL SCHEDULES WING B	08-15-2024
E-606	ELECTRICAL SCHEDULES WING C	08-15-2024
E-607	ELECTRICAL SCHEDULES	08-15-2024

END OF SECTION 000115

SECTION 001116 - INVITATION FOR BID

1.0 OWNER:

- A. The State of Missouri
Office of Administration,
Division of Facilities Management, Design and Construction
Jefferson City, Missouri

2.0 PROJECT TITLE AND NUMBER:

- A. Upgrades and Renovations
Missouri Veterans Home
Cape Girardeau, Missouri
Project No.: U1805-01

3.0 BIDS WILL BE RECEIVED:

- A. Until: 1:30 PM, July 8, 2025
- B. **Only electronic bids sent to FMDCBids@oa.mo.gov shall be accepted:** (See Instructions to Bidders for further detail)

4.0 DESCRIPTION:

- A. Scope: The project includes interior renovations and various building additions.
- B. MBE/WBE/SDVE Goals: MBE 10%, WBE 10%, and SDVE 3%. **NOTE: Only MBE/WBE firms certified by the State of Missouri Office of Equal Opportunity as of the date of bid opening, or SDVE(s) meeting the requirements of Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE participation goals for this project.**

5.0 PRE-BID MEETING:

- A. Place/Time: 10 AM, June, 25, 2025, at Missouri Veterans Home, 2400 Veterans Memorial Dr., Cape Girardeau, Missouri
- B. Access to State of Missouri property requires presentation of a photo ID by all persons

6.0 HOW TO GET PLANS & SPECIFICATIONS:

- A. View Only Electronic bid sets are available at no cost or paper bid sets for a deposit of **\$100.00** from American Document Solutions (ADS). MAKE CHECKS PAYABLE TO: American Document Solutions. Mail to: American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433, <https://www.adsplanroom.net>. NOTE: Prime contractors will be allowed a maximum of two bid sets at the deposit rate shown above. Other requesters will be allowed only one bid set at this rate. Additional bid sets or parts thereof may be obtained by any bidder at the cost of printing and shipping by request to American Document Solutions at the address shown above. Bidder must secure at least one bid set to become a planholder.
- B. **Refunds: Return plans and specifications in unmarked condition within 15 working days of bid opening to American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433. Deposits for plans not returned within 15 working days shall be forfeited.**
- C. Information for upcoming bids, including downloadable plans, specifications, Invitation for Bid, bid tabulation, award, addenda, and access to the ADS planholders list, is available on the Division of Facilities Management, Design and Construction's web site: <https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans>.

7.0 POINT OF CONTACT:

- A. Designer: Farnsworth Group, Juliana Schafer-Rich, 314-962-7900, email: jschafer-rich@F-W.com
- B. Project Manager: Sandra Walther, 573-257-7322, email: sandra.walther@oa.mo.gov

8.0 GENERAL INFORMATION:

- A. The State reserves the right to reject any and all bids and to waive all informalities in bids. No bid may be withdrawn for a period of 20 working days subsequent to the specified bid opening time. The contractor shall pay not less than the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed, as determined by the Missouri Department of Labor and Industrial Relations and as set out in the detailed plans and specifications.
- B. Bid results will be available at <https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans> after it is verified that at least one bid is awardable and affordable.
- C. This is a federally funded/assisted construction project that requires compliance by the awarded contractor with applicable federal laws and regulations. The Bidder should review Section 007333, SUPPLEMENTARY GENERAL CONDITIONS FOR FEDERALLY FUNDED/ASSISTED CONSTRUCTION PROJECTS, which is made part of this solicitation and will be made part of the resulting contract by reference.
- D. The State of Missouri, OA-FMDC, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, businesses owned and controlled by socially and economically disadvantaged individuals will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, religion, creed, sex, age, ancestry or national origin in consideration for an award.

SECTION 002113 – INSTRUCTIONS TO BIDDERS

1.0 - SPECIAL NOTICE TO BIDDERS

- A. If awarded a contract, the Bidder's employees, and the employees of all subcontractors, who perform the work on the project must adhere to requirements in Section 013513 – Site Security and Health Requirements as applicable per Agency.
- B. The Bidder's prices shall include all city, state, and federal sales, excise, and similar taxes that may lawfully be assessed in connection with the performance of work, and the purchased of materials to be incorporated in the work. **THIS PROJECT IS NOT TAX EXEMPT.**

2.0 - BID DOCUMENTS

- A. The number of sets obtainable by one (1) party may be limited in accordance with available supply.
- B. For the convenience of contractors, subcontractors and suppliers, bidding documents are available on the Owner's website at <https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans>.

3.0 - BIDDERS' OBLIGATIONS

- A. Bidders must carefully examine the entire site of the work and shall make all reasonable and necessary investigations to inform themselves thoroughly as to the facilities available as well as to all the difficulties involved in the completion of all work in accordance with the specifications and the plans. Bidders are required to examine all maps, plans and data mentioned in the specifications. No plea of ignorance concerning observable existing conditions or difficulties that may be encountered in the execution of the work under this contract will be accepted as an excuse for any failure or omission on the part of the successful Bidder (contractor) to fulfill every detail of the requirements of the contract, nor accepted as a basis for any claims for extra compensation or time extension.
- B. Under no circumstances will Bidders give their plans and specifications to other Bidders. It is highly encouraged, but not required, that all Bidders be on the official planholders list to receive project updates including but not limited to any addenda that are issued during the bidding process.

4.0 - INTERPRETATIONS

- A. No Bidder shall be entitled to rely on oral or written representations from any person as to the meaning of the plans and specifications or the acceptability of alternate products, materials, form or type of construction.
- B. Bidders shall make all requests for interpretations in writing and submit all requests to the Project Designer and Project Manager identified in Section 007300 – Supplementary Conditions with all necessary supporting documentation no less than five (5) working days before opening of bids. Responses to requests for interpretation will be issued via a written addendum and will be sent as promptly as is practicable to all official planholders and posted on the Owner's website. All such addenda shall become part of the bid and contract documents.
- C. Bidders shall make all requests for an "Acceptable Substitution" on the Section 006325 Substitution Request Form. The request shall be emailed to the Project Designer and Project Manager identified in Section 007300 – Supplementary Conditions no less than five (5) working days before opening of bids. Responses to requests for substitutions will be issued via a written addendum and will be sent as promptly as is practicable to all official planholders and posted on the Owner's website. All such addenda shall become part of the bid and contract documents.
- D. An "Acceptable Substitution" requested after the award of bid will only be approved if proven to the satisfaction of the Owner and the Designer that the product is acceptable in design, strength, durability, usefulness, and convenience for the purpose intended. Approval of the substitution after award is at the sole discretion of the Owner and all requests of this nature must be submitted in accordance with Article 3.1 of the General Conditions.

5.0 - BIDS AND BIDDING PROCEDURE

- A. Bidders shall submit all submission forms and accompanying documents listed in Section 004113 – Bid Form, Article 5.0, Attachments to Bid by the stated time on the bid documents or the bid will be rejected for being non-responsive.
- B. Depending on the specific project requirements, **the following is a GENERIC list** of all possible bid forms that may be due with bid submittals. Bidders must verify each specific project's requirements in Section 004113 to ensure they have provided all the required documentation with their submission.

Bid Submittal – due before stated date and time of bid opening (see IFB):

004113	Bid Form (all pages are always required)
004322	Unit Prices Form
004336	Proposed Subcontractors Form
004337	MBE/WBE/SDVE Compliance Evaluation Form
004338	MBE/WBE/SDVE Eligibility Determination for Joint Ventures
004339	MBE/WBE/SDVE GFE Determination
004340	SDVE Business Form
004541	Affidavit of Work Authorization
004545	Anti-Discrimination Against Israel Act Certification form

- C. The Bidder shall submit its bid on the forms provided by the Owner in the same file format (PDF) with each space fully and properly completed, typewritten or legibly printed, including all amounts required for alternate bids, unit prices, cost accounting data, etc. The Owner will reject bids that are not on the Owner's forms or that do not contain all requested information. All forms can be found on the Owner's website at <https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans> and shall be submitted with your bid to FMDCBids@oa.mo.gov.
- D. All bids shall be submitted without additional terms and conditions, modifications, or reservations. The completed forms should not include interlineations, alterations, or erasures. Bids not in compliance with the requirements of this paragraph will be rejected as non-responsive.
- E. All bids shall be accompanied by a bid bond executed by the bidder and a duly authorized surety company, certified check, cashier's check or bank draft made payable to the Division of Facilities Management, Design and Construction, State of Missouri, in the amount indicated in the bid documents in Section 004113. Failure of the Bidder to submit the duly authorized bid bond or the full amount required shall be sufficient cause to reject his bid. The Bidder agrees that the proceeds of the check, draft, or bond shall become the property of the State of Missouri, if for any reason the Bidder withdraws his bid after bid closing or if the Bidder, within ten (10) working days after notification of award, refuses or is unable to 1) execute the tendered contract, 2) provide an acceptable performance and payment bond, or 3) provide evidence of required insurance coverage.
- F. The bid bond check or draft submitted by the successful Bidder will be returned after the receipt of an acceptable performance and payment bond and execution of the formal contract. Checks or drafts of all other Bidders will be returned within a reasonable time after it is determined that the bid represented by same will receive no further consideration by the State of Missouri.

6.0 - SIGNING OF BIDS

- A. A bid should contain the full and correct legal name of the Bidder. If the Bidder is an entity registered with the Missouri Secretary of State, the Bidder's name on the bid form should appear as shown in the Secretary of State's records. If the Bidder is an entity organized in a state other than Missouri, the Bidder must provide a Certificate of Authority to do business in the State of Missouri.
- B. If the successful Bidder is doing business in the State of Missouri under a fictitious name, the Bidder shall furnish to Owner, attached to the Bid Form, a properly certified copy of the certificate of Registration of Fictitious Name from the State of Missouri, and such certificate shall remain on file with the Owner.
- C. A bid from an individual shall be signed as noted on the Bid Form.
- D. A bid from a partnership or joint venture shall require only one signature of a partner, an officer of the joint venture authorized to bind the venture, or an attorney-in-fact. If the bid is signed by an officer of

a joint venture or an attorney-in-fact, a document evidencing the individual's authority to execute contracts should be included with the bid form.

- E. A bid from a limited liability company (LLC) shall be signed by a manager or a managing member of the LLC.
- F. A bid from a corporation shall have the correct corporate name thereon and the signature of an authorized officer of the corporation. Title of office held by the person signing for the corporation shall appear, along with typed name of said individual and the corporate license number shall be provided. In addition, for corporate proposals, the President or Vice-President listed per the current filing with the Missouri Secretary of State should sign as the Bidder. If the signatory is other than the corporate president or vice president, the bidder must provide satisfactory evidence that the signatory has the legal authority to bind the corporation.

7.0 - RECEIVING BID SUBMITTALS

- A. It is the Bidder's sole responsibility to ensure receipt of the bid submittals by Owner on or before the date and time specified in the Invitation for Bid or as modified via written addenda. Bids received after the date and time specified will not be considered by the Owner.
- B. All bids shall be received via email at FMDCBids@oa.mo.gov and bids received by the Owner through any other means, including hard copies, will not be considered, and will be discarded by the Owner unopened.

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

- A. Bidder may withdraw a bid at any time prior to the scheduled closing time for receipt of bids, but no bidder may withdraw his bid for a period of twenty (20) working days after the scheduled closing time for receipt of bids.
- B. Bidder may modify a bid until the scheduled closing time by sending a revised bid to FMDCBids@oa.mo.gov with a note in the subject line and body of the email that it is a revised bid. All revised bids must be submitted to FMDCBids@oa.mo.gov, revised bids sent any other way will not be considered.

9.0 - AWARD OF CONTRACT

- A. The Owner reserves the right to reject any and/or all bids and further to waive all informalities in bidding when deemed in the best interest of the State of Missouri.
- B. The Owner reserves the right to let other contracts in connection with the work including, but not limited to, contracts for the furnishing and installation of furniture, equipment, machinery, appliances and other apparatuses.
- C. The Owner will award a contract to the lowest, responsive, and responsible Bidder in accordance with Section 8.250, RSMo. No contract will be awarded to any Bidder who has had a contract with the Owner terminated within the preceding twelve months for material breach of contract or who has been suspended or debarred by the Owner.
- D. Award of alternates, if any, will be made in numerical order unless all bids received are such that the order of acceptance of alternates does not affect the determination of the lowest, responsive, responsible bidder.
- E. No award shall be considered binding upon the Owner until the written contract has been properly executed and the following documentation has been provided: 1) performance and payment bond consistent with Article 6.1 of the General Conditions; 2) proof of the required insurance coverage; 3) an executed Section 004541 - Affidavit of Work Authorization form; and 4) documentation evidence enrollment and participation in a federal work authorization program.
- F. Failure to execute and return the contract and associated documents within the prescribed period shall be treated, at the option of the Owner, as a breach of Bidder's obligation and the Owner shall be under no further obligation to Bidder.
- G. Transient employers subject to Sections 285.230 and 285.234, RSMo, (out-of-state employers who temporarily transact any business in the State of Missouri) may be required to file a bond with the

Missouri Department of Revenue. No contract will be awarded by the Owner unless the successful Bidder certifies that he has complied with all applicable provisions of Section 285.230-234.

- H. Sections 285.525 and 285.530, RSMo, require business entities to enroll and participate in a federal work authorization program in order to be eligible to receive award of any state contract in excess of \$5,000. Bidders should submit with their bid an Affidavit of Work Authorization (Section 004541) along with appropriate documentation evidencing such enrollment and participation. Bidders must also submit an E-Verify Memorandum before the Owner may award a contract to the Bidder. Information regarding a E-Verify is located at <https://www.e-verify.gov/employers/enrolling-in-e-verify>. The contractor shall be responsible for ensuring that all subcontractors and suppliers associated with this contract enroll in E-Verify.
- I. The successful Bidder must be registered in MissouriBUYS powered by MOVERS at <https://missouribuyss.mo.gov/supplier-registration#> as an approved vendor prior to being issued a contract.

10.0 - CONTRACT SECURITY

- A. The successful Bidder shall furnish a performance/payment bond as set forth in General Conditions Article 6.1 prior to the State executing the contract and issuing a notice to proceed.

11.0 - LIST OF SUBCONTRACTORS

- A. If required by "Section 004113 – Bid Form," each Bidder must submit as part of their bid a list of subcontractors to be used in performing the work (Section 004336). The list must specify the name of the single designated subcontractor, manufacturer, or suppliers for each category of work listed in "Section 004336 - Proposed Subcontractors Form." If work within a category will be performed by more than one subcontractor, the bidder must provide the name of each subcontractor and specify the exact portion of the work to be done by each. If the Bidder intends to perform any of the designated subcontract work with the use of his own employees, the Bidder shall make that fact clear, by listing his own firm for the subject category. **If any category of work is left vacant or if more than one subcontractor is listed for any category without designating the portion of work to be performed by each, the bid shall be rejected.**

12.0 - WORKING DAYS

- A. Contract duration time is stated in working days and will use the following definition in determining the actual calendar date for contract completion:
 - 1. Working days are defined as all calendar days except Saturdays, Sundays and the following State of Missouri observed holidays: New Year's Day, Martin Luther King, Jr. Day, Lincoln Day, Washington's Birthday, Truman Day, Memorial Day, Juneteenth, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and Christmas Day.

13.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

- A. By signing the bid form and submitting a bid on this project, the Bidder certifies that it will use American and Missouri products as set forth in Article 1.7 of the General Conditions. Bidders are advised to review those requirements carefully prior to bidding.
- B. A preference shall be given to Missouri firms, corporations or individuals, or firms, corporations or individuals that maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less.
- C. Pursuant to Section 34.076, RSMo, a contractor or Bidder domiciled outside the boundaries of the State of Missouri shall be required, in order to be successful, to submit a bid the same percent less than the lowest bid submitted by a responsible contractor or Bidder domiciled in Missouri as would be required for such a Missouri domiciled contractor or Bidder to succeed over the bidding contractor or Bidder domiciled outside Missouri on a like contract or bid being let in the Bidder's domiciliary state and, further, the contractor or Bidder domiciled outside the boundaries of Missouri shall be required to submit an audited financial statement as would be required of a Missouri domiciled contractor or Bidder on a like contract or bid being let in the domiciliary state of that contractor or Bidder.

14.0 – ANTI-DISCRIMINATION AGAINST ISRAEL ACT CERTIFICATION:

- A. If the Bidder meets the section 34.600, RSMo., definition of a “company” and the Bidder has ten or more employees, the Bidder must certify in writing that the Bidder is not currently engaged in a boycott of goods or services from the State of Israel and shall not engage in a boycott of goods or services from the State of Israel, if awarded a contract, for the duration of the contract. The Bidder is required to complete and submit the applicable portion of Section 004545 - Anti-Discrimination Against Israel Act Certification with its Bid Form. The applicable portion of the exhibit must be submitted prior to execution of a contract by the Owner and issuance of Notice to Proceed.

15.0 – MBE/WBE/SDVE INSTRUCTIONS

A. Definitions:

1. **“MBE”** means a Minority Business Enterprise.
2. **“MINORITY”** has the same meaning as set forth in 1 C.S.R. 10-17.010.
3. **“MINORITY BUSINESS ENTERPRISE”** has the same meaning as set forth in section 37.020, RSMo.
4. **“WBE”** means a Women’s Business Enterprise.
5. **“WOMEN’S BUSINESS ENTERPRISE”** has the same meaning as set forth in section 37.020, RSMo.
6. **“SDVE”** means a Service-Disabled Veterans Enterprise.
7. **“SERVICE-DISABLED VETERAN”** has the same meaning as set forth in section 34.074, RSMo.
8. **“SERVICE-DISABLED VETERAN ENTERPRISE”** has the same meaning as “Service-Disabled Veteran Business” set forth in section 34.074, RSMo.

B. MBE/WBE/SDVE General Requirements:

1. For all bids greater than \$100,000, the Bidder shall obtain MBE, WBE and SDVE participation in an amount equal to or greater than the percentage goals set forth in the Invitation for Bid and the Bid Form, unless the Bidder is granted a Good Faith Effort waiver by the Director of the Division, as set forth below. If the Bidder does not meet the MBE, WBE and SDVE goals, or make a good faith effort to do so, the Bidder shall be nonresponsive, and its bid shall be rejected.
2. The Bidder should submit with its bid all the information requested in the MBE/WBE/SDVE Compliance Evaluation Form for every MBE, WBE, or SDVE subcontractor or material supplier the Bidder intends to use for the contract work. The Bidder is required to submit all MBE/WBE/SDVE documentation before the stated time and date set forth in the Invitation for Bid. If the Bidder fails to provide such information by the specified date and time, the Owner shall reject the bid.
3. The Director reserves the right to request additional information from a Bidder to clarify the Bidder’s proposed MBE, WBE, and/or SDVE participation. The Bidder shall submit the clarifying information requested by the Owner within two (2) working days of receiving the request for clarification.
4. Pursuant to section 34.074, RSMo, a Prime Bidder that qualifies as an SDVE shall receive a three-percentage point bonus preference in the contract award evaluation process. The bonus preference will be calculated and applied by reducing the bid amount of the eligible SDVE by three percent of the apparent low responsive Bidder’s bid. Based on this calculation, if the eligible SDVE’s evaluation is less than the apparent low responsive Bidder’s bid, the eligible SDVE’s bid will become the apparent low responsive bid. This reduction is for evaluation purposes only and will have no impact on the actual amount(s) of the bid or the amount(s) of any contract awarded. In order to be eligible for the SDVE preference, the Bidder must complete and submit with its bid the Missouri Service-Disabled Veteran Business Form, and any information required by the form.

C. Computation of MBE/WBE/SDVE Goal Participation:

1. A Bidder who is a MBE, WBE, or SDVE may count 100% of the contract towards the MBE, WBE or SDVE goal, less any amounts awarded to another MBE, WBE or SDVE. (NOTE: a MBE firm that bids as general contractor must obtain WBE and SDVE participation; a WBE firm that bids as

a general contractor must obtain MBE and SDVE participation; and a SDVE firm that bids as general contractor must obtain MBE and WBE participation.) For the remaining contract amount to be counted towards the MBE, WBE or SDVE goal, the Bidder must complete the MBE/WBE/SDVE Compliance Evaluation Form (Section 004337) identifying itself as an MBE, WBE or SDVE.

2. The total dollar value of the work granted to a certified MBE, WBE or SDVE by the Bidder shall be counted towards the applicable goal.
3. Expenditures for materials and supplies obtained from a certified MBE, WBE, or SDVE supplier or manufacturer may be counted towards the MBE, WBE and SDVE goals, if the MBE, WBE, or SDVE assumes the actual and contractual responsibility for the provision of the materials and supplies.
4. The total dollar value of the work granted to a second or subsequent tier subcontractor or a supplier may be counted towards a Bidder's MBE, WBE and SDVE goals, if the MBE, WBE, or SDVE properly assumes the actual and contractual responsibility for the work.
5. The total dollar value of work granted to a certified joint venture equal to the percentage of the ownership and control of the MBE, WBE, or SDVE partner in the joint venture may be counted towards the MBE/WBE/SDVE goals.
6. Only expenditures to a MBE, WBE, or SDVE that performs a commercially useful function in the work may be counted towards the MBE, WBE and SDVE goals. A MBE, WBE, or SDVE performs a commercially useful function when it is responsible for executing a distinct element of the work and carrying out its responsibilities by performing, managing and supervising the work or providing supplies or manufactured materials.

D. Certification of MBE/WBE/SDVE Subcontractors:

1. In order to be counted towards the goals, an MBE or WBE must be certified by the State of Missouri Office of Equal Opportunity and an SDVE must be certified by the State of Missouri, Office of Equal Opportunity or by the Federal U.S. Small Business Administration directory.
2. The Bidder may determine the certification status of a proposed MBE or WBE subcontractor or supplier by referring to the Office of Equal Opportunity (OEO)'s online MBE/WBE directory <https://apps1.mo.gov/MWBCertifiedFirms/>. The Bidder may determine the eligibility of a SDVE subcontractor or supplier by referring to the Office of Equal Opportunity online SDVE directory at <https://oeo.mo.gov/sdve-certification-program/> or the Federal U.S. Small Business Administration directory <https://veterans.certify.sba.gov/#search>.
3. Additional information, clarifications, or other information regarding the MBE/WBE/SDVE listings in the directories may be obtained by contacting the Contract Specialist of record as shown in the Supplementary Conditions (Section 007300).

E. Waiver of MBE/WBE/SDVE Participation:

1. If a Bidder has made a good faith effort to secure the required MBE, WBE and/or SDVE participation and has failed, the Bidder shall submit with its bid the information requested in MBE/WBE/SDVE Good Faith Effort (GFE) Determination form. The Director will determine if the Bidder made a good faith effort to meet the applicable goals. If the Director determines that the Bidder did not make a good faith effort, the bid shall be rejected as being nonresponsive to the bid requirements. Bidders who demonstrate that they have made a good faith effort to include MBE, WBE, and/or SDVE participation will be granted a waiver and will be considered to be responsive to the applicable participation goals, regardless of the percent of actual participation obtained, if the bid is otherwise acceptable.
2. In determining whether a Bidder has made a good faith effort to obtain MBE, WBE and/or SDVE participation, the Director may evaluate the factors set forth in 1 CSR 30-5.010(6)(C) and the following:
 - a. The amount of actual participation obtained;

- b. How and when the Bidder contacted potential MBE, WBE, and SDVE subcontractors and suppliers;
- c. The documentation provided by the Bidder to support its contacts, including whether the Bidder provided the names, addresses, phone numbers, and dates of contact for MBE/WBE/SDVE firms contacted for specific categories of work;
- d. If project information, including plans and specifications, were provided to MBE/WBE/SDVE subcontractors;
- e. Whether the Bidder made any attempts to follow-up with MBE, WBE or SDVE firms prior to bid;
- f. Amount of bids received from any of the subcontractors and/or suppliers that the Bidder contacted;
- g. The Bidder's stated reasons for rejecting any bids;

F. Contractor MBE/WBE/SDVE Obligations

- 1. If awarded a contract, the Bidder will be contractually required to subcontract with or obtain materials from the MBE, WBE, and SDVE firms listed in its bid, in amounts equal to or greater than the dollar amount in the bid, unless the amount is modified in writing by the Owner.
- 2. If the Contractor fails to meet or maintain the participation requirements contained in the Contractor's bid, the Contractor must satisfactorily explain to the Director why it cannot comply with the requirement and why failing meeting the requirement was beyond the Contractor's control. If the Director finds the Contractor's explanation unsatisfactory, the Director may take any appropriate action including, but not limited to:
 - a. Declaring the Contractor ineligible to participate in any contracts with the Division for up to twelve (12) months (suspension); and/or
 - b. Declaring the Contractor be nonresponsive to the Invitation for Bid, or in breach of contract and rejecting the bid or terminating the contract.
- 3. If the Contractor replaces an MBE, WBE, or SDVE during the course of the contract, the Contractor shall replace it with another MBE, WBE, or SDVE or make a good faith effort to do so. All MBE, WBE and SDVE substitutions must be approved by the Director in writing.
- 4. The Contractor shall provide the Owner with regular reports on its progress in meeting its MBE/WBE/SDVE obligations. At a minimum, the Contractor shall report the dollar-value of work completed by each MBE, WBE, or SDVE during the preceding month and the cumulative total of work completed by each MBE, WBE or SDVE to date with each monthly application for payment. The Contractor shall also make a final report, which shall include the total dollar-value of work completed by each MBE, WBE, and SDVE during the entire contract.



State of Missouri Construction Contract

THIS AGREEMENT is made (DATE) by and between:

Contractor Name and Address

hereinafter called the "Contractor," and the **State of Missouri**, hereinafter called the "**Owner**", represented by the Office of Administration, Division of Facilities Management, Design and Construction.

WITNESSETH, that the Contractor and the Owner, for the consideration stated herein agree as follows:

ARTICLE 1. STATEMENT OF WORK

The Contractor shall furnish all labor and materials and perform all work required for furnishing and installing all labor, materials, equipment and transportation and everything necessarily inferred from the general nature and tendency of the plans and specifications for the proper execution of the work for:

Project Name: Upgrades and Renovations
Missouri Veterans Home
Cape Girardeau, Missouri

Project Number: U1805-01

in strict accordance with the Contract Documents as enumerated in Article 7, all of which are made a part hereof.

ARTICLE 2. TIME OF COMPLETION

The contract performance time is **480 working days** from the transmittal date of this agreement. The contract completion date is **MONTH, DAY, YEAR**. This time includes ten (10) working days for the Contractor to receive, sign and return the contract form along with required bonding and insurance certificates. Failure of the Contractor to provide correct bonding and insurance within the ten (10) working days shall not be grounds for a time extension. Receipt of proper bonding and insurance is a condition precedent to the formation of the contract and if not timely received, may result in forfeiture of the Contractor's bid security. Work may not commence until the Owner issues a written Notice to Proceed and must commence within seven (7) working days thereafter.

ARTICLE 3. LIQUIDATED DAMAGES

Whenever time is mentioned in this contract, time shall be and is of the essence of this contract. The Owner would suffer a loss should the Contractor fail to have the work embraced in this contract fully completed on or before the time above specified. **THEREFORE**, the parties hereto realize in order to adjust satisfactorily the damages on account of such failure that it might be impossible to compute accurately or estimate the amount of such loss or damages which the Owner would sustain by reason of failure to complete fully said work within the time required by this contract. The Contractor hereby covenants and agrees to pay the Owner, as and for **liquidated damages, the sum of \$1,000** per day for each and every day, Sunday and legal holidays excepted, during which the work remains incomplete and unfinished. Any sum which may be due the Owner for such damages shall be deducted and retained by the Owner from any balance which may be due the Contractor when said work shall have been finished and accepted. But such provisions shall not release the Bond of the Contractor from liability according to its terms. In case of failure to complete, the Owner will be under no obligation to show or prove any actual or specific loss or damage.

ARTICLE 4. CONTRACT SUM

The Owner shall pay the Contractor for the prompt, faithful and efficient performance of the conditions and undertakings of this contract, subject to additions, and deductions as provided herein, in current funds the sum of:

Base Bid: \$

Accepted Alternates, if applicable to the Project and accepted by the Owner.

TOTAL CONTRACT AMOUNT: (\$CONTRACT AMOUNT)

ARTICLE 5. PREVAILING WAGE RATE

MISSOURI PREVAILING WAGE LAW (Sections 290.210 to 290.340, RSMo): The Contractor shall pay not less than the specified hourly rate of wages, as set out in the wage order attached to and made part of the specifications for work under this contract, to all workers performing work under the contract, in accordance with sections 290.210 to 290.340, RSMo. The Contractor shall forfeit a penalty to the Owner of one hundred dollars per day (or portion of a day) for each worker that is paid less than the specified rates for any work done under the contract by the Contractor or by any subcontractor, in accordance with section 290.250, RSMo.

DAVIS-BACON ACT: Requirements of the Davis-Bacon Act are not applicable to this project.

ARTICLE 6. MINORITY/WOMEN/SERVICE DISABLED VETERAN BUSINESS ENTERPRISE PARTICIPATION

The Contractor has been granted a waiver of the 10% MBE and 10% WBE and 3% SDVE participation goals. The Contractor agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows: (OR)

The Contractor has met the MBE/WBE/SDVE participation goals and agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows:

MBE/WBE/SDVE Firm:	Subcontract Amt:\$
MBE/WBE/SDVE Firm:	Subcontract Amt:\$
MBE/WBE/SDVE Firm:	Subcontract Amt:\$

Total \$

MBE/WBE/SDVE assignments identified above shall not be changed without a contract change signed by the Owner.

The Director of the Division of Facilities Management, Design and Construction or his Designee shall be the final authority to resolve disputes and disagreements between the Contractor and the MBE/WBE/SDVE firms listed above when such disputes impact the subcontract amounts shown above.

ARTICLE 7. CONTRACT DOCUMENTS

The following documents are hereby incorporated into this contract by reference (all division/section numbers and titles are as utilized in the Project Manual published by the Owner for this Project):

1. Division 0 – Procurement and Contracting Information, including, but not limited to:
 - a. Invitation for Bid (Section 001116)
 - b. Instructions to Bidders (Section 002113)
 - c. Supplementary Instructions to Bidders (if applicable) (Section 002213)
 - d. The following documents as completed and executed by the Contractor and accepted by the Owner, if applicable:
 - i. Bid Form (Section 004113)
 - ii. Unit Prices (Section 004322)
 - iii. Proposed Contractors Form (Section 004336)
 - iv. MBE, WBE, SDVE Compliance Evaluation Form(s) (Section 004337)
 - v. MBE, WBE, SDVE Eligibility Determination Form for Joint Ventures (Section 004338)

- vi. MBE, WBE, SDVE Good Faith Effort (GFE) Determination Form (Section 004339)
 - vii. Missouri Service Disabled Veteran Business Form (Section 004340)
 - viii. Affidavit of Work Authorization (Section 004541)
 - e. Performance and Payment Bond, completed and executed by the Contractor and surety (Section 006113)
 - f. General Conditions (Section 007213)
 - g. Supplementary Conditions (Section 007300)
 - h. Supplementary General Conditions for Federally Funded/Assisted Construction Projects (Section 007333), if applicable
 - i. Wage Rate(s) (Section 007346)
- 2. Division 1 – General Requirements
 - 3. All Drawings identified in the Project Manual
 - 4. All Technical Specifications included in the Project Manual
 - 5. Addenda, if applicable

ARTICLE 8 – CERTIFICATION

By signing this contract, the Contractor hereby re-certifies compliance with all legal requirements set forth in Section 6.0, Bidder's Certifications of the Bid Form.

By signature below, the parties hereby execute this contract document.

APPROVED:

Brian Yansen, Director
Division of Facilities Management,
Design and Construction

Contractor's Authorized Signature

I, Corporate Secretary, certify that I am Secretary of the corporation named above and that (CONTRACTOR NAME), who signed said contract on behalf of the corporation, was then (TITLE) of said corporation and that said contract was duly signed for and in behalf of the corporation by authority of its governing body, and is within the scope of its corporate powers.

Corporate Secretary

SECTION 006113 - PERFORMANCE AND PAYMENT BOND FORM

KNOW ALL MEN BY THESE PRESENTS, THAT we _____

as principal, and _____

_____ as Surety, are held and firmly bound unto the

STATE OF MISSOURI. in the sum of _____ Dollars (\$ _____)

for payment whereof the Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

WHEREAS, the Principal has, by means of a written agreement dated the _____

day of _____, 20_____, enter into a contract with the State of Missouri for

(Insert Project Title and Number)

NOW, THEREFORE, if the Principal shall faithfully perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the State of Missouri, with or without notice to the Surety and during the life of any guaranty required under the contract; and shall also faithfully perform and fulfill all undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made with or without notice to the Surety; and shall also promptly make payment for materials incorporated, consumed or used in connection with the work set forth in the contract referred to above, and all insurance premiums, both compensation and all other kinds of insurance, on said work, and for all labor performed on such work, whether by subcontractor or otherwise, at not less than the prevailing hourly rate of wages for work of a similar character (exclusive of maintenance work) in the locality in which the work is performed and not less than the prevailing hourly rate of wages for legal holiday and overtime work (exclusive of maintenance work) in the locality in which the work is performed both as determined by the Department of Labor and Industrial Relations or determined by the Court of Appeal, as provided for in said contract and in any and all duly authorized modifications of said contract that may be hereafter made, with or without notice to the Surety, then, this obligation shall be void and of no effect, but it is expressly understood that if the Principal should make default in or should fail to strictly, faithfully and efficiently do, perform and comply with any or more of the covenants, agreements, stipulations, conditions, requirements or undertakings, as specified in or by the terms of said contract, and with the time therein named, then this obligation shall be valid and binding upon each of the parties hereto and this bond shall remain in full force and effect; and the same may be sued on at the instance of any material man, laborer, mechanic, subcontractor, individual, or otherwise to whom such payment is due, in the name of the State of Missouri, to the use of any such person.

AND, IT IS FURTHER specifically provided that any modifications which may hereinafter be made in the terms of the contract or in the work to be done under it or the giving by the Owner of any extension of the time for the performance of the contract or any other forbearance on the part of either the Owner or the Principal to the other, shall not in any way release the Principal and the Surety, or either or any of them, their heirs, executors, administrators and successors, from their liability hereunder, notice to the Surety of any such extension, modifications or forbearance being hereby waived.

IN WITNESS WHEREOF, the above bounden parties have executed the within instrument this _____ day of _____, 20 ____.

AS APPLICABLE:

AN INDIVIDUAL

Name: _____

Signature: _____

A PARTNERSHIP

Name of Partner: _____

Signature of Partner: _____

Name of Partner: _____

Signature of Partner: _____

CORPORATION

Firm Name: _____

Signature of President: _____

SURETY

Surety Name: _____

Attorney-in-Fact: _____

Address of Attorney-in-Fact: _____

Telephone Number of Attorney-in-Fact: _____

Signature Attorney-in-Fact: _____

NOTE: Surety shall attach Power of Attorney



STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION
PRODUCT SUBSTITUTION REQUEST

PROJECT NUMBER

PROJECT TITLE AND LOCATION

CHECK APPROPRIATE BOX

- ☐ **SUBSTITUTION PRIOR TO BID OPENING**
(Minimum of (5) working days prior to receipt of Bids as per Article 4 – Instructions to Bidders)
- ☐ **SUBSTITUTION FOLLOWING AWARD**
(Maximum of (20) working days from Notice to Proceed as per Article 3 – General Conditions)

FROM: BIDDER/CONTRACTOR (PRINT COMPANY NAME)

TO: ARCHITECT/ENGINEER (PRINT COMPANY NAME)

Bidder/Contractor hereby requests acceptance of the following product or systems as a substitution in accordance with provisions of Division One of the Bidding Documents:

SPECIFIED PRODUCT OR SYSTEM

SPECIFICATION SECTION NO.

SUPPORTING DATA

- ☐ Product data for proposed substitution is attached (include description of product, standards, performance, and test data)
- ☐ Sample ☐ Sample will be sent, if requested

QUALITY COMPARISON

	SPECIFIED PRODUCT	SUBSTITUTION REQUEST
NAME, BRAND		
CATALOG NO.		
MANUFACTURER		
VENDOR		

PREVIOUS INSTALLATIONS

PROJECT	ARCHITECT/ENGINEER
LOCATION	DATE INSTALLED

SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

REASON FOR SUBSTITUTION

DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?☐ YES ☐ NO

IF YES, EXPLAIN

SUBSTITUTION REQUIRES DIMENSIONAL REVISION OR REDESIGN OF STRUCTURE OR A/E WORK☐ YES ☐ NO**BIDDER'S/CONTRACTOR'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:**

We have investigated the proposed substitution. We believe that it is equal or superior in all respects to specified product, except as stated above; that it will provide the same Warranty as specified product; that we have included complete implications of the substitution; that we will pay redesign and other costs caused by the substitution which subsequently become apparent; and that we will pay costs to modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning as a result of the substitution.

BIDDER/CONTRACTOR

DATE

REVIEW AND ACTION☐ Resubmit Substitution Request with the following additional information:

☐ Substitution is accepted.☐ Substitution is accepted with the following comments:

☐ Substitution is not accepted.

ARCHITECT/ENGINEER

DATE



STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION
FINAL RECEIPT OF PAYMENT AND RELEASE

PROJECT NUMBER

KNOW ALL MEN BY THESE PRESENT THAT: hereinafter called "Subcontractor" who heretofore entered into an agreement with hereinafter called "Contractor", for the performance of work and/or furnishing of material for the construction of the project entitled

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

for the State of Missouri (Owner) which said subcontract is by this reference incorporated herein, in consideration of such final payment by Contractor.

DOES HEREBY:

1. ACKNOWLEDGE that they have been **PAID IN FULL** all sums due for work and materials contracted or done by their Subcontractors, Material Vendors, Equipment and Fixture Suppliers, Agents and Employees, or otherwise in the performance of the Work called for by the aforesaid Contract and all modifications or extras or additions thereto, for the construction of said project or otherwise.
2. RELEASE and fully, finally, and forever discharge the Owner from any and all suits, actions, claims, and demands for payment for work performed or materials supplied by Subcontractor in accordance with the requirements of the above referenced Contract.
1. REPRESENT that all of their Employees, Subcontractors, Material Vendors, Equipment and Fixture Suppliers, and everyone else has been **paid in full** all sums due them, or any of them, in connection with performance of said Work, or anything done or omitted by them, or any of them in connection with the construction of said improvements, or otherwise.

DATED this day of , 20 .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents



STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

MBE/WBE/SDVE PROGRESS REPORT

Remit with **ALL** Progress and Final Payments

(Please check appropriate box) ☐CONSULTANT ☐CONSTRUCTION

PAY APP NO.	PROJECT NUMBER
CHECK IF FINAL <input type="checkbox"/> FINAL	DATE

PROJECT TITLE			
PROJECT LOCATION			
FIRM			
ORIGINAL CONTRACT SUM (Same as Line Item 1. on Form A of Application for Payment) \$		TOTAL CONTRACT SUM TO DATE (Same as Line Item 3. on Form A of Application for Payment) \$	
THE TOTAL MBE/WBE/SDVE PARTICIPATION DOLLAR AMOUNT OF THIS PROJECT AS INDICATED IN THE ORIGINAL CONTRACT: \$			
SELECT MBE, WBE, SDVE	ORIGINAL CONTRACT PARTICIPATION AMOUNT	PARTICIPATION AMOUNT PAID-TO-DATE (includes approved contract changes)	CONSULTANT/SUBCONSULTANT OR CONTRACTOR/SUBCONTRACTOR/SUPPLIER COMPANY NAME
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	

Revised 06/2023

INSTRUCTIONS FOR MBE/WBE/SDVE PROGRESS REPORT

CONTRACTOR OR CONSULTANT TO FILL OUT AND REMIT WITH EACH PAY APPLICATION:

The MBE/WBE/SDVE Progress Report for the project is issued with the contract comprising values reported in the consultant's Proposal or on the successful contractor's Section 004337 Compliance Evaluation Forms.

At Initial Pay Application fill in the following:

1. Pay App No. Start with 1.
2. Fill in the Project Number and Date.
3. Enter Project Title, Project Location, and Firm.
4. Fill in the "Original Contract Sum" and "Total Contract Sum To Date" (Reference applicable Line Items on Form A of Application for Payment).
5. Indicate the Total Participation Dollar Amount from the Original Contract.
6. Select MBE, WBE, or SDVE for each Consultant/Subconsultant or Contractor/Subcontractor/Supplier.
7. Enter the "Total Amount of Subcontract", "\$ Amount (Paid-To-Date)", and Company Name.

For all subsequent Pay Applications fill in the following:

1. Pay App No.
2. If Final Pay App, check box.
3. Fill in the Project Number and Date.
4. Enter Project Title, Project Location, and Firm
5. At each Pay App fill in the "Original Contract Sum" and "Total Contract Sum To Date" (reference applicable Line Items on Form A of Application for Payment).
6. Indicate the Total Participation Dollar Amount from the Original Contract.
7. Select MBE, WBE, or SDVE for each Consultant/Subconsultant or Contractor/Subcontractor/Supplier
8. Enter the "Total Amount of Subcontract", "\$ Amount (Paid-To-Date)", and Company Name.



STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION
AFFIDAVIT – COMPLIANCE WITH PREVAILING WAGE LAW

PROJECT NUMBER

Before me, the undersigned Notary Public, in and for the County of _____

State of _____ personally came and appeared _____

(NAME)

of the _____

(POSITION)

(NAME OF THE COMPANY)

(a corporation) (a partnership) (a proprietorship) and after being duly sworn did depose and say that all provisions and requirements set out in Chapter 290, Sections 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on public works project have been fully satisfied and there has been no exception to the full and completed compliance with said provisions and requirements

and with Wage Determination No: _____ issued by the

Department of Labor and Industrial Relations, State of Missouri on the _____ day of _____ 20 ____

in carrying out the contract and working in connection with _____

(NAME OF PROJECT)

Located at _____ in _____ County

(NAME OF THE INSTITUTION)

Missouri, and completed on the _____ day of _____ 20 ____

SIGNATURE

NOTARY INFORMATION

NOTARY PUBLIC EMBOSSER OR
BLACK INK RUBBER STAMP SEAL

STATE

COUNTY (OR CITY OF ST. LOUIS)

SUBSCRIBED AND SWORN BEFORE ME, THIS

DAY OF

YEAR

USE RUBBER STAMP IN CLEAR AREA BELOW

NOTARY PUBLIC SIGNATURE

MY COMMISSION
EXPIRES

NOTARY PUBLIC NAME (TYPED OR PRINTED)

FILE: Closeout Documents

CERTIFICATE OF MATERIALS ORIGIN

FEDERAL PROJECT NUMBER		STATE PROJCT NUMBER	
ITEM DESCRIPTION		BID ITEM NUMBER	
INVOICE NUMBER		QUANTITY	
DATE RECEIVED		BILL OF LADING No.	

MATERIAL SOURCE (NAME AND ADDRESS) TO INCLUDE EACH SUPPLIER, FABRICATOR, AND MANUFACTURER INCLUDING HEAT/BATCH NUMBERS IF AVAILABLE

MATERIAL DESCRIPTION

DESCRIPTION OF MATERIALS OF UNKNOWN ORIGIN OR FOREIGN MATERIALS DELIVERED TO THE PROJECT

This certification is made for the purpose of establishing the materials acceptance under the Buy America Certification (23CFR 635.410) and the Contract Special Provisions. All iron and steel manufacturing processes, including protective coating for the domestic materials described above occurred in the United States of America. Manufacturer's certificates verify the origin above described in the domestic materials and will be kept on file for three years by the suppliers following final payment. Copies will be provided to the Missouri Department of Natural Resources upon request.

I declare under penalty of perjury under the Missouri and Federal Laws that the foregoing is true and correct.

Company Name and Address	Authorized Representative
	Name: Title: Signature: Date:

CERTIFICATE OF MATERIALS ORIGIN (NON-IRON/STEEL)

FEDERAL PROJECT NUMBER		STATE PROJECT NUMBER	
ITEM DESCRIPTION		BID ITEM NUMBER	
INVOICE NUMBER		QUANTITY	
DATE RECEIVED		BILL OF LADING No.	

MATERIAL SOURCE (NAME AND ADDRESS) TO INCLUDE EACH SUPPLIER, FABRICATOR, AND MANUFACTURER INCLUDING HEAT/BATCH NUMBERS IF AVAILABLE

MATERIAL DESCRIPTION

DESCRIPTION OF MATERIALS OF UNKNOWN ORIGIN OR FOREIGN MATERIALS DELIVERED TO THE PROJECT

This certification is made for the purpose of establishing the materials acceptance under the Buy America requirements in the Jobs ACT legislation which includes Build America, Buy America Act Publication L. No. 117-68. This certification is for the additional construction material requirements to be domestically produced in addition to the existing steel and iron Buy America requirements. The construction material origin and any manufacturing processes for this product shall all be performed domestically in the United States of America. Manufacturer's certificates shall verify the origin above described in the domestic materials and will be kept on file for three years by the suppliers following final payment. Copies will be provided to the Missouri Department of Natural Resources upon request.

I declare to the best of my knowledge under penalty of perjury under the Missouri and Federal Laws that the foregoing is true and correct.

Company Name and Address	Authorized Representative
	Name: Title: Signature: Date:

This data collection is for submitting a waiver request to the Build America, Buy America requirements. According to the Build America Buy America Act (BABAA), “none of the funds made available for a Federal financial assistance program for infrastructure, including each deficient program¹, may be obligated for a project unless all of the iron, steel, manufactured products, and construction materials used in the project are produced in the United States.”

Instructions: The applicant/recipient/subrecipient need to complete questions 1 through 16, sign and certify the form, and email/submit the waiver request to the Federal agency contact identified in your Federal award notification. The Federal agency will complete questions 1A through 11A. The Federal agency will review and determine to approve or not approve the waiver request.

Required fields are marked with an asterisk (*)

1. Submitter Type: *	Applicant	Recipient	Subrecipient
----------------------	-----------	-----------	--------------

Legal Name * | Unique Entity Identifier (UEI) *

Address 1 *

Address 2

City *

County/Parish

State

Province

Country *

Zip/Postal Code *

4. Submitter Email *

5. Submitter Phone Number *

March 2024 | Page 1

6. Describe the infrastructure project description and location, to the extent known. *

7. Total funding, including federal and non-federal shares: *

8. Total estimated infrastructure costs, including all federal and non-federal shares (to the extent known): *

9. Is this waiver for a specific product or a category of products? Check one below: *

- a. Specific Product
 - b. Category of Products
-

10. Listing of Materials, Technical Specifications, and Quantity: *

List of iron or steel items, manufactured products, and construction materials proposed to be excepted from BABAA requirements, including name, cost, countries of origin (if known), and relevant Product Service Code (PSC) and North American Industry Classification System (NAICS) code for each. List each item separately. List the name of the product, how much the product costs, in U.S. dollars, the country or countries of origin, if known, and the relevant PSC and NAICS for each product. Links to manuals that provide the PSC and NAICS codes:

- PSC Codes: <https://www.acquisition.gov/psc-manual>
 - NAICS Codes: <https://www.census.gov/naics/>
-

10.1 Technical specification descriptions of items to be waived, if applicable.

10.2 Quantity required:

11. Waiver Type *

Choose one of the three waiver types listed in this section and only answer the questions applicable to the chosen waiver type.

- **Nonavailability waivers:** Complete questions [11.1.1](#), and [11.1.2](#).
- **Unreasonable Cost waivers:** Complete questions [11.2.1](#), [11.2.2](#), and [11.2.3](#).
- **Public Interest waivers:** Complete question [11.3](#).

11.1 Nonavailability Waiver

Applicable responses to the following are required:

11.1.1 A description of the due diligence performed by the applicant, including names and contact information of the manufacturers, distributors, or suppliers contacted for quotes (minimum 3), and the responses provided.

11.1.2 If one or more respondent indicated that they could provide a Build America Buy America (BABA) compliant item, but you are requesting the non-availability waiver because the lead time to obtain the BABA compliant item is excessive, indicate below how the difference in lead time between a BABA compliant and non-compliant item is going to cause the project to miss a significant milestone or deadline.

11.2 Unreasonable Cost Waiver (BABA compliance increases total project cost by more than 25 percent)

Applicable responses to the following are required:

11.2.1 What is the additional cost of the BABA compliant items, compared to using iron and steel, manufactured products, and construction materials of non-domestic or unknown origin? Attach documentation of prices for BABA compliant and non-compliant items for items to be included in the cost comparison. Attach an additional PDF file if needed.

(See page 8 for [attachment instructions](#))

11.2.2 What is the additional administrative cost for compliance with the BABA requirements? Attach a certification from the engineer or architect attesting to the actual or expected additional administrative cost. Attach an additional PDF file if needed. (See page 8 for [attachment instructions](#))

11.2.3 The BABA requirements will be waived for individual items until the total additional cost of BABA compliance is less than 25 percent of the total project cost. Which items is the applicant requesting to be waived from the BABA requirements to reduce costs below the 25 percent cost threshold?

11.3 Public Interest Waiver

Explain how waiving the BABA requirement for this project or product serves the public interest.

12. Additional Waiver Information

Provide any additional information for the Agency's consideration of the requested waiver.

13. Anticipated Impacts *

Identify any anticipated impacts if no waiver is issued. Attach additional PDF pages if needed.

(See page 8 for [attachment instructions](#))

14. Certifying Official Name: *

15. Certifying Official Signature: *

16. Date of Certification: *

Questions to be Answered by the Federal Agency

All fields are required and must be filled out.

If additional space is needed see [attachment instructions on page 8](#).

Federal [agency instructions](#) can be found on pages 13 and 14 of this document.

1A. Federal Awarding Agency

2A. Federal Financial Assistance Program Listing Number

3A. Federal Financial Assistance Program Title

4A. Federal Awarding Agency Point of Contact

First Name

Last Name

Email

Phone

5A. FAIN and Federal Awarding Agency Organizational Information

Provide the Federal Award Identification Number (FAIN) (if available) and Federal Agency name, subcomponent name (if known), and the CGAC code (e.g., Common Government-wide Accounting Classification (CGAC) Agency Code).

Enter the Federal Agency name, and subcomponent name, if known, and the CGAC code. **USDA's CGAC code is 012. For example, an appropriate response would be U.S. Department of Agriculture, Forest Service, CGAC 012.**

FAIN

Federal Agency name, and subcomponent name, if known, and the CGAC code

6A. Waiver Level

Select one of the four waiver levels:

Project

Award

Program

Agency

7A. Is this a general applicability waiver?

Yes

No

8A. Agency Summary and Determination

Provide an agency summary and determination regarding the waiver request.

9A. Agency Waiver

This response should be a narrative and include all necessary information to support the justification for a waiver. To avoid the need for a project-specific waiver, a justification may cite, if applicable, the absence of any BABA compliant bids received in response to a solicitation.

(See page 8 for [attachment instructions](#)).

10A. Public Comments

Provide any relevant comments received through the public comment period. This section is to be filled out after the waiver has been posted to the Agency's BABA Website. For example, the USDA website is found at <https://www.usda.gov/ocfo/federal-financial-assistance-policy/USDABuyAmericaWaiver>.

11A. Waiver Timeline

Select the timeline you are requesting for the waiver of the BABAA domestic sourcing requirements.

For the entire period of performance of the grant in which the infrastructure projects will occur.

OR

For a limited time during the period of performance of the grant. We request a waiver of the identified BABAA domestic sourcing requirements from [] to [] date.

File Attachment Instructions

Attach PDF files if additional space is needed to answer any of the questions in this form. Indicate which questions the attachment addresses.

To attach a file, select the “Attach File” button to open the Attachment Panel in Adobe Reader or Acrobat.



Drag and drop your attachments to the panel or select the “Add a New Attachment” button from the left Attachment panel in Adobe reader or Acrobat.

Please indicate which questions the attachments address by naming your file with the question number (i.e., Question 9A.pdf).

Recipient Instructions:

1. **Submitter Type:** Select a submitter type. Applicant, Recipient or Subrecipient.
2. **Submitter Contact Information:**
 - **Legal Name:** Required. Enter the legal name of the financial assistance award recipient that is seeking a waiver under the award. This is the organization that has registered with the System for Award Management (SAM). Information on registering with SAM may be obtained by visiting [SAM.gov](https://sam.gov).
 - **UEI:** Required. Enter the organization's Unique Entity Identifier (UEI) received from SAM. The UEI is a unique 12 character organization identifier. Information on registering with System for Award Management ([SAM.gov](https://sam.gov)) may be obtained by visiting the [Grants.gov](https://grants.gov) website. If the entity is not required to register in SAM.gov, respond "Exempt from registration in SAM.gov."
 - **Address:** Required. Enter address: **Address 1** (required); **City** (required); **County/Parish, State** (required if country is US); **Province; Country** (required); **9-digit ZIP/Postal Code** (required if country is US). If +4 does not exist or it is unknown for the address, enter "0000".
3. **Submitter First and Last Name:** Provide the first and last name of the person submitting the waiver request.
4. **Submitter Email:** Enter the email of the person submitting the waiver request.
5. **Submitter Phone Number:** Enter the area code and phone number of the person submitting the waiver request. Include the area code, phone number and phone extension if applicable.
6. **Describe the infrastructure project description and location** (to the extent known). The location can be an address (street, city, state, country and postal code) or a description of an area, such as a roadway or tract of land. Global Positioning System (GPS) location information may also be used.
7. **Total Funding, including Federal and non-Federal shares:** Report the total funding amount for the award, in whole dollars. If the entity is contributing non-Federal funds, sometimes known as cost sharing or match, and add that to the Federal funding amount and report the sum of the two figures in the field.
8. **Total estimated infrastructure costs, including all Federal and non-Federal shares** (to the extent known): List the portion of the total award amount that represents construction costs, including any Federal funding being used for this project. If the entity is contributing non-Federal funds, sometimes known as cost sharing or match, add that to the Federal funding amount and report the sum of the two figures in the field.
9. **Is this a waiver for a specific product or a category of products?** Check the box next to Specific Product or Category of products.

Example:

- 9a. **Product waiver:** 8-inch stainless steel valves
- 9b. **Category of products:** all valves on the project.

10. Listing of Materials, Technical Specifications, and Quantity

List of iron or steel item(s), manufactured products, and construction material(s) proposed to be excepted from BABAA requirements, including name, cost, country(ies) of origin (if known), and relevant Product Service Code (PSC) and North American Industry Classification System (NAICS) code for each. Please see the instructions below for listing the items. List the name of the product, how much the product costs, in U.S. Dollars, the country or countries of origin, if known, and the relevant PSC and NAICS for each product. Links to manuals that provide the PSC and NAICS codes can be found below.

10.1 Technical specifications description of items to be waived, if applicable. Provide the technical specifications for each of the items listed in question 10.

10.2 Quantity required: List the quantity required for each item listed in question 10.

- **PSC Codes:** <https://www.acquisition.gov/psc-manual>
- **NAICS Codes:** <https://www.census.gov/naics/>

List each item separately.

- **“Manufactured Product”:** Items that consist of two or more of the listed construction materials below that have been combined together through a manufacturing process, and items that include at least one of the listed construction materials combined with a material that is not listed through a manufacturing process, should be treated as manufactured products, rather than as construction materials. For example, a plastic framed sliding window should be treated as a manufactured product while plate glass should be treated as a construction material.
- **“Construction Materials”** includes an article, material, or supply— other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives— that is or consists primarily of:
 - non-ferrous metals;
 - plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
 - glass (including optic glass);
 - lumber; or drywall.

11. Waiver type: Choose one of the three waiver types listed in this section and only answer the questions applicable to the chosen waiver type:

- **Nonavailability waivers:** Complete questions 11.1, 11.1.1, and 11.1.2.
- **Unreasonable Cost waivers:** Complete questions 11.2, 11.2.1, 11.2.2, and 11.2.3.
- **Public Interest waivers:** Complete question 11.3.

Provide sufficient information related to the specific request.

11.1 Nonavailability Waiver: Check this box if seeking a Nonavailability waiver. By choosing this selection, this means you are unable to obtain American made iron, steel, manufactured products, or construction materials for an infrastructure project. You are requesting the Federal agency to waive the application of the Build America Buy America domestic preference. You must demonstrate market research, which may be accomplished with assistance from the Federal agency, and adequately considered qualified alternate items, products, or materials.

Applicable responses to the following are required:

11.1.1 A description of the due diligence performed by the applicant, engineer/architect, or contractor, including names and contact information of the manufacturers, distributors, or suppliers contacted for quotes (minimum 3), and the responses provided.

11.1.2 If one or more respondent indicated that they could provide a BABA compliant item, but you are requesting the non-availability waiver because the lead time to obtain the BABA compliant item is excessive, indicate below how the difference in lead time between a BABA compliant and non-compliant item is going to cause the project to miss a significant milestone or deadline.

- 11.2 Unreasonable Cost.** (BABA compliance increases total project cost by more than 25 percent). This checkbox is chosen when the inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the total project cost to the overall project by more than 25 percent. You are requesting the Federal agency to waive the application of the BABAA domestic preference. You must provide documentation to the Federal agency that no domestic alternatives are available within the cost parameter. This may be accomplished with assistance from the Federal agency.

Applicable responses to the following are required:

- 11.2.1** What is the additional cost of BABA compliant iron and steel, manufactured products, and construction materials, compared to items of non-domestic or unknown origin? Attach documentation of prices for BABA compliant and non-compliant items for items to be included in the cost comparison. Such documentation may include quotes from suppliers or bid tabulations from bid actions which solicited both BABA compliant and non-compliant products. Attach an additional PDC file if needed.
- 11.2.2** What is the additional administrative cost for compliance with the BABA requirements? Attach a certification from the engineer or architect attesting to the actual or expected additional administrative cost. Attach an additional PDF file if needed.
- 11.2.3** The BABAA allows for a waiver in cases where “the inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent.” If you are requesting a waiver under this requirement, we will waive items until the excess costs due to BABA are less than 125 percent of the non-BABA project. The BABA requirements will be waived for individual items until the total additional cost of BABA compliance is less than 25 percent of the total project cost.

For example, the project has three items which each cost \$20 for the non-domestic item. The equivalent domestic item costs \$30. Total project cost includes those items, along with \$40 of labor and soft costs. (“Soft costs” is a construction industry term or contractor accounting term for an expense item that is not considered direct construction cost. Soft costs include architectural, engineering, financing, and legal fees, and other pre- and post-construction expenses.) In this example, administration of BABA adds \$4 to soft costs. The total cost of the non-BABA project would be \$100 ($3 \times \$20 + \40) and the BABA project is \$134 ($3 \times \$30 + \44), a 34 percent increase. Waiving BABA requirements for one of the three items would decrease total project cost to \$124, which is less than 25 percent cost threshold.

Item	BABA cost	Non-BABA cost
Construction contracts		
Items procured outside of construction contract		
Architecture/engineering services		
Subconsultants		
Land and right-of-ways		
Legal services		
Funds administration		
Construction management		
Construction contingency		
Interest		
Equipment		
Refinancing		
Other soft costs		
Total Project Cost	A	B

1) Percentage increase in total project cost due to BABA (= 100 percent multiplied by (A-B)/B):

2) Dollar amount to be waived (= A – 1.25 multiplied by B):

Indicate which items the applicant wishes to waive from the BABA requirements to bring the total costs below 125 percent of the non-BABA total project cost. Items should be selected judiciously so that the total cost savings of using non-BABA items exceeds the amount in Row 2 by the smallest practicable amount. Only items submitted in response to question 10.2.1 are eligible for a waiver (it is not expected that soft costs will be affected significantly by the waiver).

11.3 Public Interest. Explain how waiving the BABA requirement for this project or product serves the public interest. By choosing this checkbox, you will explain how waiving the BABA domestic preference for this project or product serves the public interest. You can demonstrate definite impacts on the community if specific items, products or materials are not utilized in an infrastructure project. You are requesting the Federal agency waive the application of the BABA domestic preference because the domestic content preference would be inconsistent with the public interest. You will ensure this waiver is used judiciously and construed to ensure the maximum utilization of goods, products, and materials produced in the United States.

12. **Waiver Additional Information:** Indicate any additional information for the Agency's consideration of the requested waiver.

13. **Anticipated Impacts:** Identify any anticipated impacts if no waiver is issued. Provide a narrative that will explain the impact to the award, project, or the public should the waiver be denied. Attach additional PDF pages if needed.

14. **Certifying Official Name:** The name of the person who is certifying the waiver request.

15. **Certifying Official Signature:** The signature of the person who is certifying the waiver request will sign this section.

16. **Date of Certification:** Provide the date (MM/DD/YYYY) that the signature was provided.

Federal Agency Instructions:

- 1A. Provide the Federal awarding agency.
- 2A. Provide the Federal financial assistance program listing number.
- 3A. Provide the Federal financial assistance program title.
- 4A. Provide the first name, last name, email, and phone number of the Federal awarding agency point of contact.
- 5A. Provide the Federal Award Identification Number (FAIN) (if available) and the Federal awarding agency organizational information (e.g., Common Government wide Accounting Classification (CGAC) Agency Code). Enter the Federal Agency name, and subcomponent name if known, and the CGAC code. **USDA's CGAC code is 012. For example, an appropriate response would be U.S. Department of Agriculture, Forest Service, CGAC 012.**
- 6A. Indicate waiver level. Project, Award, Program or Agency.
- 7A. Is this a general applicability waiver? Indicate if this is a general applicability waiver or not.
- 8A. Agency summary and determination regarding the waiver request. Provide a narrative summarizing the Federal Agency's determination of the waiver request. It should include the reasons for approving or disapproving the waiver.
- 9A. Agency waiver: In an attempt to avoid the need for a project specific waiver, such a justification may cite, if applicable, the absence of any Buy America-compliant bids received in response to a solicitation. This should be a narrative and include all necessary information to support the justification for a waiver. This may be submitted as an attachment as a PDF file.
- 10A. Any relevant comments received through the public comment period. This is to be filled out after the waiver has been posted to the Agency's Buy American Website. For example, the USDA website if found here: <https://www.usda.gov/ocfo/federal-financial-assistance-policy/USDABuyAmericaWaiver>.
- 11A. Select the timeline you are requesting for the waiver of the BABAA domestic sourcing requirements:

For the entire period of performance of the grant in which the infrastructure projects will occur.
OR
For a limited time during the period of performance of the grant. We request a waiver of the identified BABAA domestic sourcing requirements from [XX/XX/XXXX] only until [XX/XX/XXXX] date. After the identified end date, if there is a need for another waiver for the infrastructure projects, a new Build America Buy America Waiver Request form must be completed and submitted to the Federal agency. The waiver time frame cannot exceed the approved period of performance of the grant unless there is an approved grant extension by the Federal awarding agency.

Public Posting of Waiver Request Information

The BABAA domestic sourcing requirements waiver authority generally requires the Federal awarding agency to post this waiver information for a period of public comment and review. The Department will not publicly post information considered to be personally identifiable information (PII), including signatures and specific contact information such as an email address and phone number. However, all other information contained in this form, along with any supporting documentation, may be publicly posted so that the public has adequate information to comment on your requested waiver of the BABAA domestic sourcing requirements. If you feel that some of the information contained in this waiver request is “proprietary information” and do not want this information disclosed, please follow the instructions in “Submission of Proprietary Information”, below. Please note that your designations of exempt material are not binding on the Department.

Submission of Proprietary Information

FOIA exempts from mandatory disclosure any “trade secrets or commercial or financial information obtained from a person and privileged or confidential.” 5 U.S.C. 552(b)(4) (Exemption 4). In accordance with Exemption 4, the Department will maintain as confidential any documents submitted by you, or prepared by the applicant or grantee, that are both customarily and actually treated as private by the applicant or grantee, or closely held and not publicly disseminated. If you feel that some or all of this submission falls within the scope of Exemption 4 and is entitled to confidential treatment, you must indicate the specific information the applicant or grantee considers proprietary in a cover attachment to this form. Please note that your designations of exempt material are not binding on the Department.

Paperwork Burden Statement

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless such collection displays a valid OMB control number. The valid OMB control number for this information collection is 0505-0028. Public reporting burden for this collection of information is estimated to average 10 hours per response, including time for reviewing instructions, searching existing data sources, gathering, and maintaining the data needed, and completing and reviewing the collection of information. The obligation to respond to this collection is *required to obtain or retain benefit* (with section 70914 of the [Build America Buy America Act \(Pub. L. No. 117-58 §§ 70901-70952\)](#)). If you have any comments concerning the accuracy of the time estimate, suggestions for improving this individual collection, or if you have comments or concerns regarding the status of your individual form, application, or survey, please contact your assigned program officer directly.

GENERAL CONDITIONS

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SECTION 007213 - GENERAL CONDITIONS

- A. These General Conditions apply to each section of these specifications. The Contractor is subject to the provisions contained herein.
- B. The General Conditions are intended to define the relationship of the Owner, the Designer and the Contractor thereby establishing certain rules and provisions governing the operation and performance of the work so that the work may be performed in a safe, orderly, expeditious and workmanlike manner.

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

As used in these contract documents, the following terms shall have the meanings and refer to the parties designated in these definitions.

1. **"COMMISSIONER"**: The Commissioner of the Office of Administration.
2. **"CONSTRUCTION DOCUMENTS"**: The "Construction Documents" shall consist of the Project Manual, Drawings and Addenda.
3. **"CONSTRUCTION REPRESENTATIVE"**: Whenever the term "Construction Representative" is used, it shall mean the Owner's Representative at the work site.
4. **"CONTRACTOR"**: Party or parties who have entered into a contract with the Owner to furnish work under these specifications and drawings.
5. **"DESIGNER"**: When the term "Designer" is used herein, it shall refer to the Architect, Engineer, or Consultant of Record specified and defined in Paragraph 2.0 of the Supplemental Conditions, or his duly authorized representative. The Designer may be either a consultant or state employee.
6. **"DIRECTOR"**: Whenever the term "Director" is used, it shall mean the Director of the Division of Facilities Management, Design and Construction or his Designee, representing the Office of Administration, State of Missouri. The Director is the agent of the Owner.
7. **"DIVISION"**: Shall mean the Division of Facilities Management, Design and Construction, State of Missouri.
8. **"INCIDENTAL JOB BURDENS"**: Shall mean those expenses relating to the cost of work, incurred either in the home office or on the job-site, which are necessary in the course of doing business but are incidental to the job. Such costs include office supplies and equipment, postage, courier services, telephone expenses including long distance, water and ice and other similar expenses.
9. **"JOINT VENTURE"**: An association of two (2) or more businesses to carry out a single business enterprise for profit for which purpose they combine their property, capital, efforts, skills and knowledge.
10. **"OWNER"**: Whenever the term "Owner" is used, it shall mean the State of Missouri. Acting by and through the Office of Administration, Division of Facilities Management, Design and Construction.
11. **"PROJECT"**: Wherever the term "Project" is used, it shall mean the work required to be completed by the construction contract.
12. **"PROJECT MANUAL"**: The "Project Manual" shall consist of Introductory Information, Invitation for Bid, Instructions to Bidders, Bid Documents, Additional Information, Standard Forms, General Conditions, Supplemental General Conditions, General Requirements and Technical Specifications.
13. **"SUBCONTRACTOR"**: Party or parties who contract under, or for the performance of part or this entire Contract between the Owner and Contractor. The subcontract may or may not be direct with the Contractor.
14. **"WORK"**: All supervision, labor, materials, tools, supplies, equipment, and any incidental operations and/or activities required by or reasonably inferable from the Contract Documents necessary to construct the Project and to produce the results intended by the Contract Documents in a safe, expeditious, orderly, and workmanlike manner so that the project shall be complete and finished in the best manner known to each respective trade.
15. **"WORKING DAYS"**: are all calendar days except Saturdays, Sundays and the following holidays: New Year's Day, Martin Luther King, Jr. Day, Lincoln Day, Washington's Birthday (observed), Truman Day, Memorial Day, Juneteenth, Independence Day, Labor Day, Columbus Day, Veterans Day (observed), Thanksgiving Day, Christmas Day.

ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

- A. In case of discrepancy between drawings and specifications, specifications shall govern. Should discrepancies in architectural drawings, structural drawings and mechanical drawings occur, architectural drawings shall govern and, in case of conflict between structural and mechanical drawings, structural drawings shall govern.
- B. Specifications are separated into titled divisions for convenience of reference only and to facilitate letting of contracts and subcontracts. The Contractor is responsible for establishing the scope of work for subcontractors, which may cross titled divisions. Neither the Owner nor Designer will establish limits and jurisdiction of subcontracts.
- C. Figured dimensions take precedence over scaled measurements and details over smaller scale general drawings. In the event of conflict between any of the documents contained within the contract, the documents shall take precedence and be controlling in the following sequence: addenda, supplementary general conditions, general conditions, division 1 specifications, technical division specifications, drawings, bid form and instructions to bidders.
- D. Anything shown on drawings and not mentioned in these specifications or vice versa, as well as any incidental work which is obviously necessary to complete the project within the limits established by the drawings and specifications, although not shown on or described therein, shall be performed by the Contractor at no additional cost as a part of his contract.
- E. Upon encountering conditions differing materially from those indicated in the contract documents, the Contractor shall promptly notify the Designer and Construction Representative in writing before such conditions are disturbed. The Designer shall promptly investigate said conditions and report to the Owner, with a recommended course of action. If conditions do materially differ and cause an increase or decrease in contract cost or time required for completion of any portion of the work, a contract change will be initiated as outlined in Article 4 of these General Conditions.
- E. Only work included in the contract documents is authorized, and the Contractor shall do no work other than that described therein or in accordance with appropriately authorized and approved contract changes.

ARTICLE 1.3 - COMPLIANCE WITH LAWS, PERMITS, REGULATIONS AND INSPECTIONS

- A. Since the Owner is the State of Missouri, municipal or political subdivisions, zoning ordinances, construction codes (other than licensing of trades), and other like ordinances are not applicable to construction on Owner's property, and Contractor will not be required to submit drawings and specifications to any municipal or political subdivision, authority, obtain construction permits or any other licenses (other than licensing of trades) or permits from or submit to inspections by any municipality or political subdivision relating to the construction for this project. All permits or licenses required by municipality or political subdivision for operation on property not belonging to Owner shall be obtained by and paid for by Contractor. Each Contractor shall comply with all applicable laws, ordinances, rules and regulations that pertain to the work of this contract.
- B. Contractors, subcontractors and their employees engaged in the businesses of electrical, mechanical, plumbing, carpentry, sprinkler system work, and other construction related trades shall be licensed to perform such work by the municipal or political subdivision where the project is located, if such licensure is required by local code. Local codes shall dictate the level (master, journeyman, and apprentice) and the number, type and ratio of licensed tradesmen required for this project within the jurisdiction of such municipal or political subdivision.
- C. Equipment and controls manufacturers and their authorized service and installation technicians that do not maintain an office within the jurisdiction of the municipal or political subdivision but are a listed or specified contractor or subcontractor on this project are exempt from Paragraph 1.3 B above.
- D. The Contractor shall post a copy of the wage determination issued for the project and included as a part of the contract documents, in a prominent and easily accessible location at the site of construction for the duration of the project.
- E. Any contractor or subcontractor to such contractor at any tier signing a contract to work on this project shall provide a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the Department of Labor and Industrial Relations which is at least as stringent as an approved OSHA program. The contractor shall forfeit as a penalty to the public body on whose

behalf the contract is made or awarded, two thousand five hundred dollars plus one hundred dollars for each employee employed by the contractor or subcontractor, for each calendar day, or portion thereof, such employee is employed without the required training.

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

A. The Contractor and his subcontractors will not discriminate against individuals based on race, color, religion, national origin, sex, disability, or age, but may use restrictions which relate to bona fide occupational qualifications. Specifically, the Contractor and his subcontractors shall not discriminate:

1. Against recipients of service on the basis of race, color, religion, national origin, sex, disability or age.
2. Against any employee or applicant, for employment on the basis of race, color, religion, national origin, sex or otherwise qualified disability status.
3. Against any applicant for employment or employee on the basis of age, where such applicant or employee is between ages 40 and 70 and where such Contractor employs at least 20 persons.
4. Against any applicant for employment or employee on the basis of that person's status as a disabled or Vietnam-era veteran.

The Contractor and his Subcontractors will ensure applicants for employment and employees are treated equally without regard to race, color, religion, national origin, sex, disability, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion and transfer; recruitment or recruitment advertising; and selection for training, including apprenticeship. The Contractor and his Subcontractors will give written notice of their commitments under this clause to any labor union with which they have bargaining or other agreements under this clause to any labor union with which they have bargaining or other agreements.

B. In the event of the Contractor's or his subcontractor's noncompliance with any provisions of this Article of the Contract, the Owner may cancel this contract in whole or in part or require the Contractor to terminate his contract with the subcontractor.

ARTICLE 1.5 - ANTI-KICKBACK

No employee of the division, shall have or acquire any pecuniary interest, whether direct or indirect, in this contract or in any part hereof. No officer, employee, designer, attorney, or administrator of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall have or acquire any pecuniary interest, whether direct or indirect, in this contract, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

ARTICLE 1.6 - PATENTS AND ROYALTIES

A. The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liabilities of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article or appliance manufactured or used in the performance of this contract, including its use by the Owner, unless otherwise specifically stipulated in the contract documents.

B. If the Contractor uses any design, device or materials covered by letters, patent or copyright, the Contractor shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, without exception, that the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract and shall indemnify the Owner for any cost, expense or damage it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

- A. By virtue of statutory authority a preference will be given to Missouri labor and to products of mines, forests and quarries of the state of Missouri when they are found in marketable quantities in the state, and all such materials shall be of the best quality and suitable character that can be obtained at reasonable market prices, all as provided for in Section 8.280, Missouri Revised Statutes and Cumulative Supplements.
- B. Furthermore, pursuant to Section 34.076 Missouri Revised Statutes and Cumulative Supplements, a preference shall be given to those persons doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less. In addition, in order for a non-domiciliary bidder to be successful, his bid must be that same percentage lower than a domiciliary Missouri bidder's bid, as would be required for a Missouri bidder to successfully bid in the non-domiciliary state.
- C. In accordance with the Missouri Domestic Products Procurement Act Section 34.350 RSMo and Cumulative Supplements any manufactured goods or commodities used or supplied in the performance of this contract or any subcontract thereto shall be manufactured, assembled or produced in the United States, unless the specified products are not manufactured, assembled or produced in the United States in sufficient quantities to meet the agency's requirements or cannot be manufactured, assembled or produced in the United States within the necessary time in sufficient quantities to meet the contract requirements, or if obtaining the specified products manufactured, assembled or produced in the United States would increase the cost of this contract for purchase of the product by more than ten percent.

ARTICLE 1.8 - COMMUNICATIONS

- A. All notices, requests, instructions, approvals, and claims must be in writing and shall be delivered to the Designer and copied to the Construction Representative for the project except as required by Article 1.12 Disputes and Disagreements, or as otherwise specified by the Owner in writing as stated in Section 012600. Any such notice shall be deemed to have been given as of the time of actual receipt.
- B. The Contractor shall attend on-site progress and coordination meetings, as scheduled by the Construction Representative, no less than once a month.

- C. The Contractor shall ensure that major subcontractors and suppliers shall attend monthly progress meetings as necessary to coordinate the work, and as specifically requested by the Construction Representative.

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

- A. The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs.
- B. The Contractor shall consult the drawings for all other contractors in connection with this work. Any work conflicting with the above shall be brought to the attention of the Owner's Representative before the work is performed. If the Contractor fails to do this, and constructs any work which interferes with the work of another contractor, the Contractor shall remove any part so conflicting and rebuild same, as directed by the Owner's Representative at no additional cost to the Owner.
- C. Each contractor shall be required to coordinate his work with other contractors so as to afford others reasonable opportunity for execution of their work. No contractor shall delay any other contractor by neglecting to perform contract work at the proper time. If any contractor causes delay to another, they shall be liable directly to that contractor for such delay in addition to any liquidated damages which might be due the Owner.
- D. Should the Contractor or project associated subcontractors refuse to cooperate with the instructions and reasonable requests of other Contractors or other subcontractors in the overall coordinating of the work, the Owner may take such appropriate action and issue directions, as required, to avoid unnecessary and unwarranted delays.
- E. Each Contractor shall be responsible for damage done to Owner's or other Contractor's property by him/her or workers in his employ through their fault or negligence.
- F. Should a Contractor sustain any damage through any act or omission of any other Contractor having a contract with the Owner, the Contractor so damaged shall have no claim or cause of action against the Owner for such damage, but shall have a claim or cause of action against the other Contractor to recover any and all damages sustained by reason of the acts or omissions of such Contractor. The phrase "acts or omissions" as used in this section shall be defined to include, but

not be limited to, any unreasonable delay on the part of any such contractors.

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

- A. No assignment by Contractor of any amount or any part of this contract or of the funds to be received there under will be recognized unless such assignment has had the written approval of the Director and the surety has been given due notice of such assignment and has furnished written consent thereto. In addition to the usual recitals in assignment contracts, the following language must be set forth: "It is agreed that the funds to be paid to the assignee under this assignment are subject to performance by the Contractor of this contract and to claims or liens for services rendered or materials supplied for the performance of the work called for in said contract in favor of all persons, firms or corporations rendering such services or supplying such materials."

ARTICLE 1.11 - INDEMNIFICATION

- A. Contractor agrees to indemnify and save harmless Owner and its respective commissioners, officers, officials, agents, consultants and employees and Designer, their agents, servants and employees, from and against any and all liability for damage arising from injuries to persons or damage to property occasioned by any acts or omissions of Contractor, any subcontractors, agents, servants or employees, including any and all expense, legal or otherwise, which may be incurred by Owner or Designer, its agents, servants or employees, in defense of any claim, action or suit.
- B. The obligations of the Contractor under this paragraph shall not extend to the liability of the Designer, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, contract changes, design or specifications, or (2) giving of or the failure to give directions or instructions by the Designer, his agents or employees as required by this contract documents provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

It is hereby expressly agreed and understood that in case any controversy or difference of opinion arises during construction, best efforts will be given to resolution at the field level. Should those efforts be unsuccessful, the Contractor has the right to appeal in writing, the decision of the Director's Designee to the Director at Room 730 Truman Building, P.O. Box 809, Jefferson City, Missouri 65102. The decision of the Director shall be final and binding on all parties.

ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES

- A. The Owner shall give all orders and directions contemplated under this contract relative to the execution of the work. During progress of work the Owner will be represented at the project site by the Construction Representative and/or Designer, whose responsibilities are to see that this contract is properly fulfilled.
- B. The Owner shall at all times have access to the work whenever it is in preparation or progress. The Contractors shall provide proper facilities for such access and for inspection and supervision.
- C. All materials and workmanship used in the work shall be subject to the inspection of the Designer and Construction Representative, and any work which is deemed defective shall be removed, rebuilt or made good immediately upon notice. The cost of such correction shall be borne by the Contractor. Contractor shall not be entitled to an extension of the contract completion date in order to remedy defective work. All rejected materials shall be immediately removed from the site of the work.
- D. If the Contractor fails to proceed at once with the correction of rejected defective materials or workmanship, the Owner may, by separate contract or otherwise, have the defects remedied or rejected. Materials removed from the site and charge the cost of the same against any monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.
- E. Failure or neglect on the part of Owner to observe faulty work, or work done which is not in accordance with the drawings and specifications shall not relieve the Contractor from responsibility for correcting such work without additional compensation.
- F. The Owner shall have the right to direct the Contractor to uncover any completed work.
 - 1. If the Contractor fails to adequately notify the Construction Representative and/or Designer of an inspection as required by the Contract Documents, the Contractor shall, upon written request, uncover the work. The Contractor shall bear all costs associated with uncovering and again covering the work exposed.
 - 2. If the Contractor is directed to uncover work, which was not otherwise required by the Contract Documents to be inspected, and the work is found to be defective in any respect, no compensation shall be allowed for this work. If, however, such work is found to meet

the requirements of this contract, the actual cost of labor and material necessarily involved in the examination and replacement plus 10% shall be allowed the Contractor.

- G. The Designer shall give all orders and directions contemplated under this contract relative to the scope of the work and shall give the initial interpretation of the contract documents.
- H. The Owner may file a written notice to the Contractor to dismiss immediately any subcontractors, project managers, superintendents, foremen, workers, watchmen or other employees whom the Owner may deem incompetent, careless or a hindrance to proper or timely execution of the work. The Contractor shall comply with such notice as promptly as practicable without detriment to the work or its progress.
- I. If in the Owner's judgment it becomes necessary at any time to accelerate work, when ordered by the Owner in writing, the Contractor shall redirect resources to such work items and execute such portions of the work as may be required to complete the work within the current approved contract schedule.

ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES

The Contractor shall register and utilize the Owner's eBuilder digital project management system for submission of documents described in the following sections. This includes but is not limited to submittals as required by designer, payment applications, Request for Information (RFI), construction change orders, Request for Proposals (RFP), Designer Supplemental Instructions (DSI), etc.

ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS

- A. The Contractor may request use of any article, device, product, material, fixture, form or type of construction which in the judgment of the Owner and Designer is equal in all respects to that named. Standard products of manufacturers other than those specified will be accepted when, prior to the ordering or use thereof, it is proven to the satisfaction of the Owner and Designer that they are equal in design, strength, durability, usefulness and convenience for the purpose intended.
- B. Any changes required in the details and dimensions indicated on the drawings for the substitution of products other than those specified shall be properly made at the expense of the Contractor requesting the substitution or change.
- C. The Contractor shall submit a request for such substitutions in writing to the Owner and Designer within twenty (20) working days after the date of

the "Notice to Proceed." Thereafter no consideration will be given to alternate forms of accomplishing the work. This Article does not preclude the Owner from exercising the provisions of Article 4 hereof.

- D. Any request for substitution by the Contractor shall be submitted in accordance with SECTION 002113 - INSTRUCTIONS TO BIDDERS.
- E. When a material has been approved, no change in brand or make will be permitted unless:
 - 1. Written verification is received from the manufacturer stating they cannot make delivery on the date previously agreed, or
 - 2. Material delivered fails to comply with contract requirements.

ARTICLE 3.2 -- SUBMITTALS

- A. The Contractor's submittals must be submitted with such promptness as to allow for review and approval so as not to cause delay in the work. The Contractor shall coordinate preparation and processing of submittals with performance of construction activities.

Coordinate each submittal with fabrication, = purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

Submit four (4) copies to the Designer and additional copies as required for the subcontractors and material suppliers. Also provide copies to meet the requirements for maintenance manuals.

- B. All subcontractors' shop drawings and schedules shall be submitted by the Contractor and shall bear evidence that Contractor has received, reviewed, and approved them. Any shop drawings and schedules submitted without this evidence will be returned to the Contractor for resubmission.
- C. The Contractor shall include with the shop drawing, a letter indicating any and all deviations from the drawings and/or specifications. Failure to notify the Designer of such deviations will be grounds for subsequent rejection of the related work or materials. If, in the opinion of the Designer, the deviations are not acceptable, the Contractor will be required to furnish the item as specified and indicated on the drawings.
- D. The Designer shall check shop drawings and schedules with reasonable promptness and approve them only if they conform to the design concept of the project and comply with the information given in the contract documents. The approval shall not relieve the Contractor from the responsibility to comply with the drawings and specifications, unless the Contractor has called the Designer's attention to the deviation, in writing, at the time of

submission and the Designer has knowingly approved thereof. An approval of any such modification will be given only under the following conditions:

1. It is in the best interest of the Owner
 2. It does not increase the contract sum and/or completion time
 3. It does not deviate from the design intent
 4. It is without prejudice to any and all rights under the surety bond.
- E. No extension of time will be granted because of the Contractor's failure to submit shop drawings and schedules in ample time to allow for review, possible resubmission, and approval. Fabrication of work shall not commence until the Contractor has received approval. The Contractor shall furnish prints of approved shop drawings and schedules to all subcontractors whose work is in any way related to the work under this contract. Only prints bearing this approval will be allowed on the site of construction
- F. The Contractor shall maintain a complete file on-site of approved shop drawings available for use by the Construction Representative.

ARTICLE 3.3 – AS-BUILT DRAWINGS

- A. The Contractor shall update a complete set of the construction drawings, shop drawings and schedules of all work monthly by marking changes, and at the completion of their work (prior to submission of request for final payment) note all changes and turn the set over to the Construction Representative. The updates shall show all addenda, all field changes that were made to adapt to field conditions, changes resulting from contract changes or supplemental instructions, and all locations of structures, buried installations of piping, conduit, and utility services. All buried and concealed items both inside and outside shall be accurately located as to depth and referenced to permanent features such as interior or exterior wall faces and dimensions shall be given in a neat and legible manner in a contrasting colored pencil or ink. If approved by the Designer, an electronic file format may be provided.

ARTICLE 3.4 – GUARANTY AND WARRANTIES

- A. General Guaranty
1. Neither the final certificate of payment nor any provision in the contract documents nor partial use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with contract requirements.

2. The Contractor or surety shall remedy any defects in the work and pay for any damage to property resulting there from which shall appear within a period of one (1) year from the date of substantial completion unless a longer period is otherwise specified or a differing guaranty period has been established in the substantial completion certificate. The Owner will give notice of observed defects with reasonable promptness.
3. In case of default on the part of the Contractor in fulfilling this part of this contract, the Owner may correct the work or repair the damage and the cost and expense incurred in such event shall be paid by or recoverable from the Contractor or surety.
4. The work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's guaranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment

B. Extended Warranty

Manufacturer's certificates of warranty shall be obtained for all major equipment. Warranty shall be obtained for at least one year. Where a longer period is offered at no additional cost or called for in the specific equipment specifications, the longer period shall govern.

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

- A. Immediately after equipment submittals are approved and no later than ten (10) working days prior to the substantial completion inspection, the Contractor shall provide to the Designer three (3) copies of operating instructions and service manuals, containing the following:
1. Start-up and Shut-down Procedures: Provide a step-by-step write up of all major equipment. When manufacturer's printed start-up, trouble shooting and shut-down procedures are available; they may be incorporated into the operating manual for reference.

2. Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.
 3. Equipment List: List of all major equipment as installed shall be prepared to include model number, capacities, flow rate, name plate data, shop drawings and air and water balance reports.
 4. Service Instructions: Provide the following information for all pieces of equipment.
 - a. Recommended spare parts including catalog number and name of local supplier or factory representative.
 - b. Belt sizes, types, and lengths.
 - c. Wiring diagrams.
 5. Manufacturer's Certificate of Warranty as described in Article 3.4.
 6. Prior to the final payment, furnish to the Designer three (4) copies of parts catalogs for each piece of equipment furnished by him/her on the project with the components identified by number for replacement ordering.
- B. Submission of operating instructions shall be done in the following manner.
1. Manuals shall be in quadruplicate, and all materials shall be bound into volumes of standard 8½" x 11" hard binders. Large drawings too bulky to be folded into 8½" x 11" shall be separately bound or folded and in envelopes, cross referenced and indexed with the manuals.
 2. The manuals shall identify project name, project number, and include the name and address of the Contractor, subcontractors and manufacturers who were involved with the activity described in that particular manual.
 3. Internally subdivide the binder contents with permanent page dividers, logically organized with tab titles clearly printed under reinforced laminated plastic tabs.
 4. Contents: Prepare a Table of Contents for each volume, with each product or system description identified.

ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES

- A. The Contractor shall keep on site, during progress of the work, a competent superintendent satisfactory to the Construction Representative. The superintendent shall represent the Contractor and all agreements made by the superintendent shall be binding. The superintendent shall

carefully study and compare all drawings, specifications and other instructions and shall promptly notify the Construction Representative and Designer, in writing, any error, inconsistency or omission which may be discovered. The superintendent shall coordinate all work on the project. Any change of the superintendent shall be approved by the Construction Representative.

- B. Contractor shall, at all times, enforce strict discipline and good order among his employees, and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him/her.
- C. The Contractor shall supply sufficient labor, material, plant and equipment and pay when due any laborer, subcontractor or supplier for supplies furnished and otherwise prosecute the work with diligence to prevent work stoppage and ensure completion thereof within the time specified.
- D. The Contractor and each of his subcontractors shall submit to the Construction Representative, through the Designer such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.
- E. The Contractor, subcontractors, and material suppliers shall upon written request, give the Owner access to all time cards, material invoices, payrolls, estimates, profit and loss statements, and all other direct or indirect costs related to this work.
- F. The Contractor shall be responsible for laying out all contract work such as layout of architectural, structural, mechanical and electrical work, which shall be coordinated with layouts of subcontractors for general construction work. The Contractor is also responsible for unloading, uncrating and handling of all materials and equipment to be erected or placed by him/her, whether furnished by Contractor or others. No extra charges or compensation will be allowed as a result of failure to verify dimensions before ordering materials or fabricating items.
- G. The Contractor must notify the Construction Representative at least one working day before placing concrete or burying underground utilities, pipelines, etc.
- H. Contractors shall prearrange time with the Construction Representative for the interruption of any facility operation. Unless otherwise specified in these documents, all connections, alterations or relocations as well as all other portions of the work will be performed during normal working hours.

- I. The Contractor shall coordinate all work so there will not be prolonged interruptions of existing equipment operation. Any existing plumbing, heating, ventilating, air conditioning or electrical disconnections necessary for the project, which affect portions of this construction or building or any other building must be scheduled with the Construction Representative to minimize or avoid any disruption of facility operations. In no case, unless previously approved in writing by the Construction Representative, shall utilities be left disconnected at the end of a work day or over a weekend. Any interruption of utilities either intentionally or accidentally shall not relieve the Contractor responsible for the interruption from the responsibility to repair and restore the utility to normal service. Repairs and restoration shall be made before the workers responsible for the repair and restoration leave the job.
- J. Contractors shall limit operations and storage of materials to the area within the project, except as necessary to connect to existing utilities, and shall not encroach on neighboring property. The Contractor shall be responsible for repair of their damage to property on or off the project site occurring during construction of project. All such repairs shall be made to the satisfaction of the property owner.
- K. Unless otherwise permitted, all materials shall be new and both workmanship and materials shall be of the best quality.
- L. Unless otherwise provided and stipulated within these specifications, the Contractor shall furnish, construct, and/or install and pay for materials, devices, mechanisms, equipment, all necessary personnel, utilities including, but not limited to water, heat, light and electric power, transportation services, applicable taxes of every nature, and all other facilities necessary for the proper execution and completion of the work.
- M. Contractor shall carefully examine the plans and drawings and shall be responsible for the proper fitting of his material, equipment and apparatus into the building.
- N. The Contractor or subcontractors shall not overload, or permit others to overload, any part of any structure during the performance of this contract.
- O. All temporary shoring, bracing, etc., required for the removal of existing work and/or for the installation of new work shall be included in this contract. The Contractor shall make good, at no cost to the Owner, any damage caused by improper support or failure of shoring in any respect. Each Contractor shall be responsible for shoring required to protect his work or adjacent property and improvements of Owner and shall be responsible for shoring or for giving written notice to adjacent property owners. Shoring shall be removed only after completion of permanent supports.
- P. The Contractor shall provide at the proper time such material as is required for support of the work. If openings are required, whether shown on drawings or not, the Contractor shall see that they are properly constructed.
- Q. During the performance of work the Contractor shall be responsible for providing and maintaining warning signs, lights, signal devices, barricades, guard rails, fences and other devices appropriately located on site which will give proper and understandable warning to all persons of danger of entry onto land, structure or equipment.
- R. The Contractor shall be responsible for protection, including weather protection, and proper maintenance of all equipment and materials.
- S. The Contractor shall be responsible for care of the finished work and shall protect same from damage or defacement until substantial completion by the Owner. If the work is damaged by any cause, the Contractor shall immediately begin to make repairs in accordance with the drawings and specifications. Contractor shall be liable for all damage or loss unless attributable to the acts or omissions of the Owner or Designer. Any claim for reimbursement shall be submitted in accordance with Article 4. After substantial completion the Contractor will only be responsible for damage resulting from acts or omissions of the Contractor or subcontractors through final warranty.
- T. In the event the Contractor encounters an unforeseen hazardous material, the Contractor shall immediately stop work in the area affected and report the condition to the Owner and Designer in writing. The Contractor shall not be required, pursuant to Article 4, to perform, any work relating to hazardous materials.
- U. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 4.
- V. Before commencing work, Contractors shall confer with the Construction Representative and facility representative and review any facility rules and regulations which may affect the conduct of the work.

- W. Project signs will only be erected on major projects and only as described in the specifications. If no sign is specified, none shall be erected.

ARTICLE 3.7 -- SUBCONTRACTS

- A. Subcontractor assignments as identified in the bid form shall not be changed without written approval of the Owner. The Owner will not approve changes of a listed subcontractor unless the Contractor documents, to the satisfaction of the Owner that the subcontractor cannot or will not perform the work as specified.
- B. The Contractor is fully responsible to the Owner for the acts and omissions of all subcontractors and of persons either directly or indirectly employed by them.
- C. Every subcontractor shall be bound by the applicable terms and provisions of these contract documents, but no contractual relationship shall exist between any subcontractor and the Owner unless the right of the Contractor to proceed with the work is suspended or this contract is terminated as herein provided, and the Owner in writing elects to assume the subcontract.
- D. The Contractor shall upon receipt of "Notice to Proceed" and prior to submission of the first payment request, notify the Designer and Construction Representative in writing of the names of any subcontractors to be used in addition to those identified in the bid form and all major material suppliers proposed for all parts of the work.

ARTICLE 4 -- CHANGES IN THE WORK

4.1 CHANGES IN THE WORK

- A. The Construction Representative, without giving notice to the surety and without invalidating this contract, may order extra work or make changes by altering, adding to or deducting from the work, this contract sum being adjusted accordingly. All such work shall be executed under the conditions of the original contract. A claim for extension of time caused by any change must be adjusted at the time of ordering such change. No future request for time will be considered.
- B. Each Contract Change shall include all costs required to perform the work including all labor, material, equipment, overheads and profit, delay, disruptions, or other miscellaneous expenses. No subsequent requests for additional compensation including claims for delay, disruption, or reduced efficiency as a result of each change will be considered. Values from the Schedule of Values will not be binding as a basis for additions to or deductions from the contract price.

- C. The amount of any adjustment in this contract price for authorized changes shall be agreed upon before such changes become effective and shall be determined, through submission of a request for proposal, as follows:

1. By an acceptable fixed price proposal from the Contractor. Breakdowns shall include all takeoff sheets of each Contractor and subcontractor. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.
2. By a cost-plus-fixed-fee (time and material) basis with maximum price, total cost not to exceed said maximum. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.
3. By unit prices contained in Contractor's original bid form and incorporated in the construction contract.

- D. Overhead and Profit on Contract Changes shall be applied as follows:

1. The overhead and profit charge by the Contractor and all subcontractors shall be considered to include, but is not limited to: incidental job burdens, small truck (under 1 ton) expense, mileage, small hand tools, warranty costs, company benefits and general office overhead. Project supervision including field supervision and job site office expense shall be considered a part of overhead and profit unless a compensable time extension is granted.
2. The percentages for overhead and profit charged on Contract Changes shall be subject to the following limits: (a) the percentage mark-up for the Contractor shall be limited to the Contractor's fee; (b) fifteen percent (15%) maximum for Work directly performed by employees of a subcontractor, or sub-subcontractor; (c) five percent (5%) maximum for the Work performed or passed through to the Owner by the Contractor; (d) five percent (5%) maximum subcontractor's mark-up for

Work performed by a sub-subcontractor and passed through to the Owner by the subcontractor and Contractor; and (e) in no case shall the total overhead and profit paid by the Owner on any Contract Changes exceed twenty-five percent (25%) of the cost of materials, labor and equipment (exclusive of Contractor or any Subcontractor overhead and profit) necessary to put the contract change work in place.

3. The Contractor will be allowed to add the cost of Contractor's payment and performance bonding, builder's risk insurance, and general liability insurance to their cost of work. The above listed bonding and insurance cost shall not exceed two percent (2%) and shall be allowed on the total cost of the added work, including overhead and profit.
 4. On proposals covering both increases and decreases in the amount of this contract, the application of overhead and profit shall be on the net change in the cost of the work.
 5. The percentage(s) for overhead and profit to be credited to the Owner on Contract Changes that are solely decreases in the quantity of work or materials shall be the same as those for additive Contract Changes provided above.
- E. No claim for an addition to this contract sum shall be valid unless authorized as aforesaid in writing by the Owner. In the event that none of the foregoing methods are agreed upon, the Owner may order the Contractor to perform work on a time and material basis. The cost of such work shall be determined by the Contractor's actual labor and material cost to perform the work plus overhead and profit as outlined herein. The Designer and Construction Representative shall approve the Contractor's daily time and material invoices for the work involved.
- F. If the Contractor claims that any instructions involve extra cost under this contract, the Contractor shall give the Owner's Representative written notice thereof within a reasonable time after the receipt of such instructions, and in any event before proceeding to execute the work. No such claim shall be valid unless so made and authorized by the Owner, in writing.
- G. In an emergency affecting the safety of life or of the structure or of adjoining property, the Contractor, without special instruction or authorization from the Construction Representative, is hereby permitted to act at their discretion to prevent such threatened loss or injury. The Contractor shall submit a claim for compensation for such emergency work in writing to the Owner's Representative.

ARTICLE 4.2 – CHANGES IN COMPLETION TIME

- A. Extension of the number of work days stipulated in the Contract for completion of the work with compensation may be made when:
1. The contractor documents that proposed Changes in the work, as provided in Article 4.1, extends construction activities critical to contract completion date, OR
 2. The Owner suspends all work for convenience of the Owner as provided in Article 7.3, OR
 3. An Owner caused delay extends construction activities critical to contract completion (except as provided elsewhere in these General Conditions). The Contractor is to review the work activities yet to begin and evaluate the possibility of rescheduling the work to minimize the overall project delay.
- B. Extension of the number of work days stipulated in the Contract for completion of the work without compensation may be made when:
1. Weather-related delays occur, subject to provisions for the inclusion of a specified number of "bad weather" days when provided for in Section 012100-Allowances, OR
 2. Labor strikes or acts of God occur, OR
 3. The work of the Contractor is delayed on account of conditions which were beyond the control of the Contractor, subcontractors or suppliers, and were not the result of their fault or negligence.
- C. No time extension or compensation will be provided for delays caused by or within the control of the Contractor, subcontractors or suppliers and for concurrent delays caused by the Owner.
- D. The Contractor shall notify the Owner promptly of any occurrence or conditions which in the Contractor's opinion results in a need for an extension of time. The notice shall be in writing and shall include all necessary supporting materials with details of any resultant costs and be submitted in time to permit full investigation and evaluation of the Contractor's claim. The Owner shall promptly acknowledge the Contractor's notice and, after recommendation from the Owner's Representative and/or Designer, shall provide a decision to the Contractor. Failure on the part of the Contractor to provide such notice and to detail the costs shall constitute a waiver by the Contractor of any claim. Requests for extensions of time shall be for working days only.

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT

A. Upon receipt of the "Intent to Award" letter, the Contractor must submit the following properly executed instruments to the Owner:

1. Contract;
2. Performance/payment bond as described in Article 6.1;
3. Certificates of Insurance, or the actual policies themselves, showing that the Contractor has obtained the insurance coverage required by Article 6.2.

Above referenced items must be received by the Owner within ten (10) working days after the effective date of the contract. If not received, the Owner may treat the failure to timely submit them as a refusal by the Contractor to accept a contract for this work and may retain as liquidated damages the Contractor's bid bond, cashier's check or certified check as provided in the Instructions to Bidders. Upon receipt the Owner will issue a "Notice to Proceed" with the work to the Contractor.

B. Within the time frame noted in Section 013200 - Schedules, following receipt of the "Notice to Proceed", the Contractor shall submit to the Owner a progress schedule and schedule of values, showing activities through the end of the contract period. Should the Contractor not receive written notification from the Owner of the disapproval of the schedule of values within fifteen (15) working days, the Contractor may consider it approved for purpose of determining when the first monthly Application and Certification for Payment may be submitted.

C. The Contractor may commence work upon receipt of the Division of Facilities Management, Design and Construction's "Notice to Proceed" letter. Contractor shall prosecute the work with faithfulness and energy, and shall complete the entire work on or before the completion time stated in the contract documents or pay to the Owner the damages resulting from the failure to timely complete the work as set out within Article 5.4.

ARTICLE 5.2 -- PROJECT CONSTRUCTION

A. Each Contractor shall submit for the Owner's approval, in reproducible form, a progress schedule showing the rate of progress and the order of the work proposed to carry on various phases of the project. The schedule shall be in conformance

with the requirements outlined in Section 013200 – Schedules.

B. Contractor shall employ and supply a sufficient force of workers, material, and equipment and shall pay when due, any worker, subcontractor or supplier and otherwise prosecute the work with such diligence so as to maintain the rate of progress indicated on the progress schedule, prevent work stoppage, and insure completion of the project within the time specified.

ARTICLE 5.3 -- PROJECT COMPLETION

A. Substantial Completion. A Project is substantially complete when construction is essentially complete and work items remaining to be completed can be done without interfering with the Owner's ability to use the Project for its intended purpose.

1. Once the Contractor has reached what they believe is Substantial Completion, the Contractor shall notify the Designer and the Construction Representative of the following:
 - a. That work is essentially complete with the exception of certain listed work items. The list shall be referred to as the "Contractor's Punch."
 - b. That all Operation and Maintenance Manuals have been assembled and submitted in accordance with Article 3.5A.
 - c. That the Work is ready for inspection by the Designer and Construction Representative. The Owner shall be entitled to a minimum of ten working days notice before the inspection shall be performed.
2. If the work is acceptable, the Owner shall issue a Certificate of Substantial Completion, which shall set forth the responsibilities of the Owner and the Contractor for utilities, security, maintenance, damage to the work and risk of loss. The Certificate shall also identify those remaining items of work to be performed by the Contractor. All such work items shall be complete within 30 working days of the date of the Certificate, unless the Certificate specifies a different time. If the Contractor shall be required to perform tests that must be delayed due to climatic conditions, it is understood that such tests and affected equipment will be identified on the Certificate and shall be accomplished by the Contractor at the earliest possible date. Performance of the tests may not be required before Substantial Completion can be issued. The date of the issuance of the Certificate of

Substantial Completion shall determine whether or not the work was completed within the contract time and whether or not Liquidated Damages are due.

3. If the work is not acceptable, and the Owner does not issue a Certificate of Substantial Completion, the Owner shall be entitled to charge the Contractor with the Designer's and Owner's costs of re-inspection, including time and travel.
- B. Partial Occupancy. Contractor agrees that the Owner shall be permitted to occupy and use any completed or partially completed portions of the Project, when such occupancy and use is in the Owner's best interest. Owner shall notify Contractor of its desire and intention to take Partial Occupancy as soon as possible but at least ten (10) working days before the Owner intends to occupy. If the Contractor believes that the portion of the work the Owner intends to occupy is not ready for occupancy, the Contractor shall notify the Owner immediately. The Designer shall inspect the work in accordance with the procedures above. If the Contractor claims increased cost of the project or delay in completion as a result of the occupancy, he shall notify the Owner immediately but in all cases before occupancy occurs.
- C. Final Completion. The Project is finally complete when the Certificate of Substantial Completion has been issued and all work items identified therein as incomplete have been completed, and when all administrative items required by the contract have been completed. Final Completion entitles the Contractor to payment of the outstanding balance of the contract amount including all change orders and retainage. Within five (5) working days of the date of the Certificate of Substantial Completion, the Contractor shall identify the cost to complete any outstanding items of work. The Designer shall review the Contractor's estimate and either approve it or provide an independent estimate for all such items. If the Contractor fails to complete the remaining items within the time specified in the Certificate, the Owner may terminate the contract and go to the surety for project completion in accordance with Article 7.2 or release the contract balance to the Contractor less 150% of the approved estimate to complete the outstanding items. Upon completion of the outstanding items, when a final cost has been established, any monies remaining shall be paid to the Contractor. Failure to complete items of work does not relieve the Contractor from the obligation to complete the administrative requirements of the contract, such as the provisions of Article 5.3 FAILURE TO COMPLETE ALL ITEMS OF WORK UNDER THE CONTRACT SHALL BE CONSIDERED A

DEFAULT AND BE GROUNDS FOR CONTRACT TERMINATION AND DEBARMENT.

- D. Liquidated Damages. Contractor agrees that the Owner may deduct from the contract price and retain as liquidated damages, and not as penalty or forfeiture, the sum stipulated in this contract for each work day after the Contract Completion Day on which work is not Substantially Complete. Assessment of Liquidated Damages shall not relieve the Contractor or the surety of any responsibility or obligation under the Contract. In addition, the Owner may, without prejudice to any other rights, claims, or remedies the Owner may have including the right to Liquidated Damages, charge the Contractor for all additional expenses incurred by the Owner and/or Designer as the result of the extended contract period through Final Completion. Additional Expenses shall include but not be limited to the costs of additional inspections.
- E. Early Completion. The Contractor has the right to finish the work before the contract completion date; however, the Owner assumes no liability for any hindrances to the Contractor unless Owner caused delays result in a time extension to the contract completion date. The Contractor shall not be entitled to any claims for lost efficiencies or for delay if a Certificate of Substantial Completion is given on or before the Contract Completion Date.

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

- A. Payments on account of this contract will be made monthly in proportion to the work which has been completed. Request for payment must be submitted on the Owner's forms. No other pay request will be processed. Supporting breakdowns must be in the same format as Owner's forms and must provide the same level of detail. The Designer will, within 5 working days from receipt of the contractor's request for payment either issue a Certificate for Payment to the Owner, for such amount as the Designer determines is properly due, or notify the Contractor in writing of reasons for withholding a Certificate. The Owner shall make payment within 30 calendar days after the "Application and Certification for Payment" has been received and certified by the Designer. The following items are to be attached to the contractor's pay request:
 1. Updated construction schedule
 2. Certified payrolls consisting of name, occupation and craft, number of hours worked and actual wages paid for each individual employee, of the Contractor and all subcontractors working on the project

- B. The Owner shall retain 5 percent of the amount of each such payment application, except as allowed by Article 5.4, until final completion and acceptance of all work covered by this contract.
- C. Each payment made to Contractor shall be on account of the total amount payable to Contractor and all material and work covered by paid partial payment shall thereupon become the sole property of Owner. This provision shall not be construed as relieving Contractor from sole responsibility for care and protection of materials and work upon which payments have been made or restoration of any damaged work or as a waiver of the right of Owner to require fulfillment of all terms of this contract.
- D. Materials delivered to the work site and not incorporated in the work will be allowed in the Application and Certification for Payment on the basis of one hundred (100%) percent of value, subject to the 5% retainage providing that they are suitably stored on the site or in an approved warehouse in accordance with the following requirements:
 - 1. Material has previously been approved through submittal and acceptance of shop drawings conforming to requirements of Article 3.2 of General Conditions.
 - 2. Delivery is made in accordance with the time frame on the approved schedule.
 - 3. Materials, equipment, etc., are properly stored and protected from damage and deterioration and remain so - if not, previously approved amounts will be deleted from subsequent pay applications.
 - 4. The payment request is accompanied by a breakdown identifying the material equipment, etc. in sufficient detail to establish quantity and value.
- E. The Contractor shall be allowed to include in the Application and Certification for Payment, one hundred (100%) of the value, subject to retainage, of major equipment and material stored off the site if all of the following conditions are met:
 - 1. The request for consideration of payment for materials stored off site is made at least 15 working days prior to submittal of the Application for Payment including such material. Only materials inspected will be considered for inclusion on Application for Payment requests.
 - 2. Materials stored in one location off site are valued in excess of \$25,000.
 - 3. That a Certificate of Insurance is provided indicating adequate protection from loss, theft

conversion or damage for materials stored off site. This Certificate shall show the State of Missouri as an additional insured for this loss.

- 4. The materials are stored in a facility approved and inspected, by the Construction Representative.
- 5. Contractor shall be responsible for, Owner costs to inspect out of state facilities, and any delays in the completion of the work caused by damage to the material or for any other failure of the Contractor to have access to this material for the execution of the work.
- F. The Owner shall determine the amount, quality and acceptability of the work and materials which are to be paid for under this contract. In the event any questions shall arise between the parties, relative to this contract or specifications, determination or decision of the Owner or the Construction Representative and the Designer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected in any manner or to any extent by such question.
- G. Payments Withheld: The Owner may withhold or nullify in whole or part any certificate to such extent as may be necessary to protect the Owner from loss on account of:
 - 1. Defective work not remedied. When a notice of noncompliance is issued on an item or items, corrective action shall be undertaken immediately. Until corrective action is completed, no monies will be paid and no additional time will be allowed for the item or items. The cost of corrective action(s) shall be borne by the Contractor.
 - 2. A reasonable doubt that this contract can be completed for the unpaid balance.
 - 3. Failure of the Contractor to update as-built drawings monthly for review by the Construction Representative.
 - 4. Failure of the Contractor to update the construction schedule.When the Construction Representative is satisfied the Contractor has remedied above deficiencies, payment shall be released.
- H. Final Payment: Upon receipt of written notice from the Contractor to the Designer and Project Representative that the work is ready for final inspection and acceptance, the Designer and Project Representative, with the Contractor, shall promptly make such inspection. If the work is acceptable and the contract fully performed, the Construction Representative shall complete a final acceptance report and the Contractor will be

directed to submit a final Application and Certification for Payment. If the Owner approves the same, the entire balance shall be due and payable, with the exception of deductions as provided for under Article 5.4.

1. Where the specifications provide for the performance by the Contractor of (certain tests for the purpose of balancing and checking the air conditioning and heating equipment and the Contractor shall have furnished and installed all such equipment in accordance with the specifications, but said test cannot then be made because of climatic conditions, such test shall may be considered as required under the provisions of the specifications, Section 013300 and this contract may be substantial Full payment will not be made until the tests have been made and the equipment and system is finally accepted. If the tests are not completed when scheduled, the Owner may deduct 150% of the value of the tests from the final payment.
2. The final payment shall not become due until the Contractor delivers to the Construction Representative:
 - a) A complete file of releases, on the standard form included in the contract documents as "Final Receipt of Payment and Release Form", from subcontractors and material suppliers evidencing payment in full for services, equipment and materials, as the case may require, if the Owner approves, or a consent from the Surety to final payment accepting liability for any unpaid amounts.
 - b) An Affidavit of Compliance with Prevailing Wage Law, in the form as included in this contract specifications, properly executed by each subcontractor, and the Contractor
 - c) Certified copies of all payrolls
 - d) As-built drawings
3. If any claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such a claim including all costs and a reasonable attorney's fee.
4. Missouri statute requires prompt payment from the Owner to the Contractor within thirty calendar days and from the Contractor to his subcontractors within fifteen calendar days. Failure to make payments within the required

time frame entitles the receiving party to charge interest at the rate of one and one half percent per month calculated from the expiration of the statutory time period until paid.

5. The value of all unused unit price allowances and/or 150% of the value of the outstanding work items, and/or liquidated damages may be deducted from the final pay request without executing a Contract Change. Any unit price items which exceed the number of units in the contract may be added by Contract Change.

ARTICLE 6 -- INSURANCE AND BONDS

ARTICLE 6.1 -- BOND

- A. Contractor shall furnish a performance/payment bond in an amount equal to 100% of the contract price to guarantee faithful performance of the contract and 100% of the contract price to guarantee the payment of all persons performing labor on the project and furnishing materials in connection therewith under this contract as set forth in the standard form of performance and payment bond included in the contract documents. The surety on such bond shall be issued by a surety company authorized by the Missouri Department of Insurance to do business in the state of Missouri.
- B. All Performance/Payment Bonds furnished in response to this provision shall be provided by a bonding company with a rating of B+ or higher as established by A.M. Best Company, Inc. in their most recent publication.

ARTICLE 6.2 – INSURANCE

A. The successful Contractor shall procure and maintain for the duration of the contract issued a policy or policies of insurance for the protection of both the Contractor and the Owner and their respective officers, officials, agents, consultants and employees. The Owner requires certification of insurance coverage from the Contractor prior to commencing work.

B. Minimum Scope and Extent of Coverage

1. General Liability

Commercial General Liability, ISO coverage form number or equivalent CG 00 01 ("occurrence" basis), or I-SO coverage form number CG 00 02, or ISO equivalent.

If ISO equivalent or manuscript general liability coverage forms are used, minimum coverage will be as follows: Premises/Operations; Independent Contractors; Products/Completed Operations; personal injury; Broad Form Property Damage including Completed Operations; Broad Form Contractual Liability Coverage to include Contractor's obligations under Article 1.11 Indemnification and any other Special Hazards required by the work of the contract.

2. Automobile Liability

Business Automobile Liability Insurance, ISO Coverage form number or equivalent CA 00 01 covering automobile liability, code 1 "ANY AUTO".

3. Workers' Compensation and Employer's Liability

Statutory Workers' Compensation Insurance for Missouri and standard Employer's Liability Insurance, or the authorization to self-insure for such liability from the Missouri Division of Workers' Compensation.

4. Builder's Risk or Installation Floater Insurance

Insurance upon the work and all materials, equipment, supplies, temporary structures and similar items which may be incident to the performance of the work and located at or adjacent to the site, against loss or damage from fire and such other casualties as are included in extended coverage in broad "All Risk" form, including coverage for Flood and Earthquake, in an amount not less than the replacement cost of the work or this contract price, whichever is greater, with loss payable to Contractor and Owner as their respective interests may appear.

Contractor shall maintain sufficient insurance to cover the full value of the work and materials as the work progresses, and shall furnish Owner copies of all endorsements. If Builder's Risk Reporting- Form of Endorsement is used, Contractor shall make all reports as required therein so as to keep in force an amount of insurance which will equal the replacement cost of the work, materials, equipment, supplies, temporary structures, and other property covered thereby; and if, as a result of Contractor's failure to make any such report, the amount of insurance so recoverable shall be less than such replacement cost, Contractor's interest in the proceeds of such insurance, if any, shall be subordinated to Owner's interest to the end that Owner may receive full reimbursement for its loss.

C. Minimum Limits of Insurance

1. General Liability

Contractor

\$2,000,000	combined single limit per occurrence for bodily injury, personal injury, and property damage
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\$2,000,000	annual aggregate
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2. Automobile Liability

\$2,000,000	combined single limit per occurrence for bodily injury and property damage
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3. Workers' Compensation and Employers Liability

Workers' Compensation limits as required by applicable State Statutes (generally unlimited) and minimum of \$1,000,000 limit per accident for Employer's Liability.

General Liability and Automobile Liability insurance may be arranged under individual policies for the full limits required or by a combination of underlying policies with the balance provided by a form-following Excess or Umbrella Liability policy.

D. Deductibles and Self-Insured Retentions

All deductibles, co-payment clauses, and self-insured retentions must be declared to and approved by the Owner. The Owner reserves the right to request the reduction or elimination of unacceptable deductibles or self-insured retentions, as they would apply to the Owner, and their respective officers, officials, agents, consultants and employees. Alternatively, the Owner may request Contractor to procure a bond guaranteeing

payment of losses and related investigations, claims administration, and defense expenses.

E. Other Insurance Provisions and Requirements

The respective insurance policies and coverage, as specified below, must contain, or be endorsed to contain the following conditions or provisions:

1. General Liability

The Owner, and its respective commissioners, officers, officials, agents, consultants and employees shall be endorsed as additional insured's by ISO form CG 20 26 Additional Insured - Designated Person or Organization. As additional insured's, they shall be covered as to work performed by or on behalf of the Contractor or as to liability which arises out of Contractor's activities or resulting from the performance of services or the delivery of goods called for by the Contract.

Contractor's insurance coverage shall be primary with respect to all additional insured's. Insurance of self-insurance programs maintained by the designated additional -insured's shall be excess of the Contractor's insurance and shall not contribute with it.

Additionally, the Contractor and Contractor's general liability insurer shall agree to waive all rights of subrogation against the Owner and any of their respective officers, officials, agents, consultants or employees for claims, losses, or expenses which arise out of Contractor's activities or result from the performance of services or the delivery of goods called for by the Contract.

Contractor's failure to comply with the terms and conditions of these insurance policies shall not affect or abridge coverage for the Owner, or for any of their officers, officials, agents, consultants or employees.

2. Automobile Insurance

The Owner, and their respective officers, officials, agents, consultants and employees shall be endorsed as additional insured's by ISO form CG 20 26 - Additional Insured Designated Person or Organization. As additional insured's, they shall be covered as to work performed by or on behalf of the Contractor or as to liability which arises out of Contractor's activities or resulting from the performance of services or the delivery of goods called for by the Contract.

Contractor's insurance coverage shall be primary with respect to all additional insured's. Insurance or self-insurance

programs maintained by the designated additional insured's shall be in excess of the Contractor's insurance and shall not contribute with it.

Additionally, the Contractor and Contractor's automobile insurer shall agree to waive all rights of subrogation against the Owner and any of their respective officers, officials, agents, consultants or employees for claims, losses, or expenses which arise out of Contractor's activities or result from the performance of services or the delivery of goods called for by the Contract.

Contractor's failure to comply with the terms and conditions of these insurance policies shall not affect or abridge coverage for the Owner or for any of its officers, officials, agents, consultants or employees.

3. Workers' Compensation/Employer's Liability

Contractor's workers' compensation insurance shall be endorsed with NCCI form WC 00 03 01 A - Alternative Employer Endorsement. The Alternative Employer Endorsement shall designate the Owner as "alternate employers."

4. All Coverages

Each insurance policy required by this section of the Contract shall contain a stipulation, endorsed if necessary, that the Owner will receive a minimum of a thirty (30) calendar day advance notice of any policy cancellation. Ten (10) calendar days advance notice is required for policy cancellation due to non-payment of premium.

F. Insurer Qualifications and Acceptability

Insurance required hereunder shall be issued by an A.M. Best, "B+" rated, Class IX insurance company approved to conduct insurance business in the state of Missouri.

G. Verification of Insurance Coverage

Prior to Owner issuing a Notice to Proceed, the Contractor shall furnish the Owner with Certificate(s) of Insurance and with any applicable original endorsements evidencing the required insurance coverage. The insurance certificates and endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates and endorsements received by the Owner are subject to review and approval by the Owner. The Owner reserves the right to require certified copies of all required policies at any time. If the scope of this contract will exceed one (1) year - or, if any of Contractor's applicable insurance coverage expires prior to completion of the work or services required under this contract -

the Contractor will provide a renewal or replacement certificate before continuing work or services hereunder. If the Contractor fails to provide documentation of required insurance coverage, the Owner may issue a stop work order and no additional contract completion time and/or compensation shall be granted as a result thereof.

ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

When conditions at the site of the proposed work are considered by the Owner to be unsatisfactory for prosecution of the work, the Contractor may be ordered in writing to suspend the work or any part thereof until reasonable conditions exist. When such suspension is not due to fault or negligence of the Contractor, time allowed for completion of such suspended work will be extended by a period of time equal to that lost due to delay occasioned by ordered suspension. This will be a no cost time extension.

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

1. If the Contractor shall file for bankruptcy, or should make a general assignment for the benefit of the creditors, or if a receiver should be appointed on account of insolvency, or if the contractor should persistently or repeatedly refuse or fail to supply enough properly skilled workers or proper materials, or if the contractor should fail to make prompt payment to subcontractors or for material or labor, or persistently disregard laws, ordinances or the instructions of the Owner, or otherwise be guilty of a substantial violation of any provision of this contract, then the Owner may serve notice on the Contractor and the surety setting forth the violations and demanding compliance with this contract. Unless within ten (10) consecutive calendar days after serving such notice, such violations shall cease and satisfactory arrangements for correction be made, the Owner may suspend the Contractor's right to proceed with the work or terminate this contract.
2. In the event the Owner suspends Contractor's right to proceed with the work or terminates the contract, the Owner may demand that the Contractor's surety take over and complete the work on this contract, after the surety submits a written proposal to the Owner and receives written approval and upon the surety's failure or refusal to do so within ten (10) consecutive

calendar days after demand therefore, the Owner may take over the work and prosecute the same to completion by bid or negotiated contract, or the Owner may elect to take possession of and utilize in completing the work such materials, supplies, appliances and plant as may be on the site of the work, and all subcontractors, if the Owner elects, shall be bound to perform their contracts.

- B. The Contractor and its surety shall be and remain liable to the Owner for any excess cost or damages occasioned to the Owner as a result of the actions above set forth.
- C. The Contractor in the event of such suspension or termination shall not be entitled to receive any further payments under this contract until the work is wholly finished. Then if the unpaid balance under this contract shall exceed all expenses of the Owner as certified by the Director, such excess shall be paid to the Contractor; but, if such expenses shall exceed the unpaid balance as certified by the Director, the Contractor and their surety shall be liable for and shall pay the difference and any damages to the Owner.
- D. In exercising Owner's right to secure completion of the work under any of the provisions hereof, the Director shall have the right to exercise Owner's sole discretion as to the manner, methods and reasonableness of costs of completing the work.
- E. The rights of the Owner to suspend or terminate as herein provided shall be cumulative and not exclusive and shall be in addition to any other remedy provided by law.
- F. The Contractor in the event of such suspension or termination may be declared ineligible for Owner contracts for a minimal period of twelve (12) months. Further, no contract will be awarded to any Contractor who lists in their bid form any subcontractor whose prior performance has contributed, as determined by the Owner, to a breach of a contract. In order to be considered for state-awarded contracts after this period, the Contractor/subcontractor will be required to forward acceptance reports to the Owner regarding successful completion of non-state projects during the intervening twelve (12) months from the date of default. No contracts will be awarded to a subcontractor/Contractor until the ability to perform responsibly in the private sector has been proven to the Owner.

ARTICLE 7.3 -- FOR CONVENIENCE

- A. The Owner may terminate or suspend the Contract or any portion of the Work without cause at any time, and at the Owner's convenience. Notification of a termination or suspension shall be in writing

and shall be given to the Contractor and their surety. If the Contract is suspended, the notice will contain the anticipated duration of the suspension or the conditions under which work will be permitted to resume. If appropriate, the Contractor will be requested to demobilize and re-mobilize and will be reimbursed time and costs associated with the suspension.

B. Upon receipt of notification, the Contractor shall:

1. Cease operations when directed.
2. Take actions to protect the work and any stored materials.
3. Place no further subcontracts or orders for material, supplies, services or facilities except as may be necessary to complete the portion of the Contract that has not been terminated. No claim for payment of materials or supplies ordered after the termination date shall be considered.
4. Terminate all existing subcontracts, rentals, material, and equipment orders.

5. Settle all outstanding liabilities arising from termination with subcontractors and suppliers.

6. Transfer title and deliver to the Owner, work in progress, completed work, supplies and other material produced or acquire for the work terminated, and completed or partially completed plans, drawings information and other property that, if the Contract had been completed, would be required to be furnished to the Owner.

C. For termination without cause and at the Owner's convenience, in addition to payment for work completed prior to date of termination, the Contractor may be entitled to payment of other documented costs directly associated with the early termination of the contract. Payment for anticipated profit and unapplied overhead will not be allowed.

SECTION 007300 - SUPPLEMENTARY CONDITIONS

1.0 GENERAL:

- A. These Supplementary General Conditions clarify, add, delete, or otherwise modify standard terms and conditions of DIVISION 0, BIDDING AND CONTRACTING REQUIREMENTS.

2.0 CONTACTS:

Designer: Juliana Schafer-Rich
Farnsworth Group
20 Allen Avenue, Suite 200
St. Louis, MO 63119
Telephone: 314-962-7900
Email: jschafer-rich@F-W.com

Construction Representative: Brandon Keith
Division of Facilities Management, Design and Construction
1515 E Pythian St.
Springfield, MO 65802
Telephone: 417-370-0899
Email: brandon.keith@oa.mo.gov

Project Manager: Sandra Walther
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: 573-257-7322
Email: sandra.walther@oa.mo.gov

Contract Specialist: Mandy Roberson
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: 573-522-0074
Email: mandy.roberson@oa.mo.gov

3.0 NOTICE: ALL BID MATERIALS ARE DUE AT THE TIME OF BID SUBMITTAL. THERE IS NO SECOND SUBMITTAL FOR THIS PROJECT.

4.0 FURNISHING CONSTRUCTION DOCUMENTS:

- A. The Owner will furnish the Contractor with approximately 10 complete sets of drawings and specifications at no charge.
- B. The Owner will furnish the Contractor with approximately 10 sets of explanatory or change drawings at no charge.
- C. The Contractor may make copies of the documents as needed with no additional cost to the Owner.

5.0 SAFETY REQUIREMENTS

Contractor and subcontractors at any tier shall comply with RSMo 292.675 and Article 1.3, E, of Section 007213, General Conditions.

**SECTION 007333 - SUPPLEMENTARY GENERAL CONDITIONS
FOR FEDERALLY FUNDED/ASSISTED CONSTRUCTION PROJECTS**

1.0 Notice of Federal Funding

This project is being performed in whole or in part using federal funds. Therefore, all work or services performed by the Contractor and its subcontractors shall be subject to the terms and conditions set forth below in addition to all terms and conditions in the Construction Contract, General Conditions, and other contract documents. The concepts, rules, and guidelines set forth in 2 C.F.R. 200 describing allowable costs and administrative requirements apply.

2.0 Definitions

As used herein, “Federal Government” means the government of the United States of America. “Federal Agency” means an agency, entity, department or division of the Federal Government that is providing funding for this project. All other terms shall have the meanings established in the Construction Contract, General Conditions, and/or Project Manual, unless such definitions conflict with a definition provided in an applicable statute or regulation.

3.0 Conflicting Terms or Conditions

To the extent that any terms or conditions set forth herein conflict with the Construction Contract or its General Conditions, the more stringent of the two terms and conditions shall govern.

4.0 No Obligation by Federal Government

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

5.0 Compliance with Federal Laws, Regulations and Executive Orders

The Contractor and its subcontractors and suppliers are required to comply with all applicable Federal laws, regulations, and executive orders, regardless of whether set forth herein. The Contractor shall assist and enable the State of Missouri in complying with any requirements imposed by the Federal Agency as a condition of funding.

6.0 Compliance with Civil Rights Provisions

The Contractor shall comply with all Federal statutes, executive orders, and regulations relating to nondiscrimination. These include, but are not limited to the following:

Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin;

Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex;

Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps;

The Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age;

Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing;

Title VII of the Civil Rights Act of 1964 (42 U.S.C. part 2000(e), which prohibits discrimination against employees on the basis of religion;

Any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and

The requirements of any other nondiscrimination statute(s) that may apply to the application.

7.0 Equal Employment Opportunity (41 C.F.R. 60-1.4(b)).

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

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

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

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

union or workers' representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The Contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (4) in every subcontract or purchase order. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: *Provided*, however, that in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: *Provided*, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract. The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

8.0 Prohibition of Segregated Facilities

- (1) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Employment Opportunity clause in this contract.
- (2) "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.
- (3) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Employment Opportunity clause of this contract.

9.0 Davis-Bacon Act (40 U.S.C. §§ 3141-3144, and §§ 3146-3148, and 29 C.F.R. pt. 5) *(the requirements of the Davis-Bacon Act are not applicable to this Project)*

~~(1) Minimum wages:~~

- ~~(i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations~~

~~issued by the Secretary of Labor under the Copeland Act (29 C.F.R. pt. 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided*, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.~~

- ~~(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination, and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:~~
- ~~(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and~~
 - ~~(2) The classification is utilized in the area by the construction industry; and~~
 - ~~(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.~~
- ~~(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.~~
- ~~(C) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized~~

~~representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.~~

~~(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.~~

~~(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.~~

~~(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.~~

~~(2) Withholding. The (write in name of Federal Agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime Contractor, or any other federally assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the (Agency) may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.~~

~~(3) Payrolls and basic records:~~

~~(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 C.F.R. 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors~~

~~employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.~~

- ~~(ii)(A) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency). The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 C.F.R. 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH 347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime Contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the (write in name of appropriate federal agency) if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to the (write in name of agency), the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime Contractor to require a subcontractor to provide addresses and social security numbers to the prime Contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).~~
- ~~(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:~~
- ~~(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 C.F.R. pt. 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 C.F.R. pt. 5, and that such information is correct and complete;~~
 - ~~(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 C.F.R. pt. 3;~~
 - ~~(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.~~
- ~~(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH 347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.~~

~~(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.~~

~~(iii) The Contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the (write the name of the agency) or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal Agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 C.F.R. 5.12.~~

~~(4) Apprentices and trainees —~~

~~(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.~~

~~(ii) Trainees. Except as provided in 29 C.F.R. 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the~~

~~U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.~~

- ~~(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of 29 C.F.R. pt. 30.~~
- ~~(5) Compliance with Copeland Act requirements. The Contractor shall comply with the requirements of 29 C.F.R. pt. 3, which are incorporated by reference in this contract.~~
- ~~(6) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 C.F.R. 5.5(a)(1) through (10) and such other clauses as the (write in the name of the Federal Agency) may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 C.F.R. 5.5.~~
- ~~(7) Contract termination: debarment. A breach of the contract clauses in 29 C.F.R. 5.5 may be grounds for termination of the contract, and for debarment as a Contractor and a subcontractor as provided in 29 C.F.R. 5.12.~~
- ~~(8) Compliance with Davis Bacon and Related Act requirements. All rulings and interpretations of the Davis Bacon and Related Acts contained in 29 C.F.R. pts. 1, 3, and 5 are herein incorporated by reference in this contract.~~
- ~~(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 C.F.R. pts. 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.~~
- ~~(10) Certification of eligibility.~~

- ~~(i) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis Bacon Act or 29 C.F.R. 5.12(a)(1).~~
- ~~(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis Bacon Act or 29 C.F.R. 5.12(a)(1).~~
- ~~(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. § 1001.~~

10.0 Copeland “Anti-Kickback” Act

- (1) The Contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract. The Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled.
- (2) The Contractor or subcontractor shall insert in any subcontracts the clause above, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.
- (3) A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a Contractor and subcontractor as provided in 29 C.F.R. 5.12.

11.0 Contract Work Hours and Safety Standards Act (40 U.S.C. 3701 to 3708, 29 C.F.R. 5.5)

- (1) Overtime requirements. No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1) of this section the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of \$27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.
- (3) Withholding for unpaid wages and liquidated damages. The Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held

by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.

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

12.0 Suspension and Debarment (Executive Orders 12549 and 12689, 2 C.F.R. pt. 180)

- (1) A contract award (see 2 C.F.R. 180.220) must not be made to parties listed on the government-wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 C.F.R. 180 that implement Executive Orders 12549 (3 C.F.R. pt. 1986 Comp., p. 189) and 12689 (3 C.F.R. pt. 1989 Comp., p. 235), “Debarment and Suspension.” SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.
- (2) The contractor is required to verify that none of the contractor’s principals (defined at 2 C.F.R. 180.995) or its affiliates (defined at 2 C.F.R. 180.905) are excluded (defined at 2 C.F.R. 180.940) or disqualified (defined at 2 C.F.R. 180.935).
- (3) The contractor must comply with 2 C.F.R. pt. 180, subpart C and the regulations of the granting Federal Agency regarding suspension and debarment and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.
- (4) This certification is a material representation of fact relied upon by the Owner. If it is later determined that the Contractor did not comply with 2 C.F.R. pt. 180, subpart C in addition to remedies available to the Owner, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.
- (5) By submitting a bid, the bidder or proposer agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

13.0 Byrd Anti-Lobbying Amendment (31 U.S.C. § 1352)

- (1) Contractors that apply or bid for an award exceeding \$100,000 agree to file the required certification (set forth below), in compliance with 31 U.S.C. § 1352 (as amended).
- (2) Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352.

- (3) Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.

CERTIFICATION REGARDING LOBBYING

The Bidder or Offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form–LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

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

14.0 Procurement of Recovered Materials

The Contractor shall comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (42 U.S.C. § 6962). The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds \$10,000 or the value of the quantity acquired during the preceding fiscal year exceeded \$10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

Information about this requirement, along with the list of EPA designated items, is available at EPA’s Comprehensive Procurement Guidelines web site, <https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program>.

15.0 Fair Labor Standards Act

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 C.F.R. pt. 201, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part-time workers. The Contractor has full responsibility to monitor compliance to the referenced statute or regulation. The Contractor must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

16.0 Access to Records and Reports

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Owner, the Federal Agency and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers and records of the Contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

17.0 Occupational Health and Safety Act

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 C.F.R. pt. 1910 with the same force and effect as if given in full text. The employer must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The employer retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (29 C.F.R. pt. 1910). The employer must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

18.0 Rights to Inventions

Contracts or agreements that include the performance of experimental, developmental, or research work must provide for the rights of the Federal Government and the Owner in any resulting invention as established by 37 C.F.R. pt. 401, Rights to Inventions Made by Non-profit Organizations and Small Business Firms under Government Grants, Contracts, and Cooperative Agreements. This contract incorporates by reference the patent and inventions rights as specified within 37 C.F.R. 401.14. Contractor must include this requirement in all sub-tier contracts involving experimental, developmental, or research work.

19.0 Energy Conservation

The Contractor agrees to comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (42 U.S.C. § 6201 et seq.).

20.0 Clean Air Act and Federal Water Pollution Control Act

- (1) If the amount of the Contract exceeds \$150,000, the Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq. and the Federal Water Pollution Control Act, as amended, 33 U.S.C. § 1251 et seq.

- (2) The Contractor agrees to report each violation to the Owner, and understands and agrees that the Owner will, in turn, report each violation as required to assure notification to the Federal Agency and the appropriate Environmental Protection Agency Regional Office.
- (3) The Contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance.

21.0 Contractor Employee Whistleblower Rights and Requirement to Inform Employees of Whistleblower Rights

- (1) This contract and employees working on this contract will be subject to the whistleblower rights and remedies in the pilot program on contractor employee whistleblower protections established at 41 U.S.C. § 4712 by section 828 of the National Defense Authorization Act for Fiscal Year 2013 (Pub. L. 112-239) and FAR 3.908.
- (2) The Contractor shall inform its employees in writing, in the predominant language of the workforce, of employee whistleblower rights and protections under 41 U.S.C. § 4712, as described in section 3.908 of the Federal Acquisition Regulation.
- (3) The Contractor shall insert the substance of this clause, including this paragraph (c), in all subcontracts over the simplified acquisition threshold.

22.0 Veteran's Preference

In the employment of labor (excluding executive, administrative, and supervisory positions), the Contractor and all sub-tier contractors must give preference to covered veterans as defined within Title 49 United States Code Section 47112. Covered veterans include Vietnam-era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns (as defined by 15 U.S.C. § 632) owned and controlled by disabled veterans. This preference only applies when there are covered veterans readily available and qualified to perform the work to which the employment relates.

23.0 Drug Free Workplace Act

The Contractor shall provide a drug free workplace in accordance with the Drug Free Workplace Act of 1988, 41 U.S.C. Chapter 81, and all applicable regulations. The Contractor shall report any conviction of the Contractor's personnel under a criminal drug statute for violations occurring on the Contractor's premises or off the Contractor's premises while conducting official business. A report of a conviction shall be made to the state agency within five (5) working days after the conviction.

24.0 Access Requirements for Persons with Disabilities

Contractor shall comply with 49 U.S.C. § 5301(d), stating Federal policy that the elderly and persons with disabilities have the same rights as other persons to use mass transportation services and facilities and that special efforts shall be made in planning and designing those services and facilities to implement that policy. Contractor shall also comply with all applicable requirements of Sec. 504 of the Rehabilitation Act (1973), as amended, 29 U.S.C. § 794, which prohibits discrimination on the basis of handicaps, and the Americans with Disabilities Act of 1990 (ADA), as amended, 42 U.S.C. § 12101 et seq., which requires that accessible

facilities and services be made available to persons with disabilities, including any subsequent amendments thereto.

25.0 Seismic Safety

The Contractor agrees to ensure that all work performed under this contract, including work performed by subcontractors, conforms to a building code standard that provides a level of seismic safety substantially equivalent to standards established by the National Earthquake Hazards Reduction Guidelines for Contract Provisions for Obligated Sponsors and Airport Improvement Program Projects Issued on June 19, 2018 Page 61 Program (NEHRP). Local building codes that model their code after the current version of the International Building Code (IBC) meet the NEHRP equivalency level for seismic safety.

26.0 Required Use of American Iron, Steel, Manufactured Products, and Construction Materials – Build America, Buy America (Pub. L. No. 117-58, §§ 70901-52)

The Owner is the recipient of an award of Federal financial assistance from a program for infrastructure for this project. Pursuant to the Build America, Buy America Act of the Infrastructure Investment and Jobs Act (“IIJA”), Pub. L. No. 117-58, none of the funds provided under the Federal award may be used unless the requirements of the domestic content procurement preference outlined below are met. Therefore, the Contractor shall ensure the following:

- (1) all iron and steel used in the project are produced in the United States--this means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;
- (2) all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 65 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; and
- (3) all construction materials are manufactured in the United States—this means that all manufacturing processes for the construction material occurred in the United States.

The Buy America preference only applies to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does a Buy America preference apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project, but are not an integral part of the structure or permanently affixed to the infrastructure project.

Waivers

When necessary, recipients of Federal financial assistance may apply for, and the awarding agency may grant, a waiver from the domestic content procurement preference.

When the Federal agency has made a determination that one of the following exceptions applies, the awarding official may waive the application of the domestic content procurement preference in any case in which the agency determines that:

- (1) applying the domestic content procurement preference would be inconsistent with the public interest;
- (2) the types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality; or
- (3) the inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent. A request to waive the application of the domestic content procurement preference must be in writing. The agency will provide instructions on the format, contents, and supporting materials required for any waiver request. Waiver requests are subject to public comment periods of no less than 15 days and must be reviewed by the Made in America Office.

There may be instances where an award qualifies, in whole or in part, for an existing waiver described on the awarding agency web site.

If the Contractor determines that an application for a waiver is necessary or an existing waiver is applicable to this project, the Contractor shall timely notify the Owner. The Owner will make a determination if a waiver is applicable or if a waiver application is necessary. The Contractor shall not submit any waiver application or information directly to the Federal agency without prior approval by the Owner.

Definitions

“Construction materials” includes an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is or consists primarily of: • non-ferrous metals; • plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); • glass (including optic glass); • lumber; or • drywall.

“Domestic content procurement preference” means all iron and steel used in the project are produced in the United States; the manufactured products used in the project are produced in the United States; or the construction materials used in the project are produced in the United States.

“Infrastructure” includes, at a minimum, the structures, facilities, and equipment for, in the United States, roads, highways, and bridges; public transportation; dams, ports, harbors, and other maritime facilities; intercity passenger and freight railroads; freight and intermodal facilities; airports; water systems, including drinking water and wastewater systems; electrical transmission facilities and systems; utilities; broadband infrastructure; and buildings and real property. Infrastructure includes facilities that generate, transport, and distribute energy.

“Project” means the construction, alteration, maintenance, or repair of infrastructure in the United States.

27.0 Prohibition on Certain Telecommunication and Video Surveillances Services or Equipment
(Pub. L. 115-232, Section 889)

Section 889(b) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232, and 2 C.F.R. § 200.216 prohibit the head of a Federal executive agency and recipients or subrecipients of funds from such agencies from obligating or expending grant, cooperative agreement, loan, or loan guarantee funds on certain telecommunications products or from certain entities for national security reasons. Pursuant to such provisions, the Contractor understands and agrees that the Contractor and its subcontractors shall not obligate or expend loan or grant funds from the Federal Agency under this Contract to:

(1) Procure or obtain;

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

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

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

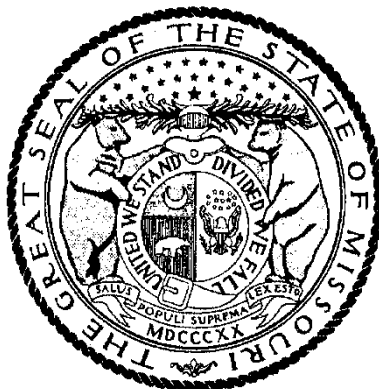
(ii) Telecommunications or video surveillance services provided by such entities or using such equipment.

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

Missouri

Division of Labor Standards

WAGE AND HOUR SECTION



MICHAEL L. PARSON, Governor

Annual Wage Order No. 31

Section 016

CAPE GIRARDEAU COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by

Todd Smith, Director
Division of Labor Standards

Filed With Secretary of State: March 8, 2024

Last Date Objections May Be Filed: April 8, 2024

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$57.45
Boilermaker	\$29.53*
Bricklayer-Stone Mason	\$47.80
Carpenter	\$52.18
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$50.29
Plasterer	
Communication Technician	\$29.53*
Electrician (Inside Wireman)	\$64.65
Electrician Outside Lineman	\$29.53*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$29.53*
Glazier	\$40.96
Ironworker	\$69.70
Laborer	\$42.44
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$29.53*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$66.34
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$42.69
Plumber	\$69.58
Pipe Fitter	
Roofer	\$46.57
Sheet Metal Worker	\$74.58
Sprinkler Fitter	\$29.53*
Truck Driver	\$34.03
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

Heavy Construction Rates for
CAPE GIRARDEAU County

Section 016

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$58.88
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$29.53*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$48.45
General Laborer	
Skilled Laborer	
Operating Engineer	\$67.10
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$29.53*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME and HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of **Interior renovations and various building additions.**
 - 1. Project Location: **Missouri Veterans Home, 2400 Veterans Memorial Dr., Cape Girardeau, Missouri 63701**
 - 2. Owner: State of Missouri, Office of Administration, Division of Facilities Management, Design and Construction, Harry S Truman State Office Building, Post Office Box 809, 301 West High Street, Jefferson City, Missouri 65102.
- B. Contract Documents dated **08-15-2024** were prepared for the Project by **Farnsworth Group, 20 Allen Avenue, Suite 200, St. Louis, MO 63119.**
- C. The Work consists of **renovations to various areas of the Cape Girardeau Veterans Home.**
 - 1. The Work includes **security upgrades to the lobby. Door and frame replacement. Room expansion in the main dining room and special care dining area. Remodeled canteen area. New storage rooms on wings. New oxygen room. Resident room interior finishes including: replacement of flooring, drywall, wall protection, specialized lighting, cabinetry, television mounting brackets, and electrical. Flooring, drywall, handrails, ceiling tile, wall protection, and baseboard replacement throughout the facility. Replace vinyl siding and soffits.**
- D. The Work will be constructed under a single prime contract.

1.3 WORK SEQUENCE

- A. The Work will be conducted in **11** phases. Refer to G-004 for Phasing Plan.
- B. The following phasing schedule is the preliminary phasing schedule. Contractor to provide detailed schedule as described in Section 01 3200
- C. Phases Core 1 and Core 2 will run subsequently. Phases A1, A2, A3, B1, B2, B3, C1, C2, C3 will run subsequently. Core Phases (Core 1 and Core 2) will run concurrently with the Resident room phases (A1, A2, A3, B1, B2, B3, C1, C2, C3).
 - 1. Phase Core 1: Expansion of the entry, main dining room, employee break room, lobby and offices, and the renovation of the existing lobby, canteen, core hallways, smoke room and activity room. Work of this phase shall be substantially complete, ready for occupancy within 100 work days of commencement of construction.
 - a. Contractor to minimize room/area closures in Core 1 phase. Intermediate occupancy of specific spaces to be decided with contractor upon awarded bid.

2. Phase Core 2: Renovation of the existing office suite. Work of this phase shall be substantially complete, ready for occupancy within 30 work days of commencement of construction.
 3. Phase C3: Renovation of resident rooms and commons in C300 wing. Work of this phase shall be substantially complete, ready for occupancy within 30 work days of commencement of construction.
 4. Phase C2: Renovation of resident rooms and commons in C200 wing along with the addition of a storage room. Work of this phase shall be substantially complete, ready for occupancy within 30 work days of commencement of construction.
 5. Phase C1: Renovation of resident rooms and commons in C100 wing. Work of this phase shall be substantially complete, ready for occupancy within 30 work days of commencement of construction.
 6. Phase B3: Renovation of resident rooms and commons in B300 wing. Work of this phase shall be substantially complete, ready for occupancy within 30 work days of commencement of construction.
 7. Phase B2: Renovation of resident rooms and commons in B200 wing along with the addition of a storage room. Work of this phase shall be substantially complete, ready for occupancy within 30 work days of commencement of construction.
 8. Phase B1: Renovation of resident rooms and commons in B100 wing. Work of this phase shall be substantially complete, ready for occupancy within 30 work days of commencement of construction.
 9. Phase A3: Renovation of resident rooms and commons in A300 wing. Work of this phase shall be substantially complete, ready for occupancy within 30 work days of commencement of construction.
 10. Phase A2: Renovation of resident rooms and commons in A200 wing along with the addition of a storage room, new dining room, and resident rooms. Work of this phase shall be substantially complete, ready for occupancy within 30 work days of commencement of construction.
 11. Phase A1: Renovation of resident rooms and commons in A100 wing along with renovation of the existing Wing A dining room and kitchenette. Work of this phase shall be substantially complete, ready for occupancy within 30 work days of commencement of construction.
- D. Resident Room Phases (A1, A2, A3, B1, B2, B3, C1, C2, C3) duration to include 10 work days between Phases to allow for the move-in and move-out of the residents by the Cape Girardeau Veteran's Home staff.
- E. Resident Room Phase Order: C3, C2, C1, B3, B2, B1, A3, A2, A1
- F. Total Duration of Construction Work Days: 350 Work Days

1.4 CONTRACTOR USE OF PREMISES

- A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises limited only by the Owner's right to perform work or to retain other contractors on portions of the Project.

- B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.
2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage cause by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

1. **Maintain 42" clear hallways at all times.**

1.5 OCCUPANCY REQUIREMENTS

- A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire construction period. Cooperate 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.
- B. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.
1. The Designer will prepare a Certificate of Partial Occupancy for each specific portion of the Work to be occupied prior to substantial completion.
 2. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will operate and maintain mechanical and electrical systems serving occupied portions for the building.
 3. Upon occupancy, the Owner will assume responsibility for maintenance and custodial service for occupied portions for the building.

1.6 OWNER-FURNISHED PRODUCTS

- A. The Owner will furnish one hundred ten (110) TV mounting brackets, and one hundred ten (110) cubical curtains. These items are to be installed by the Contractor. Refer to equipment schedule for other items provided by Owner. The Work includes providing support systems to receive Owner's equipment, and mechanical and electrical connections.
1. The Owner will arrange for and deliver necessary shop drawings, product data, and samples to the Contractor.
 2. The Owner will arrange and pay for delivery of Owner-furnished items according to the contractor's Construction Schedule.

3. The Contractor is responsible for receiving, unloading and handling Owner furnished items at the site.
4. Following delivery, the Contractor will inspect items delivered for damage. The Contractor shall not accept damaged items and shall notify the Owner of rejection of damaged items.
5. If Owner-furnished items are damaged, defective, or missing, the Owner will arrange for replacement.
6. The Owner will arrange for manufacturer's field services and for the delivery of manufacturer's warranties to the appropriate Contractor.
7. The Contractor shall designate delivery dates of Owner-furnished items in the Contractor's Construction Schedule.
8. The Contractor shall review shop drawings, product data and samples and return them to the Designer noting discrepancies or problems anticipated in use of the project.
9. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements. The Contractor shall repair or replace items damaged as a result of his operations.

1.7 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF PRODUCTS ORDERED IN ADVANCE

END OF SECTION 011000

SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Contract Change.
- B. Types of allowances include the following:
 - 1. Weather allowances.
 - 2. Facility Interruption Allowance.
- C. Related Sections include the following:
 - 1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Contract Changes for allowances.
 - 2. Division 1 Section "Unit Prices" for procedures for using unit prices.

1.3 WEATHER ALLOWANCE

- A. Included within the completion period for this project are a specified number of “bad weather” days (see Schedule of Allowances).
- B. The Contractor’s progress schedule shall clearly indicate the bad weather day allowance as an “activity” or “activities”. In the event weather conditions preclude performance of critical work activities for 50% or more of the Contractor’s scheduled workday, that day shall be declared unavailable for work due to weather (a “bad weather” day) and charged against the above allowance. Critical work activities will be determined by review of the Contractor’s current progress schedule.
- C. The Contractor’s Representative and the Construction Representative shall agree monthly on the number of “bad weather” days to be charged against the allowance. This determination will be documented in writing and be signed by the Contractor and the Construction Representatives. If there is a failure to agree on all or part of the “bad weather” days for a particular month, that disagreement shall be noted on this written document and signed by each party’s representative. Failure of the Contractor’s representative to sign the “bad weather” day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the “bad weather” day determination contained in that document.

- D. There will be no modification to the time of contract performance due solely to the failure to deplete the "bad weather" day allowance.
- E. Once this allowance is depleted, a no cost Contract Change time extension will be executed for "bad weather" days, as defined above, encountered during the remainder of the Project.

1.4 FACILITY INTERRUPTION ALLOWANCE

- A. Included within the completion period for this project are facility interruption days (see Schedule of Allowances).
- B. The Contractor's progress schedule shall clearly indicate the facility interruption day allowance as an "activity" or "activities". In the event facility interruptions preclude performance of critical work activities for 50% or more of the Contractor's scheduled workday, that day shall be declared unavailable for work due to facility interruption and charged against the above allowance. Critical work activities will be determined by review of the Contractor's current progress schedule.
- C. The Contractor's Representative and the Construction Representative shall agree monthly on the number of "facility interruption" days to be charged against the allowance. This determination will be documented in writing and be signed by the Contractor and the Construction Representatives. If there is a failure to agree on all or part of the "facility interruption" days for a particular month, that disagreement shall be noted on this written document and signed by each party's representative. Failure of the Contractor's representative to sign the "facility interruption" day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the "facility interruption" day determination contained in that document.
- D. There will be no modification to the time of contract performance due solely to the failure to deplete the "facility interruption" day allowance. The substantial completion date will not change.

1.5 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, Designer of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Designer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Designer from the designated supplier.

1.6 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Contract Changes.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

- A. Weather Allowance: Included within the completion period for this Project (24) Twenty Four “bad weather” days.
- B. Provide (7) Seven Facility Interruption days.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing Alternates.

1.3 DEFINITIONS

- A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost for each alternate is the net addition to the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.
- B. No additional time will be allowed for alternate work unless the number of workdays is so stated on the bid form.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate the Alternate Work into the Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.
- B. Notification: The award of the Contract will indicate whether alternates have been accepted or rejected.
- C. Execute accepted alternates under the same conditions as other Work of this Contract.
- D. Schedule: A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Add an infectious disease ward (COVID 19 Construction Grant)
 - 1. (20) additional working days and (5) Bad Weather Days will be added should the Owner accept this Alternate.

- B. Alternate No. 2: Add a new ornamental metal security fence at the south side of the site as indicated on the civil drawings. Refer to Specification SECTION 32 3119 - DECORATIVE METAL FENCES AND GATES and Drawing Sheet C-007
 - 1. (0) additional working days and (0) Bad Weather Days will be added should the Owner accept this Alternate.

- C. Alternate No. 3: Add (5) building additions with (2) restrooms each and semi-private sleeping room. Building additions as follows and as indicated on Drawing Sheets A-110, A-111, A-112 and A-118:
 - 1. Wing A (1) building addition.
 - 2. Wing B (2) building additions.
 - 3. Wing C (2) building additions.
 - a. (50) additional working days and (5) Bad Weather Days will be added should the Owner accept this Alternate.

END OF SECTION 012300

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract Modifications.
- B. Related Sections include the following:
 - 1. Division 1, Section 012100 "Allowances" for procedural requirements for handling and processing Allowances.
 - 2. Division 1, Section 012200 "Unit Prices" for administrative requirements for using Unit Prices.
 - 3. Division 1, Section 013115 "Project Management Communications" for administrative requirements for communications.
 - 4. Division 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
 - 5. Division 0, Section 007213, Article 4.0 "Changes in the Work" for Change Order requirements.

1.3 REQUESTS FOR INFORMATION

- A. In the event that the Contractor or Subcontractor, at any tier, determines that some portion of the Drawings, Specifications, or other Contract Documents requires clarification or interpretation, the Contractor shall submit a "Request for Information" (RFI) in writing to the Designer. A RFI may only be submitted by the Contractor and shall only be submitted on the RFI forms provided by the Owner. The Contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed. In the RFI, the Contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.
- B. Responses to RFI shall be issued within ten (10) working days of receipt of the Request from the Contractor unless the Designer determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Designer, the Designer will, within five (5) working days of receipt of the request, notify the Contractor of the anticipated response time. If the Contractor submits a RFI on a time sensitive activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Designer to respond to the request provided that the Designer responds within the ten (10) working days set forth above.
- C. Responses from the Designer will not change any requirement of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change to the

requirements of the Contract Document, the Contractor shall give written notice to the Designer requesting a Change Order for the work. Failure to give such written notice within ten (10) working days, shall waive the Contractor's right to seek additional time or cost under Article 4, "Changes in the Work" of the General Conditions.

1.4 MINOR CHANGES IN THE WORK

- A. Designer will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Amount or the Contract Time, on "Designer's Supplemental Instructions" (DSI).

1.5 PROPOSAL REQUESTS

- A. The Designer or Owner Representative will issue a detailed description of proposed Changes in the Work that may require adjustment to the Contract Amount or the Contract Time. The proposed Change Description will be issued using the "Request for Proposal" (RFP) form. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by the Designer or Owner Representative are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within ten (10) working days after receipt of Proposal Request, submit a proposal for the cost adjustments to the Contract Amount and the Contract Time necessary to execute the Change. The Contractor shall submit his proposal on the appropriate Change Order Detailed Breakdown form. Subcontractors may use the appropriate Change Order Detailed Breakdown form or submit their proposal on their letterhead provided the same level of detail is included. All proposals shall include:
 - a. A detailed breakdown of costs per Article 4.1 of the General Conditions.
 - b. If requesting additional time per Article 4.2 of the General Conditions, include an updated Contractor's Construction Schedule that indicates the effect of the Change including, but not limited to, changes in activity duration, start and finish times, and activity relationship.

1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, the Designer or Owner Representative will issue a Change Order for signatures of Owner and Contractor on the "Change Order" form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 013100 – COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Projects including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
- B. Each Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific Contractor.
- C. Related Sections include the following:
 - 1. Division 1, Section 013200 "Schedules" for preparing and submitting Contractor's Construction Schedule.
 - 2. Articles 1.8.B and 1.8.C of Section 007213 "General Conditions" for coordinating meetings onsite.
 - 3. Article 5.4.H of Section 007213 "General Conditions" for coordinating Closeout of the Contract.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections, which depend on each other for proper installation, connection, and operation.
- B. Coordination: Each Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each Contractor shall coordinate its operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other Contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required

maintenance, service, and repair of all components including mechanical and electrical.

- C. Prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate Contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other Contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Startup and adjustment of systems.
 - 8. Project Closeout activities.
- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
- B. Key Personnel Names: Within fifteen (15) work days of starting construction operations, submit a list of key personnel assignments including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 PROJECT MEETINGS

- A. The Owner's Construction Representative will schedule a Pre-Construction Meeting prior to beginning of construction. The date, time, and exact place of this meeting will be determined after Contract Award and notification of all interested parties. The Contractor shall arrange to have the Job Superintendent and all prime Subcontractors present at the meeting. During the Pre-Construction Meeting, the construction procedures and information necessary for submitting payment requests will be discussed and materials distributed along with any other pertinent information.
 - 1. Minutes: Designer will record and distribute meeting minutes.
- B. Progress Meetings: The Owner's Construction Representative will conduct Monthly Progress Meetings as stated in Articles 1.8.B and 1.8.C of Section 007213 "General Conditions".
 - 1. Minutes: Designer will record and distribute to Contractor the meeting minutes.
- C. Preinstallation Conferences: Contractor shall conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of Manufacturers and Fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer and Construction Representative of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration including requirements for the following:
 - a. Contract Documents
 - b. Options
 - c. Related RFIs
 - d. Related Change Orders
 - e. Purchases
 - f. Deliveries
 - g. Submittals
 - h. Review of mockups
 - i. Possible conflicts
 - j. Compatibility problems
 - k. Time schedules
 - l. Weather limitations
 - m. Manufacturer's written recommendations
 - n. Warranty requirements
 - o. Compatibility of materials

- p. Acceptability of substrates
 - q. Temporary facilities and controls
 - r. Space and access limitations
 - s. Regulations of authorities having jurisdiction
 - t. Testing and inspecting requirements
 - u. Installation procedures
 - v. Coordination with other Work
 - w. Required performance results
 - x. Protection of adjacent Work
 - y. Protection of construction and personnel
- 3. Contractor shall record significant conference discussions, agreements, and disagreements including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
 - 6. Revise paragraph below if Project requires holding progress meetings at different intervals. Insert special intervals such as "every third Tuesday" to suit special circumstances.
 - 7. Project name
 - 8. Name and address of Contractor
 - 9. Name and address of Designer
 - 10. RFI number including RFIs that were dropped and not submitted
 - 11. RFI description
 - 12. Date the RFI was submitted
 - 13. Date Designer's response was received
 - 14. Identification of related DSI or Proposal Request, as appropriate

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013115 - PROJECT MANAGEMENT COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division 1 Specification Sections apply to this Section.
- B. Division 1, Section 013300 - Submittals
- C. Division 1, Section 012600 – Contract Modification Procedures

1.2 SUMMARY

- A. Project Management Communications: The Contractor shall use the Internet web based project management communications tool, E-Builder® ASP software, and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.
 - 1. Project management communications is available through E-Builder® as provided by "e-Builder®" in the form and manner required by the Owner.
 - 2. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited
- B. Support: E-Builder® will provide on-going support through on-line help files.
- C. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD files, processes or design information distributed in this system is intended only for the project specified herein.
- D. Purpose: The intent of using E-Builder® is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files
- E. Authorized Users: Access to the web site will be by individuals who are authorized users.
 - 1. Individuals shall complete the E-Builder New Company/User Request Form located at the following web site: <https://oa.mo.gov/facilities/vendor-links/contractor-forms>. Completed forms shall be emailed to the following email address: OA.FMDCE-BuilderSupport@oa.mo.gov.
 - 2. Authorized users will be contacted directly and assigned a temporary user password.
 - 3. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.
- F. Administrative Users: Administrative users have access and control of user licenses and all posted items. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE! Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).

- G. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using E-Builder® to send messages. Communication functions are as follows:
1. Document Integrity and Revisions:
 - a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
 - b. The system shall make it easy to identify revised or superseded documents and their predecessors.
 - c. Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
 2. Document Security:
 - a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties communication except for Administrative Users. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!
 3. Document Integration:
 - a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
 4. Reporting:
 - a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
 5. Notifications and Distribution:
 - a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.
 6. Required Document Types:
 - a. RFI, Request for Information.
 - b. Submittals, including record numbering by drawing and specification section.
 - c. Transmittals, including record of documents and materials delivered in hard copy.
 - d. Meeting Minutes.
 - e. Application for Payments (Draft or Pencil).
 - f. Review Comments.
 - g. Field Reports.
 - h. Construction Photographs.
 - i. Drawings.
 - j. Supplemental Sketches.
 - k. Schedules.
 - l. Specifications.
 - m. Request for Proposals
 - n. Designer's Supplemental Instructions
 - o. Punch Lists
- H. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents shall be submitted by transmission in electronic form to the E-Builder® web site by licensed users.
- a. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier shall respond to documents received in electronic form on the web site, and consider them as if received in paper document form.
 - b. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to and shall reply or respond

- by transmissions in electronic form on the web site to documents actually received in paper document form.
- c. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.
- I. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:
1. Providing suitable computer systems for each licensed user at the users normal work location¹ with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
 2. Each of the above referenced computer systems shall have the following minimum system² and software requirements:
 - a. Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)
 - 1) Operating System: Windows XP or newer
 - 2) Internet Browser: Internet Explorer 6.01SP2+ (Recommend IE7.0+)
 - 3) Minimum Recommend Connection Speed: 256K or above
 - 4) Processor Speed: 1 Gigahertz and above
 - 5) RAM: 512 mb
 - 6) Operating system and software shall be properly licensed.
 - 7) Internet Explorer version 7 (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.
 - 8) Adobe Acrobat Reader (current version is a free distribution for download).
 - 9) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable.)

END OF SECTION 013115

¹ The normal work location is the place where the user is assigned for more than one-half of his time working on this project.

² The minimum system herein will not be sufficient for many tasks and may not be able to process all documents and files stored in the E-Builder® Documents area.

SECTION 013200 – SCHEDULE – BAR CHART

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for a Bar Chart Schedule for the project construction activities, schedule of submittals, and schedule for testing.

PART 2 - PRODUCTS – (Not Applicable)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

- A. The Contractor shall submit to the Designer, within ten (10) working days following the Notice to Proceed, a Progress Schedule including Schedule of Values showing the rate of progress the Contractor agrees to maintain and the order in which he proposed to carry out the various phases of Work. No payments shall be made to the Contractor until the Progress Schedule has been approved by the Owner.
 - 1. The Schedule of Values must have the following line items included with the value of the item as indicated below:
 - a. O&M's (Owner's Manual)
 - 1) \$1,000,000.00 (One million) and under – 2% of the total contract amount
 - 2) Over \$1,000,000.00 (One million) – 1% of the total contract amount
 - b. Close Out Documents
 - 1) \$1,000,000.00 (One million) and under – 2% of the total contract amount
 - 2) Over \$1,000,000.00 (One million) – 1% of the total contract amount
 - c. General Conditions
 - 1) No more than 10%
- B. The Contractor shall submit an updated Schedule for presentation at each Monthly Progress Meeting. The Schedule shall be updated by the Contractor as necessary to reflect the current Schedule and its relationship to the original Schedule. The updated Schedule shall reflect any changes in the logic, sequence, durations, or completion date. Payments to the Contractor shall be suspended if the Progress Schedule is not adequately updated to reflect actual conditions.

- C. The Contractor shall submit Progress Schedules to Subcontractors to permit coordinating their Progress Schedules to the general construction Work. The Contractor shall coordinate preparation and processing of Schedules and reports with performance of other construction activities.

3.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE

- A. Bar-Chart Schedule: The Contractor shall prepare a comprehensive, fully developed, horizontal bar chart-type Contractor's Construction Schedule. The Contractor for general construction shall prepare the Construction Schedule for the entire Project. The Schedule shall show the percentage of work to be completed at any time, anticipated monthly payments by Owner, as well as significant dates (such as completion of excavation, concrete foundation work, underground lines, superstructure, rough-ins, enclosure, hanging of fixtures, etc.) which shall serve as check points to determine compliance with the approved Schedule. The Schedule shall also include an activity for the number of "bad" weather days specified in Section 012100 – Allowances.
1. The Contractor shall provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.
 - a. If practical, use the same Schedule of Values breakdown for schedule time bars.
 2. The Contractor shall provide a base activity time bar showing duration for each construction activity. Each bar is to indicate start and completion dates for the activity. The Contractor is to place a contrasting bar below each original schedule activity time for indicating actual progress and planned remaining duration for the activity.
 3. The Contractor shall prepare the Schedule on a minimal number of separate sheets to readily show the data for the entire construction period.
 4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on schedule with other construction activities. Include minor elements involved in the overall sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.
 5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other required schedules and reports.
 6. Indicate the Intent to Award and the Contract Substantial Completion dates on the schedule.
- B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by the following:
1. Requirement for Phased completion
 2. Work by separate Contractors
 3. Work by the Owner
 4. Pre-purchased materials
 5. Coordination with existing construction
 6. Limitations of continued occupancies

7. Un-interruptible services
 8. Partial Occupancy prior to Substantial Completion
 9. Site restrictions
 10. Provisions for future construction
 11. Seasonal variations
 12. Environmental control
- C. Work Stages: Use crosshatched bars to indicate important stages of construction for each major portion of the Work. Such stages include, but are not necessarily limited to, the following:
1. Subcontract awards
 2. Submittals
 3. Purchases
 4. Mockups
 5. Fabrication
 6. Sample testing
 7. Deliveries
 8. Installation
 9. Testing
 10. Adjusting
 11. Curing
 12. Startup and placement into final use and operation
- D. Area Separations: Provide a separate time bar to identify each major area of construction for each major portion of the Work. For the purposes of this Article, a “major area” is a story of construction, a separate building, or a similar significant construction element.
1. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Permanent space enclosure
 - c. Completion of mechanical installation
 - d. Completion of the electrical portion of the Work
 - e. Substantial Completion

3.3 SCHEDULE OF SUBMITTALS

- A. Upon acceptance of the Construction Progress Schedule, prepare and submit a complete schedule of submittals. Coordinate the submittal schedule with Section 013300 SUBMITTALS, the approved Construction Progress Schedule, list of subcontracts, Schedule of Values and the list of products.
- B. Prepare the schedule in chronological order. Provide the following information

1. Scheduled date for the first submittal
 2. Related Section number
 3. Submittal category
 4. Name of the Subcontractor
 5. Description of the part of the Work covered
 6. Scheduled date for resubmittal
 7. Scheduled date for the Designer's final release or approval
- C. Distribution: Following the Designer's response to the initial submittal schedule, print and distribute copies to the Designer, Owner, subcontractors, and other parties required to comply with submittal dates indicated.
1. Post copies in the Project meeting room and temporary field office.
 2. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the Work and are no longer involved in construction activities.
- D. Schedule Updating: Revise the schedule after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

3.4 SCHEDULE OF INSPECTIONS AND TESTS

- A. Prepare a schedule of inspections, tests, and similar services required by the Contract Documents. Submit the schedule with (15) days of the date established for commencement of the Contract Work. The Contractor is to notify the testing agency at least (5) working days in advance of the required tests unless otherwise specified.
- B. Form: This schedule shall be in tabular form and shall include, but not be limited to, the following:
1. Specification Section number
 2. Description of the test
 3. Identification of applicable standards
 4. Identification of test methods
 5. Number of tests required
 6. Time schedule or time span for tests
 7. Entity responsible for performing tests
 8. Requirements for taking samples
 9. Unique characteristics of each service
- C. Distribution: Distribute the schedule to the Owner, Architect, and each party involved in performance of portions of the Work where inspections and tests are required.

END OF SECTION 013200

SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division 1 Specification Sections apply to this Section.
- B. Division 1, Section 013115 “Project Management Communications” for administrative requirements for communications.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submittals required for performance of the Work including the following:
 - 1. Shop Drawings
 - 2. Product Data
 - 3. Samples
 - 4. Quality Assurance Submittals
 - 5. Construction Photographs
 - 6. Operating and Maintenance Manuals
 - 7. Warranties
- B. Administrative Submittals: Refer to General and Supplementary Conditions other applicable Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
 - 1. Construction Progress Schedule including Schedule of Values
 - 2. Performance and Payment Bonds
 - 3. Insurance Certificates
 - 4. Applications for Payment
 - 5. Certified Payroll Reports
 - 6. Partial and Final Receipt of Payment and Release Forms
 - 7. Affidavit – Compliance with Prevailing Wage Law
 - 8. Record Drawings
 - 9. Notifications, Permits, etc.
- C. The Contractor is obliged and responsible to check all shop drawings and schedules to assure compliance with contract plans and specifications. The Contractor is responsible for the content of the shop drawings and coordination with other contract work. Shop drawings and schedules shall indicate, in detail, all parts of an Item or Work including erection and setting instructions and integration with the Work of other trades.

- D. The Contractor shall at all times make a copy, of all approved submittals, available on site to the Construction Representative.

1.3 SUBMITTAL PROCEDURES

- A. The Contractor shall comply with the General and Supplementary Conditions and other applicable sections of the Contract Documents. The Contractor shall submit, with such promptness as to cause no delay in his work or in that of any other contractors, all required submittals indicated in Part 3.1 of this section and elsewhere in the Contract Documents. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
- B. Each drawing and/or series of drawings submitted must be accompanied by a letter of transmittal giving a list of the titles and numbers of the drawings. Each series shall be numbered consecutively for ready reference and each drawing shall be marked with the following information:
 - 1. Date of Submission
 - 2. Name of Project
 - 3. Location
 - 4. Section Number of Specification
 - 5. State Project Number
 - 6. Name of Submitting Contractor
 - 7. Name of Subcontractor
 - 8. Indicate if Item is submitted as specified or as a substitution

1.4 SHOP DRAWINGS

- A. Comply with the General Conditions, Article 3.2.
- B. The Contractor shall submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
- C. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings including the following information:

1. Dimensions
2. Identification of products and materials included by sheet and detail number
3. Compliance with specified standards
4. Notation of coordination requirements
5. Notation of dimensions established by field measurement
6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8½"x11" but no larger than 36"x48".

1.5 PRODUCT DATA

- A. The Contractor shall comply with the General Conditions, Article 3.2.
- B. The Contractor shall collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.
 1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information including the following information:
 - a. Manufacturer's printed recommendations
 - b. Compliance with Trade Association standards
 - c. Compliance with recognized Testing Agency standards
 - d. Application of Testing Agency labels and seals
 - e. Notation of dimensions verified by field measurement
 - f. Notation of coordination requirements
 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.6 SAMPLES

- A. The Contractor shall comply with the General Conditions, Article 3.2.
- B. The Contractor shall submit full-size, fully fabricated samples, cured and finished as specified, and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
 1. The Contractor shall mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Designer's sample including the following:
 - a. Specification Section number and reference
 - b. Generic description of the Sample
 - c. Sample source

- d. Product name or name of the Manufacturer
 - e. Compliance with recognized standards
 - f. Availability and delivery time
- 2. The Contractor shall submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show approximate limits of the variations.
 - b. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 - c. Refer to other Sections for samples to be returned to the Contractor for incorporation in the Work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.
 - d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.
- 3. Field samples are full-size examples erected onsite to illustrate finishes, coatings, or finish materials and to establish the Project standard.
 - a. The Contractor shall comply with submittal requirements to the fullest extent possible. The Contractor shall process transmittal forms to provide a record of activity.

1.7 QUALITY ASSURANCE DOCUMENTS

- A. The Contractor shall comply with the General Conditions, Article 3.2
- B. The Contractor shall submit quality control submittals including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- C. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the Manufacturer certifying compliance with specified requirements.
 - 1. Signature: Certification shall be signed by an officer of the Manufacturer or other individual authorized to contractually bind the Company.
- D. Inspection and Test Reports: The Contractor shall submit the required inspection and test reports from independent testing agencies as specified in this Section and in other Sections of the Contract Documents.
- E. Construction Photographs: The Contractor shall submit record construction photographs as specified in this Section and in other Sections of the Contract Documents.

1. The Contractor shall submit digital photographs. The Construction Administrator shall determine the quantity and naming convention at the preconstruction meeting.
2. The Contractor shall identify each photograph with project name, location, number, date, time, and orientation.
3. The Contractor shall submit progress photographs monthly unless specified otherwise. Photographs shall be taken one (1) week prior to submitting.
4. The Contractor shall take four (4) site photographs from differing directions and a minimum of five (5) interior photographs indicating the relative progress of the Work.

1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

- A. The Contractor shall submit all required manufacturer's operating instructions, maintenance/service manuals, and warranties in accordance with the General Conditions, Article 3.5, and Supplementary Conditions along with this and other Sections of the Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REQUIRED SUBMITTALS

- A. Contractor shall submit the following information for materials and equipment to be provided under this contract.

SPEC SECTION	TITLE	CATEGORY
013200	Schedules-Bar Chart	Construction Schedule
013200	Schedules-Bar Chart	Schedule of Values
013200	Schedules-Bar Chart	List of Subcontractors
013200	Schedules-Bar Chart	Major Material Suppliers
030505	Underslab Vapor Barrier	Product Data
032000	Concrete Forming and Accessories	Product Data
032000	Concrete Reinforcing	Shop Drawings
032000	Concrete Reinforcing	Certification
033000	Cast-in-place concrete	Product Data
033000	Cast-in-place concrete	Test Report
033533	Stamped Concrete Finishing	Product Data
033533	Stamped Concrete Finishing	Sample
033533	Stamped Concrete Finishing	Operation / Maintenance Manual
033533	Stamped Concrete Finishing	Certification

040511	Mortar and Masonry Grout	Certification
040511	Mortar and Masonry Grout	Product Data
040511	Mortar and Masonry Grout	Test Report
042000	Unit Masonry	Sample
042000	Unit Masonry	Product Data
042000	Unit Masonry	Shop Drawings
047200	Cast Stone Masonry	Product Data
047200	Cast Stone Masonry	Shop Drawings
047200	Cast Stone Masonry	Sample
044313	Stone Masonry Veneer	Shop Drawings
044313	Stone Masonry Veneer	Product Data
044313	Stone Masonry Veneer	Sample
044313	Stone Masonry Veneer	Mock up
051200	Structural Steel Framing	Shop Drawings
051200	Structural Steel Framing	Product Data
051200	Structural Steel Framing	Certification
051200	Structural Steel Framing	Test Report
061000	Rough Carpentry	Product Data
061323	Heavy Timber Trusses	Shop Drawings
061323	Heavy Timber Trusses	Product Data
061323	Heavy Timber Trusses	Certification
061753	Shop Fabricated Wood Trusses	Shop Drawings
061753	Shop Fabricated Wood Trusses	Product Data
061753	Shop Fabricated Wood Trusses	Certification
062000	Finish Carpentry	Product Data
062000	Finish Carpentry	Sample
064100	Architectural Wood Casework	Shop Drawings
064100	Architectural Wood Casework	Product Data
064100	Architectural Wood Casework	Sample
068316	Fiberglass Reinforced Plastic Panels	Product Data
068316	Fiberglass Reinforced Plastic Panels	Sample
072100	Thermal Insulation	Product Data
072100	Thermal Insulation	Manufactures Instruction
072126	Blown Insulation	Product Data
072126	Blown Insulation	Manufactures Instruction
072500	Weather Barriers	Shop Drawings
072500	Weather Barriers	Product Data
072500	Weather Barriers	Manufacturer Instructions
072500	Weather Barriers	Warranty
073113	Asphalt Shingles	Shop Drawings
073113	Asphalt Shingles	Product Data

073113	Asphalt Shingles	Sample
073113	Asphalt Shingles	Manufacturer Instructions
073113	Asphalt Shingles	Warranty
074643	Plastic Siding	Product Data
074643	Plastic Siding	Sample
074646	Fiber-Cement Siding	Product Data
074646	Fiber-Cement Siding	Sample
074646	Fiber-Cement Siding	Warranty
076200	Sheet Metal Flashing and Trim	Shop Drawings
076200	Sheet Metal Flashing and Trim	Product Data
076200	Sheet Metal Flashing and Trim	Sample
078400	Firestopping	Product Data
078400	Firestopping	Certification
079200	Joint Sealants	Product Data
079200	Joint Sealants	Sample
079513	Expansion Joint Cover Assemblies	Product Data
079513	Expansion Joint Cover Assemblies	Shop Drawings
079513	Expansion Joint Cover Assemblies	Sample
081113	Hollow Metal Doors and Frames	Shop Drawings
081113	Hollow Metal Doors and Frames	Product Data
081113	Hollow Metal Doors and Frames	Manufacturer Instructions
081113	Hollow Metal Doors and Frames	Warranty
081416	Flush Wood Doors	Product Data
081416	Flush Wood Doors	Shop Drawings
081416	Flush Wood Doors	Sample
081416	Flush Wood Doors	Manufactures Instruction
081416	Flush Wood Doors	Certification
083100	Access Doors and Panels	Product Data
083100	Access Doors and Panels	Manufacturer Instructions
084229	Sliding Automatic Entrances	Shop Drawings
084229	Sliding Automatic Entrances	Product Data
084229	Sliding Automatic Entrances	Manufacturer Instructions
084229	Sliding Automatic Entrances	Operation / Maintenance Manual
085200	Aluminum Framed Storefront	Shop Drawings
085200	Aluminum Framed Storefront	Product Data
085200	Aluminum Framed Storefront	Sample
085200	Aluminum Framed Storefront	Manufacturer Instructions
085200	Aluminum Framed Storefront	Warranty
085413	Fiberglass Windows	Product Data
085413	Fiberglass Windows	Shop Drawings
085413	Fiberglass Windows	Sample

085413	Fiberglass Windows	Certification
085413	Fiberglass Windows	Manufactures Instruction
085413	Fiberglass Windows	Warranty
085659	Service and Teller Window Units	Product Data
085659	Service and Teller Window Units	Sample
085659	Service and Teller Window Units	Shop Drawings
085659	Service and Teller Window Units	Warranty
087100	Door Hardware	Shop Drawings
087100	Door Hardware	Product Data
087100	Door Hardware	Manufacturer Instructions
087100	Door Hardware	Operation / Maintenance Manual
087100	Door Hardware	Warranty
088000	Glazing	Shop Drawings
088000	Glazing	Product Data
088000	Glazing	Sample
089100	Louvers	Shop Drawings
089100	Louvers	Product Data
089100	Louvers	Test Report
089100	Louvers	Sample
090561	Common Work Results for Flooring Preparation	Product Data
090561	Common Work Results for Flooring Preparation	Test Report
090561	Common Work Results for Flooring Preparation	Manufactures Instruction
092116	Gypsum Board Assemblies	Shop Drawings
092116	Gypsum Board Assemblies	Product Data
092613	Gypsum Veneer Plastering	Product Data
092613	Gypsum Veneer Plastering	Sample
092613	Gypsum Veneer Plastering	Mock up
093000	Tiling	Product Data
093000	Tiling	Sample
093000	Tiling	Warranty
095100	Acoustical Ceilings	Product Data
095100	Acoustical Ceilings	Shop Drawings
095100	Acoustical Ceilings	Sample
095100	Acoustical Ceilings	Manufactures Instruction
095423	Linear Metal Ceilings	Product Data
095423	Linear Metal Ceilings	Shop Drawings
095423	Linear Metal Ceilings	Sample
095423	Linear Metal Ceilings	Manufactures Instruction
096500	Resilient Flooring	Product Data
096500	Resilient Flooring	Sample
096500	Resilient Flooring	Manufactures Instruction

096500	Resilient Flooring	Operation / Maintenance Manual
096700	Fluid – Applied Flooring	Product Data
096700	Fluid – Applied Flooring	Manufactures Instruction
096700	Fluid – Applied Flooring	Operation / Maintenance Manual
096813	Tile Carpeting	Product Data
096813	Tile Carpeting	Sample
096813	Tile Carpeting	Manufacturer Instructions
099113	Exterior Painting	Product Data
099113	Exterior Painting	Sample
099123	Interior Painting	Product Data
099123	Interior Painting	Sample
101200	Display Cases	Product Data
101200	Display Cases	Sample
101200	Display Cases	Shop Drawings
101400	Signage	Product Data
101400	Signage	Sample
101400	Signage	Shop Drawings
102239	Folding Panel Partitions	Product Data
102239	Folding Panel Partitions	Shop Drawings
102239	Folding Panel Partitions	Sample
102239	Folding Panel Partitions	Manufacturer Instructions
102239	Folding Panel Partitions	Operation / Maintenance Manual
102600	Wall and Door Protection	Product Data
102600	Wall and Door Protection	Shop Drawings
102600	Wall and Door Protection	Sample
102800	Toilet, Bath and Laundry Accessories	Product Data
102800	Toilet, Bath and Laundry Accessories	Sample
102800	Toilet, Bath and Laundry Accessories	Manufacturer Instructions
102800	Toilet, Bath and Laundry Accessories	Warranty
103107	Manufactured Fireplaces	Shop Drawings
103107	Manufactured Fireplaces	Product Data
103107	Manufactured Fireplaces	Manufacturer Instructions
103107	Manufactured Fireplaces	Maintenance Data
103107	Manufactured Fireplaces	Operation / Maintenance Manual
103107	Manufactured Fireplaces	Warranty
104400	Fire Protection Specialties	Product Data
104400	Fire Protection Specialties	Manufacturer Instructions
107313	Awnings	Product Data
107313	Awnings	Sample

107313	Awnings	Shop Drawings
107516	Ground Set Flagpoles	Product Data
107516	Ground Set Flagpoles	Manufactures Instruction
107516	Ground Set Flagpoles	Sample
108113	Bird Control Devices	Product Data
108113	Bird Control Devices	Sample
123600	Countertops	Shop Drawings
123600	Countertops	Product Data
123600	Countertops	Sample
123600	Countertops	Manufacturer Instructions
123600	Countertops	Maintenance Data
123600	Countertops	Warranty
210548	Vibration and Seismic Controls for Fire Suppression Piping and Equipment	Shop Drawings
210548	Vibration and Seismic Controls for Fire Suppression Piping and Equipment	Product Data
210548	Vibration and Seismic Controls for Fire Suppression Piping and Equipment	Manufacturer Instructions
211300	Fire Suppression Sprinkler Systems	Shop Drawings
211300	Fire Suppression Sprinkler Systems	Product Data
211300	Fire Suppression Sprinkler Systems	Maintenance Data
211300	Fire Suppression Sprinkler Systems	Operation / Maintenance Manual
220517	Sleeves and Sleeve Seals for Plumbing Piping	Product Data
220523	General Duty Valves for Plumbing Piping	Product Data
220529	Hangers and Supports for Plumbing Piping and Equipment	Product Data
220548	Vibration and Seismic Controls for Plumbing Piping and Equipment	Shop Drawings
220548	Vibration and Seismic Controls for Plumbing Piping and Equipment	Product Data
220548	Vibration and Seismic Controls for Plumbing Piping and Equipment	Manufacturer Instructions
220553	Identification for Plumbing Piping and Equipment	Product Data
220719	Plumbing Piping Insulation	Product Data
221005	Plumbing Piping	Product Data
221006	Plumbing Piping Specialties	Product Data
223000	Plumbing Equipment	Product Data
223000	Plumbing Equipment	Manufacturer Instructions
223000	Plumbing Equipment	Warranty

224000	Plumbing Fixtures	Product Data
230516	Expansion Fittings and Loops for HVAC Piping	Product Data
230517	Sleeves and Sleeve Seals for HVAC Piping	Product Data
230519	Meters and Gauges for HVAC Piping	Product Data
230523	General-Duty Valves for HVAC Piping	Product Data
230529	Hangers and Supports for HVAC Piping and Equipment	Product Data
230529	Hangers and Supports for HVAC Piping and Equipment	Manufacturer Instructions
230548	Vibration and Seismic Controls for HVAC Piping and Equipment	Product Data
230548	Vibration and Seismic Controls for HVAC Piping and Equipment	Manufacturer Instructions
230553	Identification for HVAC Piping and Equipment	Product Data
230553	Identification for HVAC Piping and Equipment	Manufacturer Instructions
230593	Testing, Adjusting, and Balancing for HVAC	Test Report
230713	Duct Insulation	Product Data
230719	HVAC Piping Insulation	Product Data
230913	Instrumentation and Control Devices for HVAC - Schneider Electric	Shop Drawings
230913	Instrumentation and Control Devices for HVAC - Schneider Electric	Product Data
230913	Instrumentation and Control Devices for HVAC - Schneider Electric	Wiring Diagrams
230913	Instrumentation and Control Devices for HVAC - Schneider Electric	Operation / Maintenance Manual
231123	Facility Natural-Gas Piping	Product Data
232114	Hydronic Piping	Product Data
233100	HVAC Ducts and Casings	Product Data
233100	HVAC Ducts and Casings	Manufactures Instruction
233300	Air Duct Accessories	Product Data
233300	Air Duct Accessories	Manufacturer Instructions
233423	HVAC Power Ventilators	Shop Drawings
233423	HVAC Power Ventilators	Product Data
233423	HVAC Power Ventilators	Manufacturer Instructions
233423	HVAC Power Ventilators	Wiring Diagrams
233423	HVAC Power Ventilators	Maintenance Data
233423	HVAC Power Ventilators	Operation / Maintenance Manual
233700	Air Outlets and Inlets	Product Data
233700	Air Outlets and Inlets	Manufacturer Instructions
234313	High-Efficiency Particulate Filtration	Shop Drawings
234313	High-Efficiency Particulate Filtration	Product Data
234313	High-Efficiency Particulate Filtration	Manufacturer Instructions

234313	High-Efficiency Particulate Filtration	Maintenance Data
234313	High-Efficiency Particulate Filtration	Operation / Maintenance Manual
237313	Modular Indoor Central-Station Air Handling Units	Shop Drawings
237313	Modular Indoor Central-Station Air Handling Units	Product Data
237313	Modular Indoor Central-Station Air Handling Units	Manufacturer Instructions
237313	Modular Indoor Central-Station Air Handling Units	Maintenance Data
237313	Modular Indoor Central-Station Air Handling Units	Wiring Diagrams
237313	Modular Indoor Central-Station Air Handling Units	Operation / Maintenance Manual
237433	Dedicated Outdoor Air Units	Shop Drawings
237433	Dedicated Outdoor Air Units	Manufactures Instruction
237433	Dedicated Outdoor Air Units	Operation / Maintenance Manual
237433	Dedicated Outdoor Air Units	Product Data
238200	Convection Heating and Cooling Units	Shop Drawings
238200	Convection Heating and Cooling Units	Manufactures Instruction
238200	Convection Heating and Cooling Units	Operation / Maintenance Manual
238219	Fan Coil Units	Shop Drawings
238219	Fan Coil Units	Manufactures Instruction
238219	Fan Coil Units	Product Data
238219	Fan Coil Units	Operation / Maintenance Manual
260010	Basic Electrical Requirements	Product Data
260519	Low-Voltage Electrical Power Conductors and Cables	Product Data
260526	Grounding and Bonding for Electrical Systems	Product Data
260529	Hangers and Supports for Electrical Systems	Product Data
260533	Conduit For Electrical Systems	Product Data
260533	Boxes	Product Data
260553	Identification for Electrical Systems	Product Data
260923	Lighting Control Devices	Product Data
260923	Lighting Control Devices	Shop Drawings
260923	Lighting Control Devices	Manufactures Instruction
260923	Lighting Control Devices	Operation / Maintenance Manual
260923	Lighting Control Devices	Maintenance Materials
262416	Panel Boards	Shop Drawings
262416	Panel Boards	Product Data
262416	Panel Boards	Manufacturer Instructions

262416	Panel Boards	Wiring Diagrams
262416	Panel Boards	Maintenance Data
262416	Panel Boards	Operation / Maintenance Manual
262726	Wiring Devices	Product Data
262813	Fuses	Product Data
262816.16	Enclosed Switches	Shop Drawings
262816.16	Enclosed Switches	Product Data
262816.16	Enclosed Switches	Manufacturer Instructions
262816.16	Enclosed Controllers	Product Data
262913	Enclosed Controllers	Shop Drawings
262913	Enclosed Controllers	Operation / Maintenance Manual
262913	Enclosed Controllers	Test Report
265100	Interior Lighting	Shop Drawings
265100	Interior Lighting	Product Data
265100	Interior Lighting	Manufacturer Instructions
265100	Interior Lighting	Wiring Diagrams
265100	Interior Lighting	Maintenance Data
265100	Interior Lighting	Operation / Maintenance Manual
265100	Interior Lighting	Warranty
265600	Exterior Lighting	Shop Drawings
265600	Exterior Lighting	Product Data
265600	Exterior Lighting	Manufacturer Instructions
265600	Exterior Lighting	Wiring Diagrams
265600	Exterior Lighting	Maintenance Data
265600	Exterior Lighting	Operation / Maintenance Manual
265600	Exterior Lighting	Warranty
284600	Fire Detection and Alarm	Shop Drawings
284600	Fire Detection and Alarm	Product Data
284600	Fire Detection and Alarm	Manufacturer Instructions
284600	Fire Detection and Alarm	Wiring Diagrams
284600	Fire Detection and Alarm	Maintenance Data
284600	Fire Detection and Alarm	Operation / Maintenance Manual
312316	Excavation	Test Report
312316	Trenching	Test Report
312323	Fill	Product Data
312323	Fill	Test Report
321123	Aggregate Base Courses	Product Data
321313	Concrete Paving	Product Data

321313	Concrete Paving	Test Report
323119	Decorative Metal Fences and Gates	Product Data
323119	Decorative Metal Fences and Gates	Shop Drawings
321713	Parking Bumpers	Product Data
329115	Landscape Soil Preparation	Product Data
329115	Landscape Soil Preparation	Sample
329115	Landscape Soil Preparation	Test Report
329200	Turf	Product Data
329200	Turf	Certification
329300	Plant Material and Accessories	Product Data
329300	Plant Material and Accessories	Warranty
330561	Concrete Manholes	Product Data
330561	Concrete Manholes	Shop Drawings
334211	Storm Gravity Piping	Product Data

END OF SECTION 013300

SECTION 013513.28 - SITE SECURITY AND HEALTH REQUIREMENTS (VETERANS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUBMITTALS

- A. List of required submittals:
 - 1. Materials Safety Data Sheets for all hazardous materials to be brought onsite.
 - 2. Schedule of proposed shutdowns, if applicable.
 - 3. A list of the names of all employees who will submit fingerprints for a background check, and the signed privacy documents identified below for each employee.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ACCESS TO THE SITE

- A. The Contractor shall arrange with Facility Representatives to establish procedures for the controlled entry of workers and materials into the work areas at the Facility.
- B. The Contractor shall establish regular working hours with Facility Representatives. The Contractor must report changes in working hours or overtime to Facility Representatives and obtain approval twenty-four (24) hours ahead of time. The Contractor shall report emergency overtime to Facility Representatives as soon as it is evident that overtime is needed. The Contractor must obtain approval from Facility Representatives for all work performed after dark.
- C. The Contractor shall provide the name and phone number of the Contractor's employee or agent who is in charge onsite; this individual must be able to be contacted in case of emergency. The Contractor must be able to furnish names and address of all employees upon request.
- D. All construction personnel shall visibly display issued identification cards.

3.2 FIRE PROTECTION, SAFETY, AND HEALTH CONTROLS

- A. The Contractor shall take all necessary precautions to guard against and eliminate possible fire

hazards.

1. Onsite burning is prohibited.
 2. The Contractor shall store all flammable or hazardous materials in proper containers located outside the buildings or offsite, if possible.
 3. The Contractor shall provide and maintain, in good order, during construction fire extinguishers as required by the National Fire Protection Association. In areas of flammable liquids, asphalt, or electrical hazards, 15-pound carbon dioxide or 20-pound dry chemical extinguishers shall be provided.
- B. The Contractor shall not obstruct streets or walks without permission from the Owner's Construction Representative and Facility Representatives.
- C. The Contractor's personnel shall not exceed the speed limit of 15 mph while at the Facility unless otherwise posted.
- D. The Contractor shall take all necessary, reasonable measures to reduce air and water pollution by any material or equipment used during construction. The Contractor shall keep volatile wastes in covered containers, and shall not dispose of volatile wastes or oils in storm or sanitary drains.
- E. The Contractor shall keep the project site neat, orderly, and in a safe condition at all times. The Contractor shall immediately remove all hazardous waste, and shall not allow rubbish to accumulate. The Contractor shall provide onsite containers for collection of rubbish and shall dispose of it at frequent intervals during the progress of the Work.
- F. Fire exits, alarm systems, and sprinkler systems shall remain fully operational at all times, unless written approval is received from the Owner's Construction Representative and the appropriate Facility Representative at least twenty-four (24) hours in advance. The Contractor shall submit a written time schedule for any proposed shutdowns.
- G. For all hazardous materials brought onsite, Material Safety Data Sheets shall be on site and readily available upon request at least a day before delivery.
- H. Alcoholic beverages or illegal substances shall not be brought upon the Facility premises. The Contractor's workers shall not be under the influence of any intoxicating substances while on the Facility premises.

3.3 SECURITY CLEARANCES AND RESTRICTIONS

- A. FMDC REQUIRED FINGERPRINTING FOR CRIMINAL BACKGROUND AND WARRANTS CHECK
1. All employees of the Contractor are required to submit fingerprints to the Missouri State Highway Patrol to enable the Office of Administration, Division of Facilities Management, Design and Construction (FMDC) to receive state and national criminal background checks on such employees. FMDC reserves the right to prohibit any employee of the Contractor from performing work in or on the premises of any facility

- owned, operated, or utilized by the State of Missouri for any reason.
2. The Contractor shall ensure all of its employees submit fingerprints to the Missouri State Highway Patrol and pay for the cost of such background checks. The Contractor shall submit to FMDC via email to FMDCSecurity@oa.mo.gov a list of the names of the Contractor's employees who will be fingerprinted and a signed Missouri Applicant Fingerprint Privacy Notice, Applicant Privacy Rights and Privacy Act Statement for each employee. All employees of the Contractor approved by FMDC to work at a State facility must obtain a contractor ID badge from FMDC prior to beginning work on-site, unless the Director of FMDC, at the Director's discretion, waives the requirement for a contractor ID badge. The Contractor and its employees must comply with the process for background checks and contractor ID badges found on FMDC's website at: <https://oa.mo.gov/fmdc-contractor-id-badges>.
 3. Pursuant to section 43.540, RSMo, FMDC participates in the Missouri Rap Back and National Rap Back programs as of August 28, 2018. This means that the Missouri State Highway Patrol, Central Records Repository, and the Federal Bureau of Investigation will retain the fingerprints submitted by each of the Contractor's employees, and those fingerprints will be searched against other fingerprints on file, including latent fingerprints. While retained, an employee's fingerprints may continue to be compared against other fingerprints submitted or retained by the Federal Bureau of Investigation, including latent fingerprints.
 4. As part of the Missouri and National Rap Back programs, FMDC will receive notification if a new arrest is reported for an employee whose fingerprints have been submitted for FMDC after August 28, 2018. If the employee is performing work on a State contract at the time of the arrest notification, FMDC will request and receive the employee's updated criminal history records. If the employee is no longer performing work on a State contract, FMDC will not obtain updated criminal records.
 5. Pursuant to section 43.540, RSMo, the Missouri State Highway Patrol will provide the results of the employee's background check directly to FMDC. FMDC may NOT release the results of a background check to the Contractor or provide the Contractor any information obtained from a background check, either verbally or in writing. FMDC will notify the Contractor only whether an employee is approved to work on State property.
 6. Each employee who submits fingerprints to the Missouri State Highway Patrol has a right to obtain a copy of the results of his or her background check. The employee may challenge the accuracy and completeness of the information contained in a background check report and obtain a determination from the Missouri State Highway Patrol and/or the FBI regarding the validity of such challenge prior to FMDC making a final decision about his or her eligibility to perform work under a State contract.
 7. The Contractor shall notify FMDC via email to FMDCSecurity@oa.mo.gov if an employee is terminated or resigns from employment with the Contractor. If the Contractor does not anticipate performing work on a State contract in the future, the Contractor may request that FMDC remove its employees from the Rap Back programs. However, if removed from the Rap Back programs, employees will be required to submit new fingerprints should the contractor be awarded another State contract.
 8. Upon award of a Contract, the Contractor should contact FMDC at FMDCSecurity@oa.mo.gov to determine if its employees need to provide a new background check. If a Contractor's employee has previously submitted a fingerprint background check to FMDC as part of the Missouri and National Rap Back programs, the employee may not need to submit another fingerprint search for a period of three to

six years, depending upon the circumstances. The Contractor understands and agrees that FMDC may require more frequent background checks without providing any explanation to the Contractor. The fact that an additional background check is requested by FMDC does not indicate that the employee has a criminal record.

3.4 DISRUPTION OF UTILITIES

- A. The Contractor shall give a minimum of seventy-two (72) hours written notice to the Construction Representative and the Facility Representative before disconnecting electric, gas, water, fire protection, or sewer service to any building.
- B. The Contractor shall give a minimum of seventy-two (72) hours written notice to the Construction Representative and Facility Representative before closing any access drives, and shall make temporary access available, if possible. The Contractor shall not obstruct streets, walks, or parking.

3.5 PROTECTION OF PERSONS AND PROPERTY

A. SAFETY PRECAUTIONS AND PROGRAMS

- 1. The Contractor shall at all times conduct operations under this Contract in a manner to avoid the risk of bodily harm to persons or risk of damage to any property. The Contractor shall promptly take precautions which are necessary and adequate against conditions created during the progress of the Contractor's activities hereunder which involve a risk of bodily harm to persons or a risk of damage to property. The Contractor shall continuously inspect Work, materials, and equipment to discover and determine any such conditions and shall be solely responsible for discovery, determination, and correction of any such conditions. The Contractor shall comply with applicable safety laws, standards, codes, and regulations in the jurisdiction where the Work is being performed, specifically, but without limiting the generality of the foregoing, with rules regulations, and standards adopted pursuant to the Williams-Steiger Occupational Safety and Health Act of 1970 and applicable amendments.
- 2. All contractors, subcontractors and workers on this project are subject to the Construction Safety Training provisions 292.675 RSMo.
- 3. In the event the Contractor encounters on the site, material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), lead, mercury, or other material known to be hazardous, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner's Representative and the Architect in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Owner's Representative and Contractor if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless by written agreement of the Owner's Representative and the Contractor. "Rendered Harmless" shall mean that levels of such materials are less than any applicable exposure standards, including but limited to OSHA regulations.

B. SAFETY OF PERSONS AND PROPERTY

1. The Contractor shall take reasonable precautions for safety of, and shall provide protection to prevent damage, injury, or loss to:
 - a. clients, staff, the public, construction personnel, and other persons who may be affected thereby.
 - b. the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor or the Contractor's Subcontractors of any tier; and
 - c. other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.
2. The Contractor shall give notices and comply with applicable laws, standards, codes, ordinances, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury, or loss.
3. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, safeguards for safety and protection, including, but not limited to, posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.
4. When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise the highest degree of care and carry on such activities under supervision of properly qualified personnel.
5. The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in this Section caused in whole or in part by the Contractor, a Subcontractor of any tier, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable, and for which the Contractor is responsible under this Section, except damage or loss attributable solely to acts or omissions of Owner or the Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's other obligations stated elsewhere in the Contract.
6. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents, and the maintaining, enforcing, and supervising of safety precautions and programs. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner's Representative and Architect. The Contractor shall hold regularly scheduled safety meetings to instruct Contractor personnel on safety practices, accident avoidance and prevention, and the Project Safety Program. The Contractor shall furnish safety equipment and enforce the use of such equipment by its employees and its subcontractors of any tier.
7. The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.
8. The Contractor shall promptly report in writing to the Owner all accidents arising out of or in connection with the Work which cause death, lost time injury, personal injury, or

- property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately.
9. The Contractor shall promptly notify in writing to the Owner of any claims for injury or damage to personal property related to the work, either by or against the Contractor.
 10. The Owner assumes no responsibility or liability for the physical condition or safety of the Work site or any improvements located on the Work site. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time concerning any failure by the Contractor or any Subcontractor to comply with the requirements of this Paragraph.
 11. In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences, or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.
 12. The Contractor shall maintain at his own cost and expense, adequate, safe and sufficient walkways, platforms, scaffolds, ladders, hoists and all necessary, proper, and adequate equipment, apparatus, and appliances useful in carrying on the Work and which are necessary to make the place of Work safe and free from avoidable danger for clients, staff, the public and construction personnel, and as may be required by safety provisions of applicable laws, ordinances, rules regulations and building and construction codes.

END OF SECTION 013513.28

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 design-related professional design services.
- F. Control of installation.
- G. Mock-ups.
- H. Tolerances.

1.2. RELATED REQUIREMENTS

- A. Document 00 7213 - General Conditions: Inspections and approvals required.
- B. Section 01 3300 - Submittals.

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 Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.
- C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2015a, with Editorial Revision (2016).
- 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, Testing, or Special Inspection; 2018.
- F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2015.
- G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.

1.4. DEFINITIONS

- A. 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.
- B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.5. 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.
- C. Scope of Contractor's Professional Design Services: Provide for the following items of work:
 - 1) Concrete Mix Design: As described in Section 03 3000 - Cast-in-Place Concrete. No specific designer qualifications are required.
 - 2) Structural Design of Heavy Timber Framing: As described in Section 06 1323 - Heavy Timber Framing.
 - 3) Structural Design of Wood Trusses: As described in Section 06 1753 - Shop-Fabricated Wood Trusses
 - 4) Structural Design: Include physical characteristics, engineering calculations, and resulting dimensional limitations as described in Section 08 4313 - Aluminum-Framed Storefronts.
 - 5) Structural Design for Seismic Loads: As described in Section 09 5423 - Linear Metal Ceilings.
 - 6) Electrical Calculations: For array and associated equipment, as described in Section 260573-Power System Studies.

1.6. SUBMITTALS

- A. See Section 013300 - Submittals for submittal procedures
- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.
 - 1) Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.

- a. Full name.
 - b. Professional licensure information.
 - c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.
- C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
 - 1) Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
 - 2) Include required product data and shop drawings.
 - 3) Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
 - 4) Include signature and seal of design professional responsible for allocated design services on calculations and drawings.
- D. Test Reports: After each test/inspection, promptly submit 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.
- 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. 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.

1.7. 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.
- B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.8. 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.

1.9. Testing and Inspection Agencies and Services

- A. Owner shall employ and pay for services of an independent testing agency to perform other specified testing.

- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
- C. 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) Laboratory: Authorized to operate in the State in which the Project is located.
 - 3) Laboratory Staff: Maintain a full time registered Engineer on staff to review services.

PART 3 EXECUTION

2.1. 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.

2.2. 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. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.
- D. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.
- E. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.
- F. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.

- 1) Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.
 - 2) Make corrections as necessary until Architect's approval is issued.
- G. Architect will use accepted mock-ups as a comparison standard for the remaining Work.
- H. 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.

2.3. 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.

2.4. TESTING AND INSPECTION

- A. See individual specification sections for testing and inspection required.
- B. Testing Agency Duties:
- 1) Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2) Perform specified sampling and testing of products in accordance with specified standards.
 - 3) Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4) Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5) Perform additional tests and inspections required by Architect.
 - 6) Submit reports of all tests/inspections specified.
- C. Limits on Testing/Inspection Agency Authority:
- 1) Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2) Agency may not approve or accept any portion of the Work.
 - 3) Agency may not assume any duties of Contractor.
 - 4) Agency has no authority to stop the Work.

D. Contractor Responsibilities:

- 1) Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
 - 2) Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 - 3) Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 - 4) Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 - 5) Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 - 6) Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

2.5. DEFECT ASSESSMENT

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 015000 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes requirements for construction facilities and temporary controls including temporary utilities, support facilities, security, and protection.
- B. Temporary utilities include, but are not limited to, the following:
 - 1. Water service and distribution
 - 2. Temporary electric power and light
 - 3. Temporary heat
 - 4. Ventilation
 - 5. Telephone service
 - 6. Sanitary facilities, including drinking water
 - 7. Storm and sanitary sewer
- C. Support facilities include, but are not limited to, the following:
 - 1. Field offices and storage sheds
 - 2. Temporary roads and paving
 - 3. Dewatering facilities and drains
 - 4. Temporary enclosures
 - 5. Hoists use
 - 6. Temporary project identification signs and bulletin boards
 - 7. Waste disposal services
 - 8. Rodent and pest control
 - 9. Construction aids and miscellaneous services and facilities
- D. Security and protection facilities include, but are not limited to, to following:
 - 1. Temporary fire protection
 - 2. Barricades, warning signs, and lights
 - 3. Sidewalk bridge or enclosure fence for the site
 - 4. Environmental protection

1.3 SUBMITTALS

- A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

- B. Implementation and Termination Schedule: Within (15) days of the date established for commencement of the Work, submit a schedule indicating implementation and termination of each temporary utility.

1.4 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations including, but not limited to, the following:
 - 1. Building code requirements
 - 2. Health and safety regulations
 - 3. Utility company regulations
 - 4. Police, fire department, and rescue squad rules
 - 5. Environmental protection regulations
- B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations". ANSI A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities". 29 CFR 1926 – U.S. Occupational Safety and Health Standards; current edition.
 - 1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code".
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist onsite.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. If acceptable to the Designer, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry".
 - 1. For job-built temporary office, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.
 - 2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sized and thicknesses indicated.

3. For fences and vision barriers, provide minimum 3/9" (9.5mm) thick exterior plywood.
 4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8" (16mm) thick exterior plywood.
- C. Gypsum Wallboard: Provide gypsum wallboard on interior walls of temporary offices.
- D. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary office, shops, and shed.
- E. Paint: Comply with requirements of Division 9 Section "Painting".
1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
 2. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
 3. For interior walls of temporary offices, provide two (2) quarts interior latex-flat wall paint.
- F. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of (15) or less. For temporary enclosures, provide translucent, nylon-reinforced laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
- G. Water: Provide potable water approved by local health authorities.
- H. Open-Mesh Fencing: Provide 0.120" (3mm) thick, galvanized 2" (50mm) chainlink fabric fencing 6' (2m) high with galvanized steel pipe posts, 1½" (38mm) ID for line posts and 2½" (64mm) ID for corner posts.

2.2 EQUIPMENT

- A. General: Provide new equipment. If acceptable to the Designer, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Water Hoses: Provide ¾" (19mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100' (30m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110 to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage rating.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixture where exposed to moisture.
- F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

- G. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.
- H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated re-circulation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
 - 1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
 - 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 - 3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
 - 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Designer. Neither the Owner nor Designer will accept cost or use charges as a basis of claims for Contract Change.
- B. Temporary Water Service: The Owner will provide water for construction purposes from the existing building system. All required temporary extensions shall be provided and removed by the Contractor. Connection points and methods of connection shall be designated and approved by the Construction Representative.
 - 1. Exercise measures to conserve water.
 - 2. Provide temporary pipe insulation to prevent freezing.

- C. Temporary Electric Power Service: The Owner will provide electric power for construction lighting and power tools. Contractors using such services shall pay all costs of temporary services, circuits, outlet, extensions, etc.
1. Do not disrupt Owner's need for continuous service.
 2. Exercise measures to conserve energy.
 3. Provide temporary electric feeder from existing building electrical service at locations as directed by Construction Representative.
 4. Power Service Characteristics: 120/208 volt, 400 ampere, three phase, four wire.
 5. Complement existing power service capacity and characteristics as required.
 6. Provide main service disconnect and over-current protection at convenient location and meter.
 7. Permanent convenience receptacles may be utilized during construction.
 8. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.
- D. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.
1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
 2. Provide and maintain LED, compact fluorescent, or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.
 3. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
 4. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.
 5. Maintain lighting and provide routine repairs.
 6. Permanent building lighting may be utilized during construction.
- E. Temporary Heating and Cooling: The normal heating and/or cooling system of the building shall be maintained in operation during the construction. If work is being performed in occupied resident's space, residents must be able to maintain control of the temperature (heating and cooling) in their resident room.
1. Provide heating or cooling devices as needed to maintain specified conditions for construction operations.
 2. Maintain minimum ambient temperature of 50 degrees F and maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.
 3. Owner's existing heating and cooling plant may be used.
 4. Prior to operation of permanent equipment for temporary heating or cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

- F. Temporary Telephones: Contractor shall provide their own telephones communication.
- G. Temporary Ventilation: Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.
- H. Temporary Toilets: Install self-contained toilet units. Use of pit-type privies will not be permitted. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
 - 1. Shield toilets to ensure privacy.
 - 2. Provide separate facilities for male and female personnel.
 - 3. Provide toilet tissue materials for each facility.
- I. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a health and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
 - 1. Provide paper towels or similar disposable materials for each facility.
 - 2. Provide covered waste containers for used material.
 - 3. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
- J. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled-water drinking-water units, including paper supply.
 - 1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45°F to 55°F (7°C to 13°C).
- K. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.
 - 1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings.
- C. Storage facilities: Install storage sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere onsite.
- D. Storage Facilities: Limited areas for storage of building materials are available onsite. The Contractor shall provide his own security. Specific locations for storage and craning operations will be discussed at the Pre-Bid Meeting and the Pre-Construction Meeting.
- E. Temporary Paving: Construct and maintain temporary roads and paving to support the indicated loading adequately and to withstand exposure to traffic during the construction period. Locate

temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Designer.

1. Paving: Comply with Division 2 Section "Hot-Mixed Asphalt Paving" for construction and maintenance of temporary paving.
 2. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.
 3. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.
 4. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with weather conditions to avoid unsatisfactory results.
 5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.
- F. Construction Parking: Parking at the site will be provided in the areas designated at the Pre-Construction Meeting.
- G. Construction Parking: Contractors must be prepared to discuss their storage and parking needs at the Pre-Bid Meeting.
- H. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.
- I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and materials drying or curing requirements to avoid dangerous conditions and effects.
 2. Install tarpaulins securely with incombustible wood framing and other materials. Close openings of 25 SqFt (2.3SqM) or less with plywood or similar materials.
 3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
 4. Where temporary wood or plywood enclosure exceeds 100SqFt (9.2SqM) in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.
- J. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- K. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.
1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.

2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.
- L. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.
- M. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven (7) days during normal weather or three (3) days when the temperature is expected to rise above 80°F (27°C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.
- N. Rodent Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Designer.
- B. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by **Owner** from fumes and noise.
 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 2. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 4. Insulate partitions to control noise transmission to occupied areas.
 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 6. Protect air-handling equipment.
 7. Provide walk-off mats at each entrance through temporary partition.
- C. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonable predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations”.
 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- D. Permanent Fire Protection: At the earliest feasible date in each area of the Project complete installation of the permanent fire-protection facility including connected services and place into operation and use. Instruct key personnel on use of facilities.
- E. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting including flashing red or amber lights.
- F. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.
 2. Provide plywood fence, 8' (2.5m) high, framed with (4) 2"x4" (50mm x 100mm) rails, and preservative-treated wood posts spaced not more than 8' (2.5m) apart.
- G. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
1. Storage: Where materials and equipment must be stored and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- H. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

- C. Termination and Removal: Unless the Designer requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances as required by the governing authority.
 3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
 - a. Replace air filters and clean inside of ductwork and housing.
 - b. Replace significantly worn parts and parts subject to unusual operating conditions.
 - c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 015000

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1. SECTION INCLUDES

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

1.2. RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Identification of Owner-supplied products.
- B. Section 00 7213 - General Conditions, Article 3.1 - Acceptable Substitutions: Substitutions made during procurement and/or construction phases.
- C. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.
- D. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Motors for HVAC equipment.

1.3. REFERENCE STANDARDS

- A. NEMA MG 1 - Motors and Generators; 2017.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4. 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 30 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.

1.5. QUALITY ASSURANCE

PART 2 PRODUCTS

2.1. EXISTING PRODUCTS

- A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.
- B. 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. Use of products having any of the following characteristics is not permitted:
 - 1) Made outside the United States, its territories, Canada, or Mexico.
 - 2) Made using or containing CFC's or HCFC's.
 - 3) Made of wood from newly cut old growth timber.
 - 4) Containing lead, cadmium, or asbestos.
- B. Where other criteria are met, Contractor shall give preference to products that:
 - 1) If used on interior, have lower emissions, as defined in Section 01 6116.
 - 2) If wet-applied, have lower VOC content, as defined in Section 01 6116.
- C. Motors: Refer to Section 23 0513 - Common Motor Requirements for HVAC Equipment, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.

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.
- 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 to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1. SUBSTITUTION LIMITATIONS

- A. See Section 00 7213 - General Conditions, Article 3.1 - Acceptable Substitutions: Substitutions made during procurement and/or construction phases.

3.2. OWNER-SUPPLIED PRODUCTS

- A. See Section 01 1000 - Summary, Article 1.8 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. Store and protect products in accordance with manufacturers' instructions.
- B. Store with seals and labels intact and legible.
- C. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts, and unit counts.
- 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. Do not store products directly on the ground.
- J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- K. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- L. Prevent contact with material that may cause corrosion, discoloration, or staining.
- M. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- N. 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 6116 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Requirements for Indoor-Emissions-Restricted products.
- B. Requirements for VOC-Content-Restricted products.

1.2. RELATED REQUIREMENTS

1.3. DEFINITIONS

- A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:
 - 1) Interior paints and coatings applied on site.
 - 2) Interior adhesives and sealants applied on site, including flooring adhesives.
 - 3) Flooring.
 - 4) Products making up wall and ceiling assemblies.
 - 5) Thermal and acoustical insulation.
- B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
 - 1) Interior paints and coatings applied on site.
 - 2) Interior adhesives and sealants applied on site, including flooring adhesives.
- C. Interior of Building: Anywhere inside the exterior weather barrier.
- D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.
- F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:
 - 1) Concrete.
 - 2) Clay brick.
 - 3) Metals that are plated, anodized, or powder-coated.
 - 4) Glass.
 - 5) Ceramics.

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- 6) Solid wood flooring that is unfinished and untreated.

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 D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).
- C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers; 2017, v1.2.
- D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.
- E. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.
- F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
- G. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).
- H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).
- I. SCS (CPD) - SCS Certified Products; Current Edition.
- J. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.6. QUALITY ASSURANCE

- A. Indoor Emissions Standard and Test Method: CAL (CDPH SM), using Standard Private Office exposure scenario and the allowable concentrations specified in the method, and range of total VOC's after 14 days.
 - 1) Wet-Applied Products: State amount applied in mass per surface area.
 - 2) Paints and Coatings: Test tinted products, not just tinting bases.
 - 3) Evidence of Compliance: Acceptable types of evidence are the following;
 - a. Current UL (GGG) certification.
 - b. Current SCS (CPD) Floorscore certification.
 - c. Current SCS (CPD) Indoor Advantage Gold certification.
 - d. Current listing in CHPS (HPPD) as a low-emitting product.

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- e. Current CRI (GLP) certification.
- f. Test report showing compliance and stating exposure scenario used.
- 4) Product data submittal showing VOC content is NOT acceptable evidence.
- 5) Manufacturer's certification without test report by independent agency is NOT acceptable evidence.
- B. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
 - 1) Evidence of Compliance: Acceptable types of evidence are:
 - a. Report of laboratory testing performed in accordance with requirements.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1. MATERIALS

- A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.
- B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
 - 1) Inherently Non-Emitting Materials.
- C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
 - 1) Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
 - 2) Joint Sealants: SCAQMD 1168 Rule.
 - 3) Paints and Coatings: Each color; most stringent of the following:
 - a. 40 CFR 59, Subpart D.
 - b. SCAQMD 1113 Rule.
 - c. CARB (SCM).

PART 3 EXECUTION

3.1. FIELD QUALITY CONTROL

- A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

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- B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

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SECTION 01 7000 - EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Examination, preparation, and general installation procedures.
- B. Requirements for alterations work, including selective demolition, <>.
- C. Pre-installation meetings.
- D. Cutting and patching.
- E. Surveying for laying out the work.
- F. Cleaning and protection.
- G. Starting of systems and equipment.
- H. Demonstration and instruction of Owner personnel.
- I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- J. 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 07 8400 - Firestopping.

1.3. REFERENCE STANDARDS

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

1.4. SUBMITTALS

- A. Section 01 3300 - Submittals: Submittals procedures, shop drawings, product data, and samples.
- 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. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.
 - 1) Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.

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- 2) Identify demolition firm and submit qualifications.
 - 3) Include a summary of safety procedures.
- D. 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.

1.5. QUALIFICATIONS

- A. For demolition work, employ a firm specializing in the type of work required.
- 1) Minimum of 5 years of documented experience.
- B. 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,
- C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.
- D. 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.
- 1) Provide dust-proof enclosures to prevent entry of dust generated outdoors.

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- 2) Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.
- 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.
 - 1) At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.
 - 2) Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.
 - 3) Indoors: Limit conduct of especially noisy interior work to 8 am to 5 pm.
- I. 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. 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.
- 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.

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- 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.

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- C. Notify Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
 - 1) Review conditions of examination, preparation and installation procedures.
 - 2) Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two 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. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
- D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
- E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
- F. Utilize recognized engineering survey practices.
- G. 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.
- H. Periodically verify layouts by same means.
- I. 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.

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- 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 sound retardant partitions of construction indicated on drawings 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.
 - 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 rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2) Remove items indicated on drawings.
 - 3) Relocate items indicated on drawings.
 - 4) 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.
 - 5) 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, and Telecommunications): 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.

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- 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. 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.
 - 4) Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.
- 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.

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- 2) If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

J. Clean existing systems and equipment.

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:

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- 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.

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- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel 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. Refer to Section 01 7900 - Demonstration and Training for additional State of Missouri Requirements.
- B. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.
- C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- D. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- E. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of Owner's personnel.
- F. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- G. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

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 final project assessment.
 - 1) Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Refer to Section 01 7400 - Cleaning for additional State of Missouri Requirements.
- C. Use cleaning materials that are nonhazardous.
- D. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

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- F. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
- G. Clean filters of operating equipment.
- H. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
- I. Clean site; sweep paved areas, rake clean landscaped surfaces.
- J. 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.
- B. Refer to Section 01 7900 - Demonstration and for additional State of Missouri Requirements.
- 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. Owner will occupy portions of the building as specified in Section 01 1000.
- G. 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.
- H. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- I. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
- J. 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.

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- 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

Execution and Closeout Requirements		01 7000-12
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SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for cleaning during the Project.
- B. Environmental Requirements: Conduct cleaning and waste-disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.
 - 1. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
 - 2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

- A. General
 - 1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
 - 2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
 - 3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the jobsite.
 - 4. Provide adequate storage for all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the ecology.
- B. Site

1. Daily, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
2. Weekly, inspect all arrangements of materials stored onsite. Re-stack, tidy, or otherwise service all material arrangements.
3. Maintain the site in a neat and orderly condition at all times.

C. Structures

1. Daily, inspect the structures and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
2. Weekly, sweep all interior spaces clean. "Clean" for the purposes of this paragraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom.
3. In preparation for installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.
4. Following the installation of finish floor materials, clean the finish floor daily while work is being performed in the space in which finish materials have been installed. "Clean" for the purposes of this subparagraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Construction Representative, may be injurious to the finish of the finish floor material.

3.2 FINAL CLEANING

- A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for the entire Project or a portion of the Project.
 1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities including landscape development areas, of rubbish, waste material, litter, and foreign substances.
 2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 3. Remove petrochemical spills, stains, and other foreign deposits.
 4. Remove tools, construction equipment, machinery, and surplus material from the site.
 5. Remove snow and ice to provide safe access to the building.
 6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 8. Broom clean concrete floors in unoccupied spaces.
 9. Vacuum clean carpet and similar soft surfaces removing debris and excess nap. Shampoo, if required.
 10. Clean transparent material, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 11. Remove labels that are not permanent labels.
 12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - a. Do not paint over “UL” and similar labels, including mechanical and electrical nameplates.
 13. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 14. Clean plumbing fixtures to a sanitary condition free of stains, including stains resulting from water exposure.
 15. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 16. Clean ducts, blowers, and coils if units were operated without filters during construction
 17. Clean food-service equipment to a sanitary condition, ready and acceptable for its intended use.
 18. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.
 19. Leave the Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests. Comply with regulations of local authorities.
- D. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.
- E. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.
1. Where extra materials of value remain after Final Acceptance by the Owner, they become the Owner’s property.

END OF SECTION 017400

SECTION 01 7800 - CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Operation and Maintenance Data.
- B. 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 3300 - Submittals: 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 with 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 3 EXECUTION

2.1. 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.

2.2. 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.

2.3. 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. Additional Requirements: As specified in individual product specification sections.

2.4. 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. Operation and maintenance data.
 - c. Field quality control data.
 - d. Photocopies of warranties and bonds.

2.5. 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.

END OF SECTION

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Date of video recording.
 - 2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.

3. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.
- C. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Coordination". Review methods and procedures related to demonstration and training including, but not limited to, the following:
 1. Inspect and discuss locations and other facilities required for instruction.
 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 3. Review required content of instruction.
 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

- a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 007213 "General Conditions".
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 3. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 1. Schedule training with Owner with at least seven days' advance notice.

- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

- A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.
 - 1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
 - 2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
 - 3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
 - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. E-mail address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
 - 1. Film training session(s) in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.
- E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.
- F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
- G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

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.
- C. Abandonment and removal of existing utilities and utility structures.

1.2. RELATED REQUIREMENTS

- A. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.
- B. Section 01 1000 - Summary: Sequencing and staging requirements.
- C. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.
- D. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- E. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- F. 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.

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 01 300 - Submittals for submittal procedures.
- B. Site Plan: Showing:
 - 1) Vegetation to be protected.
 - 2) Areas for temporary construction and field offices.
 - 3) Areas for temporary and permanent placement of removed materials.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.5. QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.

- 1) Minimum of 5 years of documented experience.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Fill Material: As specified in Section 31 2323 - Fill.

PART 3 EXECUTION

3.1. SCOPE

- A. Remove portions of existing buildings as designated on the drawings in the following sequence:
- B. Remove paving and curbs as required to accomplish new work.
- C. Remove concrete slabs on grade within construction limits indicated on drawings.
- D. Remove fences and gates.
- E. Remove other items indicated, for salvage, relocation, and recycling.

3.2. GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with other requirements specified in Section 01 7000.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1) Obtain required permits.
 - 2) Comply with applicable requirements of NFPA 241.
 - 3) Use of explosives is not permitted.
 - 4) 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.
 - 5) Provide, erect, and maintain temporary barriers and security devices.
 - 6) Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 7) Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 8) Do not close or obstruct roadways or sidewalks without permit.
 - 9) 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.

- 10) Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.
- F. 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.
- G. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- H. 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.
- I. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.3. EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. 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.
- E. 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.
- F. 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.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

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.
 - 2) Provide sound retardant partitions of construction indicated on drawings in locations indicated on drawings.
 - 3) Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
- 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.
- 1) Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
 - 2) Remove items indicated on drawings.
- 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.
 - a. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

- 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) Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
- 5) Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
- 6) Cover and protect furniture, furnishings, and equipment that have not been removed.
- 7) Patch as specified for patching new work.

3.5. DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 0100 - MAINTENANCE OF CONCRETE

PART 1 GENERAL

1.1.RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

1.2. PRICE AND PAYMENT PROCEDURES

1.3. REFERENCE STANDARDS

- A. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Indicate product standards, physical and chemical characteristics, technical specifications, limitations, maintenance instructions, and general recommendations regarding each material.
- C. Manufacturer's Qualification Statement and instructions.

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.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with minimum of 3 years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturers' instructions for storage, shelf life limitations, and handling of products.

PART 2 PRODUCTS

2.1. CLEANING MATERIALS

A. Degreaser:

1) Manufacturers:

- a. Euclid Chemical Company; Euco Clean and Strip: www.euclidchemical.com/#sle.
- b. L&M Construction Chemicals, Inc, a subsidiary of Laticrete International, Inc; CITREX: www.lmcc.com/#sle.
- c. SpecChem, LLC; Orange Peel-Citrus Cleaner: www.specchemllc.com/#sle.

B. Detergent: Non-ionic detergent.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that surfaces are ready to receive work.
- B. Beginning of installation means acceptance of substrate.

3.2. PREPARATION

- A. Prepare concrete surfaces to be repaired according to ICRI 310.2R, <>.

3.3. CLEANING EXISTING CONCRETE

- A. Provide enclosures, barricades, and other temporary construction as required to protect adjacent work from damage.
- B. Clean concrete surfaces of dirt or other contamination using the gentlest method that is effective.
 - 1) Try the gentlest method first, then, if not clean enough, use a less gentle method taking care to watch for impending damage.
 - 2) Clean out cracks and voids using same methods.
- C. The following are acceptable cleaning methods, in order from gentlest to less gentle:
 - 1) Water washing using low-pressure, maximum of 100 psi, and, if necessary, brushes with natural or synthetic bristles.
 - 2) Increasing the water washing pressure to maximum of 400 psi.
 - 3) Adding detergent to washing water; with final water rinse to remove residual detergent.
 - 4) Steam-generated low-pressure hot-water washing.

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 3300 - Submittals for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.
- C. Samples: Submit samples of underslab vapor barrier to be used.
- D. 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) Complying with ASTM E1745 Class A.
 - 3) Thickness: 15 mils.
 - 4) Basis of Design:
 - a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil): www.stegoindustries.com.
 - b. Other Acceptable Products subject to compliance with Basis of Design:
 - 1) Tex-trude LP; Xtreme Vapor Barrier (15-mil) Class-A

- 2) ISI Building Products; Viper Vaporcheck II (15-mil) Class A Vapor Barrier;
www.isibp.com
 - 3) W.R. Meadows Perminator (15-mil)
 - c. Substitutions: See Section 01 6000 - Product Requirements.
- B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.
- 1) Basis of Design: Vapor Barrier Accessories:
 - a. Sealing Seams: High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 4 inches. Stego Tape.
 - b. Sealing Penetrations: Stego Mastic or Stego Tape
 - c. Sealing Perimeter of Vapor barrier: StegoTack Tape (double-sided sealant tape) or Stego Crete Claw.

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. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
- E. Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
 - 1) Seal vapor barrier to the entire slab perimeter using Stego Crete Claw, per manufacturer's instructions.
 - 2) Option to install above; Seal vapor barrier to the entire perimeter wall or footing/grade beam with double sided StegoTack Tape, or both Stego Term Bar and StegoTack Tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
- F. Overlap joints 6 inches and seal with manufacturer's seam tape.
- G. Apply seam tape/Crete Claw to a clean and dry vapor barrier.

- H. For interior forming applications, avoid the use of non-permanent stakes driven through vapor barrier. Use blunt-end and/or threaded nail stakes (screed pad posts) and insert them into Beast Foot. Ensure Beast Foot's peel-and-stick adhesive base is fully adhered to the vapor barrier.
- I. If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
- J. Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.
- K. Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.
- L. For vapor barrier-safe concrete screeding applications, install Beast Screed (vapor barrier-safe screed system) per manufacturer's instructions prior to placing concrete.
- M. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.
- N. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.
- O. 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. Openings for other work.
- C. Form accessories.
- D. 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 (Reapproved 2015).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- D. ACI 347R - Guide to Formwork for Concrete; 2014.
- E. PS 1 - Structural Plywood; 2009.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data on void form materials and installation requirements.
- C. Design Data: As required by authorities having jurisdiction.

1.5. QUALITY ASSURANCE

- A. Designer Qualifications: Design formwork under direct supervision of a Professional Structural Engineer experienced in design of concrete formwork and licensed in the State in which the Project is located.
- B. Maintain one copy of each installation standard on site throughout the duration of concrete work.

1.6. 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.
- C. Protect plastic foam products from damage and exposure to sunlight.

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 concrete that complies with 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. Form Materials: At the discretion of the Contractor.

2.3. FORMWORK ACCESSORIES

- A. 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.
- B. 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.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

3.4. APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

- B. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5. INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- E. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.

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. FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

3.9. FORM REMOVAL

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- 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.

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; 2016.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- C. ACI SP-66 - ACI Detailing Manual; 2004.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- F. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- G. CRSI (DA4) - Manual of Standard Practice; 2009.
- H. CRSI (P1) - Placing Reinforcing Bars; 2011.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- 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) Maintain one copy of each document on project site.
- B. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.1. REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1) Plain billet-steel bars.
 - 2) Unfinished.
- B. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.
- C. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
 - 1) Form: Flat Sheets.
 - 2) WWR Style: 4 x 8-W6 x W10.
- D. Reinforcement Accessories:
 - 1) Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
 - 2) Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3) Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.2. FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
 - 1) Review locations of splices with Architect.

PART 3 EXECUTION

3.1. PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcing as follows:
 - 1) Walls (exposed to weather or backfill): 2 inch.
 - 2) Footings and Concrete Formed Against Earth: 3 inch.

3) Slabs on Fill: 2 inch.

E. Comply with applicable code for concrete cover over reinforcement.

F. Bond and ground all reinforcement to requirements of Section 26 0526.

3.2. FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01 4000 - Quality Requirements, will inspect installed reinforcement for conformance to contract documents before concrete placement.

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 shear walls and foundation walls.
- C. Concrete foundations and anchor bolts for pre-engineered building.
- D. Concrete reinforcement.
- E. Joint devices associated with concrete work.
- F. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, flagpole bases, thrust blocks, and manholes.
- G. Concrete curing.

1.2. RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Products and installation for sealants and joint fillers 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; 2010 (Reapproved 2015).
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 301 - Specifications for Structural Concrete; 2016.
- D. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- F. ACI 305R - Guide to Hot Weather Concreting; 2010.
- G. ACI 306R - Guide to Cold Weather Concreting; 2016.
- H. ACI 308R - Guide to External Curing of Concrete; 2016.
- I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- J. ACI 347R - Guide to Formwork for Concrete; 2014.
- K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.

- L. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- M. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- N. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- O. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- P. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.
- Q. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
- R. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- S. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.
- T. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
- U. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- V. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- W. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- X. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
- Y. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- Z. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2015.
- AA. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.
- BB. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
- CC. 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 (Reapproved 2017).
- DD. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.
- EE. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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) Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
 - 2) Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
- D. Samples: Submit samples of underslab vapor retarder to be used.
- E. Samples: Submit two, 12 inch long samples of waterstops and construction joint devices.
- F. Test Reports: Submit report for each test or series of tests specified.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5. QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
 - 1) Maintain one copy of each document on site.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.
- D. For slabs required to include moisture vapor reduction admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.

1.6. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover the cost of flooring failures due to moisture migration from slabs for life of the concrete.
 - 1) Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.
 - 2) Provide warranty by manufacturer of MVRA matching terms of flooring adhesive or primer manufacturer's material defect warranty.

- C. Moisture Emission Reducing Curing and Sealing Compound: Provide warranty to cost of flooring delamination failures for 10 years.
 - 1) Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.1. FORMWORK

- A. Formwork Design and Construction: Comply with guidelines of ACI 347R to provide formwork that will produce concrete complying with tolerances of ACI 117.
- B. Form Materials: Contractor's choice of standard products with sufficient strength to withstand hydrostatic head without distortion in excess of permitted tolerances.
 - 1) Form Facing for Exposed Finish Concrete: Steel.
 - 2) Earth Cuts: Do not use earth cuts as forms for vertical surfaces. Natural rock formations that maintain a stable vertical edge may be used as side forms.
 - 3) Form Coating: Release agent that will not adversely affect concrete or interfere with application of coatings.

2.2. REINFORCEMENT MATERIALS

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1) Type: Deformed billet-steel bars.
 - 2) Finish: Unfinished, unless otherwise indicated.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
- C. Reinforcement Accessories:
 - 1) Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
 - 2) Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.3. CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type I - Normal Portland type.
 - 1) Acquire cement for entire project from same source.
- B. Fine and Coarse Aggregates: ASTM C33/C33M.
 - 1) Acquire aggregates for entire project from same source.
- C. Fly Ash: ASTM C618, Class C or F.

- D. Calcined Pozzolan: ASTM C618, Class N.
- E. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.
- F. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.4. ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260/C260M.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. Moisture Vapor Reduction Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.
 - 1) Provide admixture in slabs to receive adhesively applied flooring.
 - 2) Manufacturers:
 - a. Barrier One, Inc; Barrier One Moisture Vapor Reduction Admixture: www.barrierone.com/#sle.
 - b. Hycrete, Inc; W500: www.hycrete.com/#sle.
 - c. ISE Logik Industries, Inc; MVRA 900: www.iselogik.com/#sle.
 - d. Specialty Products Group; Vapor Lock 20/20: www.spggogreen.com/#sle.
 - e. Substitutions: See Section 01 6000 - Product Requirements.

2.5. ACCESSORY MATERIALS

- A. Underslab Vapor Retarder: Sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. The use of single ply polyethylene is prohibited.
 - 1) Installation: Comply with ASTM E1643.
 - 2) Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
 - 3) Manufacturers:
 - a. Fortifiber Building Systems Group; Moistop Ultra 15: www.fortifiber.com/#sle.
 - b. Inteplast Group; Barrier-Bac VB-350: www.barrierbac.com/#sle.
 - c. ISI Building Products; Viper VaporCheck II 15-mil (Class A): www.isibp.com/#sle.

- d. Poly-America; Husky Yellow Guard Class A 15 mil Vapor Barrier: www.yellowguard.com/#sle.
- e. Stego Industries, LLC; <>: www.stegoindustries.com/#sle.
- f. W. R. Meadows, Inc; PERMINATOR Class A - 15 mils: www.wrmeadows.com/#sle.

2.6. BONDING AND JOINTING PRODUCTS

A. Latex Bonding Agent: Non-redispersable acrylic latex, complying with ASTM C1059/C1059M, Type II.

- 1) Manufacturers:
 - a. Euclid Chemical Company; AKKRO-7T: www.euclidchemical.com/#sle.
 - b. Kaufman Products Inc; SureBond: www.kaufmanproducts.net/#sle.
 - c. Kaufman Products Inc; SureWeld: www.kaufmanproducts.net/#sle.
 - d. SpecChem, LLC; Strong Bond Acrylic Bonder: www.specchemllc.com/#sle.
 - e. W. R. Meadows, Inc; ACRY-LOK-: www.wrmeadows.com/#sle.

B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

- 1) Material: Closed-cell, non-absorbent, compressible polymer foam in sheet form.
- 2) Manufacturers:
 - a. Nomaco, Inc; Nomaflex Expansion Joint Filler with Void Cap Option: www.nomaco.com/#sle.
 - b. W. R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip: www.wrmeadows.com/#sle.
 - c. King Packaged Materials Company; Sakrete concrete expansion joint: www.king-products.com

2.7. 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.

- 1) Manufacturers:
 - a. Dayton Superior Corporation; AquaFilm Concentrate J74: www.daytonsuperior.com/#sle.
 - b. Euclid Chemical Company ; EUCOBAR: www.euclidchemical.com/#sle.
 - c. Kaufman Products Inc; VaporAid: www.kaufmanproducts.net/#sle.

- d. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: www.specchemllc.com/#sle.
 - e. W. R. Meadows, Inc; Evapre or Evapre-RTU: www.wrmeadows.com/#sle.
 - B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.
 - 1) Application: Use at interior slabs.
 - 2) Product dissipates within 4 to 6 weeks.
 - 3) Provide product containing fugitive red dye.
 - 4) Manufacturers:
 - a. Dayton Superior Corporation; Resin Cure with Dye J11WD: www.daytonsuperior.com/#sle.
 - b. Euclid Chemical Company; COLOR-CRETE CURE AND SEAL VOC: www.euclidchemical.com/#sle.
 - c. Kaufman Products Inc; Thinfilm 420 Resin Base: www.kaufmanproducts.net/#sle.
 - d. W. R. Meadows, Inc; 1100-Clear: www.wrmeadows.com/#sle.
 - 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.
 - 5) Manufacturers:
 - a. Floor Seal Technology, Inc; VaporSeal 309 System: www.floorseal.com/#sle.
 - b. Sinak Corporation; VC5: www.sinak.com/#sle.
 - c. Bone Dry Products, Inc.; Bone dry concrete sealer; www.bonedryproducts.com
 - D. Moisture-Retaining Sheet: ASTM C171.
 - 1) White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
 - E. Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch thick, clear.
 - F. Water: Potable, not detrimental to concrete.

2.8. CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
 - 1) Replace as much Portland cement as possible with fly ash, ground granulated blast furnace slag, silica fume, or rice hull ash as is consistent with ACI recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of trial mixtures, 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:
 - 1) Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
 - 2) Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3) Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
 - 4) Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
 - 5) Cement Content: Minimum 520 pounds per cubic yard.
 - 6) Water-Cement Ratio: Maximum 40 percent by weight.
 - 7) Total Air Content: 3 percent, determined in accordance with ASTM C173/C173M.
 - 8) Maximum Slump: 4 inches.
 - 9) Maximum Aggregate Size: 5/8 inch.

2.9. MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M. and furnish batch tickets.
 - 1) When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.1. EXAMINATION

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

3.2. PREPARATION

- A. Formwork: Comply with requirements of ACI 301. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
- B. Verify that forms are clean and free of rust before applying release agent.
- C. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- D. Prepare existing concrete surfaces to be repaired according to ICRI 310.2R, \diamond.
- E. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1) Use latex bonding agent only for non-load-bearing applications.
- F. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.
- G. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- H. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 - 1) Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.3. INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

- A. Comply with requirements of ACI 301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.
- B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.
- C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.4. VAPOR BARRIER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1) Lap joints 6 inches and seal with manufacturer's recommended tape.

- 2) Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement and face laps away from the expected direction of the placement whenever possible.
- 3) Extend vapor barrier to the perimeter of the slab. If practicable, terminate it at the top of the slab, otherwise (a) at a point acceptable to the structural engineer or (b) where obstructed by impediments, such as dowels, waterstops, or any other site condition requiring early termination of the vapor barrier. At the point of termination, seal vapor barrier to the foundation wall, grade beam or slab itself.
 - a. Seal vapor barrier to the entire slab perimeter per manufacturer's instructions.
 - b. Option to install above; Seal vapor barrier to the entire perimeter wall or footing/grade beam with double sided Tack Tape, or both Term Bar and StegoTack Tape, per manufacturer's instructions. Ensure the concrete is clean and dry prior to adhering tape.
- 4) Overlap joints 6 inches and seal with manufacturer's seam tape.
- 5) Apply seam tape/Crete Claw to a clean and dry vapor barrier.
- 6) For interior forming applications, avoid the use of non-permanent stakes driven through vapor barrier. Use blunt-end and/or threaded nail stakes (screed pad posts) and insert them into center hub. Ensure center hub's peel-and-stick adhesive base is fully adhered to the vapor barrier.
- 7) If non-permanent stakes are driven through vapor retarder, repair as recommended by vapor retarder manufacturer.
- 8) Use reinforcing bar supports with base sections that eliminate or minimize the potential for puncture of the vapor barrier.
- 9) Repair damaged areas with vapor barrier material of similar (or better) permeance, puncture and tensile.
- 10) For vapor barrier-safe concrete screeding applications, install Beast Screed (vapor barrier-safe screed system) per manufacturer's instructions prior to placing concrete.

3.5. 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. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.
- G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.6. SLAB JOINTING

- A. Locate joints as indicated on 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.
 - 1) Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.
- D. 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.

3.7. FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 - 1) Exposed Concrete Floors: 1/4 inch in 10 feet.
 - 2) Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
 - 3) Under Carpeting: 1/4 inch in 10 feet.
- B. Correct the slab surface if tolerances are less than specified.
- C. 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.

3.8. CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1) Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
 - 2) Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.
- C. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on drawings. Minimum 1/8" per 1'-0"

3.9. CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, 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.
- C. 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 three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
 - a. Spraying: Spray water over floor slab areas and maintain wet.
 - b. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
 - 3) Final Curing: Begin after initial curing but before surface is dry.
 - a. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.10. FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

- H. Slab Testing: Cooperate with manufacturer of specified moisture vapor reduction admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.11. DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.12. PROTECTION

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

3.13. SCHEDULE - CONCRETE TYPES AND FINISHES

- A. Foundation Walls: Normal-weight concrete.
 - 1) Minimum Compressive Strength: 4000 psi at 28 days.
 - 2) Maximum W/C Ratio: 0.47.
 - 3) Slump Limit: 4 inches, plus or minus 1 inch.
 - 4) Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
- B. Slabs-on-Grade: Normal-weight concrete.
 - 1) Minimum Compressive Strength: 4000 psi at 28 days.
 - 2) Maximum W/C Ratio: 0.50.
 - 3) Minimum Cementitious Materials Content: 520 lb/cu. yd.
 - 4) Slump Limit: 4 inches, plus or minus 1 inch.
 - 5) Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

END OF SECTION

SECTION 03 3533 - STAMPED CONCRETE FINISHING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Stamping of new full-depth concrete.
- B. Coloring of stamped concrete.

1.2. RELATED REQUIREMENTS

- A. Section 32 1313 - Concrete Paving: Concrete mix design; concrete placement; ambient conditions; finishing of concrete surface to tolerance: floating, troweling, and similar operations; frequency and treatment of control joints; expansion joint treatment.

1.3. REFERENCE STANDARDS

- A. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- B. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- C. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section.
 - 1) Require attendance of parties directly affecting work of this section, including:
 - a. Installer.
 - b. Contractor's representative.
 - c. Architect.
 - d. Landscape architect.
 - 2) Review mock-ups, material sequence, preparation and application, cleaning, protection and coordination with other work.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. See Section 01 3300 - Submittals
- C. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1) Preparation instructions and recommendations.

- 2) Storage and handling requirements and recommendations.
- 3) Installation methods.

D. Shop Drawings: Indicate location of construction and control joints.

E. Design Samples: Submit sample panel in the field for approval; demonstrate pattern, color, and finishing, using specified materials and techniques.

- 1) Number of Samples: One of each color and pattern combination specified.
- 2) Size: 48x48 inches.

F. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

G. Certificates: Certify that products of this section meet or exceed specified requirements and are suitable for intended application.

1.6. QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by owner.

- 1) Submit installer's list of completed stamped concrete projects, including project name and location, name of Architect, and type and quantity of materials applied.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store and handle materials in accordance with manufacturer's instructions.

C. Keep materials in manufacturer's original, unopened containers and packaging until application.

D. Store materials in clean, dry area indoors and out of direct sunlight.

E. Keep materials from freezing.

F. Protect materials during storage, handling, and application to prevent contamination or damage.

1.8. FIELD CONDITIONS

A. Do not install materials when air and surface temperatures are below 55 degrees F or above 80 degrees F.

B. Do not install materials when rain, snow, or excessive moisture is expected during application or within 24 hours after application.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Stamping and Coloring Materials:

- 1) Butterfield Color; 625 West Illinois Ave., Aurora, IL 60506. PH: 800-282-3388
<https://www.butterfieldcolor.com/>
- 2) Substitutions: See Section 01 6000 - Product Requirements.

2.2. STAMPED CONCRETE APPLICATIONS

A. Full Depth Stamped Concrete Slab - Type 1: Patterned new concrete.

- 1) Application(s): As indicated on drawings.
- 2) Pattern: Bluestone Texture Mat.
- 3) Color is to be achieved as follows:
 - a. Concrete pigment, mixed into concrete prior to placement.
- 1) Pigment Color: Intergral Color: U26 - Lanon Stone.
 - b. Pigmented dry form release agent, to be substantially washed off.
- 1) Color: Release Color: R25 - Carolina Tan.
- 4) As last step, apply combination curing compound / clear sealer.
- 5) Provide all chemical components from a single manufacturer.

2.3. FULL-DEPTH CONCRETE SLAB MATERIALS

A. See other section(s) for concrete design mix, mixing, forming, and reinforcement.

- 1) Vehicular Pavements: See Section 32 1313.

B. Slump: 4.0 inches maximum.

C. Do not use calcium chloride or admixtures containing calcium chloride.

D. Aggregates: Use non-reactive fine and coarse aggregates free from deleterious material and complying with ASTM C33/C33M.

2.4. STAMPING MATERIALS

A. Stamping Mats: Mat type imprinting tools for texturing freshly placed concrete, in pattern and texture to achieve required surface profile and design.

- 1) Mat Composition: Polyurethane.

B. Release Agent: Bond breaker compound capable of releasing stamping forms from concrete without creating surface defects or leaving any residue; type as recommended by stamping mat manufacturer; compatible with concrete, form materials and specified coloring agents.

- 1) Dry Type Release Agent: Pigmented; for application to concrete surface using broadcast method; intended to be substantially removed using water.

2.5. INTEGRAL COLORING AGENTS

- A. Concrete Pigment: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.
 - 1) Concentration: Base dosage rates on weight of Portland cement, fly ash, silica fume, and other cementitious materials but not aggregate or sand.
 - 2) Packaging: If pigments are to be added to mix at site, furnish pigments in premeasured disintegrating bags to minimize job site waste.

2.6. ACCESSORY MATERIALS

- A. Curing and Sealing Compound: Clear, non-yellowing, non-staining, breathable, UV stable curing agent and sealer, complying with ASTM C1315 and compatible with all components of stamped concrete systems.
 - 1) Products:
- B. Concrete Cleaner: Biodegradable cleaning and neutralizing agent for removal of curing compounds.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine surfaces and areas to receive stamped concrete.
- B. Verify that utility penetrations and peripheral work are complete.
- C. Notify Architect of conditions that would adversely affect application or subsequent use.
- D. Do not begin preparation or application until unacceptable conditions are corrected.

3.2. PREPARATION

- A. Protect adjacent surfaces, areas, adjoining walls, and landscaping from overspray, blown dry materials, and damage due to work of this section.
- B. Immediately remove dry pigmented materials from surfaces on which they are not intended to be applied.

3.3. FULL-DEPTH CONCRETE SLABS INSTALLATION

- A. See other section(s) for concrete forming and placement.
 - 1) Vehicular Pavements: See Section 32 1313.
- B. Where concrete pigment is indicated, add to concrete mix in accordance with pigment manufacturer's instructions.

3.4. STAMPING

- A. Use stamping mats to create patterns in concrete as indicated on drawings; comply with manufacturer's recommendations and instructions.

- B. Use release agent to prevent damage to concrete surface or creation of bugholes during mat removal.
- C. After removal of stamping mats, make minor surface repairs as required.

3.5. CURING

- A. Protect recently placed materials from premature drying, excessive hot or cold temperatures and mechanical injury until fully cured.

3.6. SURFACE TREATMENTS

- A. Wait at least 28 days before applying any surface treatment materials or mechanical finishing.
- B. Clean curing agent residue off surface prior to application of surface treatment materials.
 - 1) Apply concrete cleaner in accordance with manufacturer's instructions to remove excess form release agent, efflorescence, cement scale and curing agents.
- C. Sealer/Coating Application: Apply uniformly over entire surface in accordance with manufacturer's instructions.

3.7. PROTECTION

- A. Do not allow traffic on finished surfaces for the following periods after application:
 - 1) Foot Traffic: Minimum 24 hours.
 - 2) Heavy Traffic: Minimum 72 hours.
- B. Protect finished work from damage during construction and ensure that, except for normal weathering, work will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 04 2000 - UNIT MASONRY

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Concrete block.
- B. Clay facing brick.
- C. Mortar and grout.
- D. Reinforcement and anchorage.
- E. Flashings.
- F. Accessories.

1.2. RELATED REQUIREMENTS

- A. Section 04 4313 - Stone Masonry Veneer: Stone bonded to masonry back-up.
- B. Section 05 5000 - Metal Fabrications: Loose steel lintels.
- C. Section 07 2500 - Weather Barriers: Water-resistive barriers or air barriers applied to the exterior face of the backing sheathing or masonry.
- D. Section 07 9200 - Joint Sealants: Sealing control and expansion joints.

1.3. REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- C. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- D. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2016.
- E. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
- G. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2017.
- H. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.

- I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- J. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2017a.
- K. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- M. ASTM C476 - Standard Specification for Grout for Masonry; 2018.
- N. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2017.
- O. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- P. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2016.
- Q. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- R. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- S. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
- T. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.5. SUBMITTALS

- A. See Section 01 33 00 - Submittals, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Samples: Submit 2 samples of facing brick units to illustrate color, texture, and extremes of color range.
- D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.6. QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of the contract documents.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.7. 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. CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
- 1) Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2) Special Shapes: Provide non-standard blocks configured for corners.
 - a. Provide bullnose units for outside corners.
 - 3) Load-Bearing Units: ASTM C90, normal weight.
 - a. Hollow block, as indicated.
 - b. Exposed Faces: Manufacturer's standard color and texture where indicated.

2.2. BRICK UNITS

- A. Manufacturers:
- 1) Basis of Design Sioux City Brick; Distributed by Best Block - Midwest Block
 - 2) Belden Brick; <>: www.beldenbrick.com.
 - 3) General Shale Brick; <>: www.generalshale.com.
 - 4) Substitutions: See section 01 6000 - Product Requirements.
- B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.
- 1) Color and texture: New to match existing.
 - a. Basis of Design: Sioux City Brick Amherst Velour
 - 2) Actual size: Modular 3 5/8-inch deep x 2 1/4-inch tall x 7 5/8-inch long.
 - 3) Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

2.3. MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
- 1) Not more than 0.60 percent alkali.

- C. Hydrated Lime: ASTM C207, Type S.
- D. Mortar Aggregate: ASTM C144.
- E. Grout Aggregate: ASTM C404.
- F. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
 - 1) Color(s): As selected by Architect from manufacturer's full range new to match existing.
 - 2) Manufacturers:
 - a. Davis Colors, a division of Venator Materials PLC; <>: www.daviscolors.com/#sle.
 - b. Lambert Corporation; <>: www.lambertusa.com.
 - c. Solomon Colors, Inc; <>: www.solomoncolors.com/#sle.
- G. Water: Clean and potable.
- H. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 - 1) Type: Type N.
 - 2) Color: Standard gray.
- I. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
 - 1) Type: Fine.
 - 2) Manufacturers:
 - a. Amerimix, an Oldcastle brand; AMX 600: www.amerimix.com/#sle.
 - b. Spec Mix; Core fill Grout (CF-03).
 - c. Ash Grove Pro Mix Core Fill Grout.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

2.4. REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 - 1) Blok-Lok Limited; <>: www.blok-lok.com.
 - 2) Hohmann & Barnard, Inc; Truss Mighty Lok 170-ML: www.h-b.com/#sle.

- 3) WIRE-BOND; <www.wirebond.com/#sle.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.
- C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- D. Single Wythe Joint Reinforcement: ASTM A951/A951M.
- 1) Type: Ladder.
 - 2) Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 - 3) Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- E. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
- 1) Type: Truss.
 - 2) Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
 - 3) Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.
- F. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
- 1) Type: Truss, with adjustable ties or tabs spaced at 16 in on center.
 - 2) Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
 - 3) Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
 - 4) Vertical adjustment: Not more than 1 1/4 inches.
 - 5) Seismic Feature: Provide lip, hook, or clip on extended leg of wall ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
 - 6) Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.
- G. 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.
 - 2) Wire ties: Manufacturer's standard shape, 0.1875 inch thick.

- 3) Vertical adjustment: Not less than 3-1/2 inches.
- 4) Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
- 5) Manufacturers: See structural drawings for special seismic brick veneer tie system.
 - a. WIRE-BOND; Series 2407 seismic brick veneer tie system: www.wirebond.com/#sle.
 - b. Hohmann & Barnard, Inc; DW-10HS (Vee Byna-Tie): www.h-b.com/#sle.
 - c. Heckmann Building Products, Inc; 315-D and 316 wire tie : www.heckmannbuildingprods.com/#sle

2.5. FLASHINGS

A. Membrane Non-Asphaltic Flashing Materials:

- 1) Composite Polymer Flashings - Self-Adhering: Composite polyethylene; 40 mil thick with pressure-sensitive adhesive and release paper.
 - a. Manufacturers:
 - 1) Hohmann & Barnard, Inc; Textroflash: www.h-b.com/#sle.
 - 2) WIRE-BOND; Aquaflash 500: www.wirebond.com/#sle.
 - 3) Masonpro, Inc. York Seal – 40 mil (Self-Adhering) Flashing: www.masonpro.com

B. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

C. Termination Bars: Stainless steel; compatible with membrane and adhesives.

D. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.

E. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.6. 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/#sle.

- B. 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) Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.

- a. Manufacturers:

- 1) Advanced Building Products Inc; Mortar Break
DT: www.advancedbuildingproducts.com/#sle.
- 2) Mortar Net Solutions; <>: www.mortarnet.com.
- 3) York Manufacturing, Inc; <>: www.yorkmfg.com/#sle.

- C. Weeps:

- 1) Type: Extruded propylene with honeycomb design.
- 2) Color(s): As selected by Architect from manufacturer's full range.
- 3) Manufacturers:
- a. Advanced Building Products, Inc; <>: www.advancedbuildingproducts.com/#sle.
- b. Blok-Lok Limited; <>: www.blok-lok.com.
- c. CavClear/Archovations, Inc: www.cavclear.com/#sle.
- d. Hohmann & Barnard, Inc; <>: www.h-b.com/sle.
- e. WIRE-BOND; <>: www.wirebond.com.

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

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 TMS 402/602 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. Interlock intersections and external corners, except for units laid in stack bond.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- H. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, or cavity insulation vapor barrier adhesive is applied.
- I. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- 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 on top of through-wall flashing above shelf angles and lintels and at bottom 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. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions.
 - 1) Verify that airspace width is no more than 3/8 inch greater than panel thickness.
 - 2) Hold cavity mortar control panel tight to face wythe.
 - 3) Stagger end joints in adjacent rows.
 - 4) Fit to perimeter construction and penetrations without voids.
- D. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.8. REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY, and CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.9. REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 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.
- B. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.10. MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

- 1) Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at 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. Terminate flashing up 8 inches minimum on vertical surface of backing:
- 1) Install vertical leg of flashing behind water-resistive barrier sheet over backing.
 - 2) Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer's directions.
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- D. Support flexible flashings across gaps and openings.
- E. Extend plastic, laminated, and EPDM flashings to within 1/2 inch of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

3.11. LINTELS

- A. Install loose steel lintels over face brick openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
- 1) Openings to 42 inches: Place two, No. 3 reinforcing bars 1 inch from bottom web.
 - 2) Openings from 42 inches to 78 inches: Place two, No. 5 reinforcing bars 1 inch from bottom web.
 - 3) Openings over 78 inches: Reinforce openings as detailed.
 - 4) Do not splice reinforcing bars.
 - 5) Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
 - 6) Place and consolidate grout fill without displacing reinforcing.
 - 7) Allow masonry lintels to attain specified strength before removing temporary supports.
- C. Maintain minimum 8 inch bearing on each side of opening.

3.12. GROUTED COMPONENTS

- A. Reinforce bond beams with 2, No. 5 bars, 1 inch from bottom web.
- B. Lap splices minimum 24 bar diameters.

- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.
- E. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening.

3.13. CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.
- D. Form expansion joint as detailed on drawings.

3.14. BUILT-IN WORK

- A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.
- 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.

3.15. TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.16. CUTTING AND FITTING

- A. Cut and fit for chases, pipes, and conduit. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.17. CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.18. 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 4313 - STONE MASONRY VENEER

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Cut stone veneer at exterior, interior, and Adhered masonry at fireplace chimney or where indicated on the drawings walls.
- B. Adhered cut stone veneer at exterior walls.
- C. Cut Stone fireplace hearth and mantel.
- D. Cut stone finish as interior wall finish.
- E. Metal anchors and accessories.
- F. Accessories for adhered veneer.
- G. Setting mortar.

1.2. RELATED REQUIREMENTS

- A. Section 04 2000 - Unit Masonry: Joint reinforcement, Ties, and Anchors.
- B. Section 04 7200 - Cast Stone Masonry: Cast stone installed in conjunction with masonry veneer
- C. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.
- D. Section 07 6200 - Sheet Metal Flashing and Trim: Flashings.
- E. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.3. REFERENCE STANDARDS

- A. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2012.
- B. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.
- C. ASTM A580/A580M - Standard Specification for Stainless Steel Wire; 2016.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- E. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- F. ASTM C568/C568M - Standard Specification for Limestone Dimension Stone; 2015.
- G. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2018a.
- H. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering; 2006 (Reapproved 2013).

- I. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster; 2018a.
- J. ASTM C1242 - Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems; 2018a.
- K. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2016.
- L. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.
- M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- N. ASTM E2556/E2556M - Standard Specification for Vapor Permeable Flexible Sheet Water-Resistive Barriers Intended for Mechanical Attachment; 2010 (Reapproved 2016).
- O. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- P. ILI (HB) - Indiana Limestone Handbook; 2007.
- Q. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data on stone units, accessories for full depth and adhered stone , mortar, anchors, and reinforcement.
- C. Samples: Submit two stone samples illustrating minimum and maximum stone sizes, in thicknesses, color range, texture, and markings as indicated on drawings.
- D. Samples: Submit mortar color samples.
- E. Stone Fabricator's Qualification Statement.
- F. Installer's Qualification Statement.

1.6. QUALITY ASSURANCE

- A. Stone Fabricator Qualifications: Company specializing in fabricating cut stone with minimum ten years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type required by this section, with minimum 5 years of documented experience.

1.7. MOCK-UP

- A. Construct full veneer stone wall mock-up, 6 feet long by 6 feet wide; include stone anchor accessories, corner condition, and typical control joint in mock-up.
- B. Construct adhered veneer stone wall mock-up, 6 feet long by 6 feet wide; include stone anchor accessories, corner condition, and rainscreen accessories in mock-up.
- C. Locate where directed.

1.8. DELIVERY, STORAGE, AND HANDLING

- A. Protect stone from discoloration during storage on site.
- B. Provide ventilation to prevent condensation from forming on stone.

1.9. FIELD CONDITIONS

- A. Cold Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.
- B. Stain Prevention: Prevent mortar and soil from staining exposed limestone.
 - 1) Protect base of walls from rain-splashed mud and mortar splatter.
 - 2) Protect sills, ledges, projections, and adjacent construction from mortar droppings.
 - 3) Prevent rain from splashing mortar droppings or dirt from scaffolding onto face of exposed limestone.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Acceptable Manufactures based on review and approval subject to compliance with Basis of Design.

- 1) Earthworks; 19797 Eisenbeis Bottom Rd, Ste. Genevieve, MO 63670;
<https://earthworksstone.com>
- 2) Semco Stone Perryville MO; www.info@semcostone.com
- 3) Edwards Stone.
- 4) Polycor Natural Stone.

- B. Basis of Design Manufacture

- 1) For Exterior Applications, Earthworks Harvest Mix 3"-9" Snapped – Full Stone Veneer and Thin Adhered Stone types.
- 2) For Interior Applications, Earthworks Cut Stone: At interior applications only – Fireplace Hearth, Countertop, and interior walls.
 - a. Color: Pewter Mist

- b. Finish: CST-1 (Light Polished) and CST-2 (Light Sandblasted)
 - c. Thickness: 2 inches and ¾ inches – See Drawings
 - d. Size: See Drawings.
- C. Other Acceptable Stone Quarriers / Manufactures: Based on review and approval subject to compliance with Basis of Design products.
 - 1) Semco Stone Perryville MO; www.info@semcostone.com; Rockport Tumbled Dimensional (Alternate to Earthworks Harvest Mix)
 - 2) Edwards Stone.Multi-Dimensional. (Alternate to Earthworks Harvest Mix).
 - 3) Polycor Natural Stone; Charmot – French Limestone – Honed (Alternate to Earthworks Cut Stone Lakeside Buff).
- D. Post-Installed Anchor Bolts for Concrete and Masonry: Product Quality Standards: ACI 318, D.1 and ICC-ES AC193; approved for cracked concrete conditions when used in concrete that is cracked or may become cracked under connected load. Material and Finish: ASTM F 593, Group 1, Alloy 304 stainless steel. Acceptable Manufacturers and Products:
 - 1) ITW; Redhead Truebolt Wedge Anchor.
 - 2) Powers; Bull Wedge Anchor.
 - 3) Simpson; Strong-Bolt Wedge Anchor.
- E. Full Depth Stone Masonry Reinforcement and Accessories
 - 1) Types: Pins, dowels, clips, anchors, straps, tiebacks, bolts, washers, nuts, and other devices of type, size, and configuration required by conditions.
 - 2) Material: ASTM for stainless steel applicable to device, Type 304.
 - 3) Available Manufactures:
 - a. Blok-Lok Limited; <>: www.blok-lok.com/#sle.
 - b. Hohmann & Barnard, Inc; <>: www.h-b.com/#sle.
 - c. Heckman Building Products.
 - d. WIRE-BOND; [[◇](http://www.wirebond.com/#sle)]www.wirebond.com/#sle.

2.2. STONE

- A. Limestone: Indiana Oolitic Limestone; complying with ASTM C568/C568M Classification II - Medium Density.
 - 1) Grade: Rustic, per ILI Handbook.
- B. Surface Texture: Cleft Face.

C. Color: Basis of Design Earthworks Harvest Mix.

2.3. MORTAR APPLICATIONS

A. Use only factory premixed packaged dry materials for mortar, with addition of water only at project site.

- 1) Exception: If a specified mix design is not available in a premixed dry package, provide equivalent mix design using standard non-premixed materials.

B. Mortar Color: Natural gray unless otherwise indicated.

C. Scratch Coat Mortars: Scratch coat mortars for application directly to metal lath.

- 1) Prepackaged/Preblended: ASTM C1714/C1714M, Type S.

D. Setting Bed Mortars: Setting bed used to adhere stone veneer units to scratch coat mortar or to bondable concrete or concrete masonry.

- 1) Prepackaged/Preblended: ASTM C1714/C1714M, Type S.

E. Setting Bed Mortars: Setting bed used to adhere stone veneer units to cement board.

- 1) Prepackaged/Preblended Latex Modified: ANSI A118.4 or ANSI A118.15.

F. Pointing Mortars: Pointing or grouting mortars used to fill the joints between individual stone veneer units once the setting bed mortar has sufficiently cured.

- 1) Prepackaged/Preblended: ASTM C1714/C1714M, Type S.

2.4. MORTAR MIXES

A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.

- 1) Type: Type S.
- 2) Color: Mineral pigments added as required to produce approved color sample.

B. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.

- 1) Applications: Use this type of bond coat where indicated. Interior locations where stone is adhered to cement board.
- 2) Manufacturers:
 - a. ARDEX Engineered Cements; ARDEX X 77
MICROTEC: www.ardexamericas.com/#sle.
 - b. Custom Building Products: www.custombuildingproducts.com/#sle.
 - c. LATICRETE International, Inc: LATICRETE MVIS Hi-Bond Veneer Mortar
www.laticrete.com/#sle.

- C. Mixing: Use mechanical batch mixer and comply with referenced standards.

2.5. MORTAR

- A. Setting Mortar: ASTM C270, Type S, using the Proportion Method .

2.6. ACCESSORIES - FULL DEPTH STONE

- A. Horizontal Joint Reinforcement: Ladder type; stainless steel wire conforming to ASTM A580/A580M Type 304, 3/16 inch diameter side rods with 0.1483 inch diameter cross ties.
- B. Wall Ties: Formed steel wire, at least .059 inch diameter, stainless steel conforming to ASTM A580/A580M, eye and pintle type, with provision for vertical adjustment after attachment.
- C. Other Anchors in Direct Contact with Stone: ASTM A666 Type 304, stainless steel, of sizes and configurations required for support of stone and applicable superimposed loads.
- D. Setting Buttons and Shims: Lead.
- E. Flashings and Cavity drainage material as specified in Section 042000 - Unit masonry
- F. Weep/Cavity Vents: Molded PVC grille, insect resistant.
- G. Back Coating:

- 1) Cementitious parging of mortar to a minimum thickness of 1 inch.

- H. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

2.7. ACCESSORIES - ADHERED VENEER

- A. Water-Resistive Barrier: 15 lbs.Asphalt felt paper. ASTM D226/D226M or ASTM E2556/E2556M.
- B. Weep Screed: .0217 (26 gauge) cold rolled galvanized steel. Provide weep screed with large 1-inch drainage holes to allow for proper drainage and ventilation of rain screen. Provide weep screed deflector to direct moisture away from building face.
- C. Water-Resistive Barrier: See Section 07 2500. Weather Barriers applied to building sheathing.
- D. Secondary Water-Resistive Barrier applied in two overlapping layers: #15 lbs. Asphalt Building Paper - ASTM D226
- E. Waterproofing and Crack Isolation Membrane at Exterior Installations: Provides topside protection from water intrusion; Specifically designed for bonding to concrete, masonry, cement board, or cementitious scratch coat substrates under stone veneer setting mortar; complies with ANSI A118.10 and ANSI A118.12.
 - 1) Paintable Fluid or Trowel Applied Type:
 - a. Material: Acrylic and Portland cement.
 - b. Thickness: 30 mils, minimum, dry film thickness.
- F. Flashings: As specified in Section 04 2000.

G. Bonding Compound: Provide type recommended for bonding scratch coat to solid surfaces, complying with ASTM C932.

H. Rainscreen Drainage Material:

- 1) Rainscreen Drainage Mat: Polyester or polypropylene mesh.
 - a. Thickness: 1/4 inch.
 - b. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less (Class A), when tested in accordance with ASTM E84.
 - c. Seam Tape and Bug Screen: As recommended by rainscreen manufacturer.
- 2) Manufacturers:
 - a. CavClear/Archovations, Inc: www.archovations.com/#sle.
 - b. Keene Building Products: www.keenebuilding.com/#sle.
 - c. Mortar Net Solutions; DriPlane: www.mortarnet.com/#sle.

I. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

2.8. LATH / BACKER BOARD

A. Cement Board for Interior Applications:

- 1) Cementitious Backer Panel :
 - a. Basis of Design: Subject to compliance with project requirements, the design is based on the following: USG Corporation, LLC, " USG Durock Cement Board"
 - b. .James Hardie; HardieBacker Cement Board.
 - c. PermaBASE Cement Board.
- 2) Classification: Cementitious Backer Units: ANSI A118.9, ASTM A108.11 and ASTM C 1325 provide with manufacturer's standard edges.
 - a. Thickness: **1/2 inch (12.7 mm)**.
 - b. Board Length: 8 feet (**2438 mm**).
 - c. Board Width: 4 feet (**1219 mm**).
 - d. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- 3) Fastener Requirements: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and application.
- 4) Wood Screws: Wood or Sheathing WF screws 1-5/8 inch with corrosion-resistant coating.

B. Ribbed Metal Lath for Exterior applications: ASTM C847, galvanized; 3/8 inch thick.

- 1) Weight: To suit application, comply with deflection criteria, and as specified in ASTM C841 for framing spacing.
- 2) Weight: 3.4 lb/sq yd.
- 3) Backed with treated paper.

2.9. STONE FABRICATION

A. Full veneer Nominal Thickness: 4 inch nominal.

B. Nominal Face Size: 3" to 9" inch.

C. Pattern and Coursing: Ashlar.

D. Fabricate for 3/8 inch beds and joints.

E. Bed and Joint Surfaces:

- 1) Cut or sawn full square for full thickness of unit.
- 2) Sawn or cut full square at least two-thirds of unit thickness; from that point back under square not more than 1 inch in 12 inches.
- 3) Sawn or cut full square 2 inches back from face; from that point back under square not more than 1 inch in 12 inches.

F. Backs: Sawn.

G. Form stone corners to irregular joint profile. Clean jagged corners from stone in preparation for setting.

H. Slope exposed top surfaces of stone and horizontal sill surfaces for shedding water.

I. Cut drip slot in bottom surface of work projecting more than 1/2 inch over window frame. Size slot not less than 3/8 inch wide and 1/4 inch deep for full width of projection.

2.10. STONE FABRICATION - ADHERED VENEER

A. Comply with ASTM C1242 requirements for adhered stone system without mechanical anchors for maximum stone weight and maximum individual stone panel size.

B. Comply with TMS 402/602 size requirements for adhered stone veneer units for maximum thickness, maximum face dimension, maximum face area and maximum weight per square foot.

C. Nominal Thickness: 3/4 inch to 1-1/4 inches.

D. Height: 4 inches to 8 inches.

E. Length: 6 inches to 14 inches.

F. Style: Dimensional - square and rectangle.

- G. Fabricate for 3/8 inch beds and joints.
- H. Backs: Sawn.
- I. Form stone corners to irregular joint profile. Clean jagged corners from stone in preparation for setting.
- J. Slope exposed top surfaces of stone and horizontal sill surfaces for shedding water.
- K. Provide special shapes as indicated on the drawings and as follows: Trimstones and Hearthstones.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that support work and site conditions are ready to receive work of this section.
 - 1) Per ASTM C1242, exterior walls to receive thin natural stone veneers should be designed with a stiffness ratio of L/1000 minimum.
- B. Verify that substrates to receive mortar scratch coat or setting bed comply with stone veneer manufacturer's instructions.
 - 1) Concrete Masonry: Verify joints are cut flush and surface is ready to receive mortar setting bed. Verify no bituminous or water repellent coatings exist on masonry surface.
 - 2) Concrete: Verify surfaces are flat, honeycomb is filled flush, and surface is ready to receive mortar setting bed. Verify no bituminous, water repellent, or form release agents exist on concrete surface that are detrimental to mortar setting bed.
 - 3) Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.
- C. Verify that items built-in under other sections are properly located and sized.

3.2. PREPARATION

- A. Establish lines, levels, and coursing. Protect from disturbance.
- B. Clean stone prior to erection. Do not use wire brushes or implements that mark or damage exposed surfaces.
- C. Clean sawn surfaces of rust stains and iron particles.
- D. Coat back surfaces not to be in contact with setting mortar with back coating material. Allow coating to cure.

3.3. PREPARATION - ADHERED VENEER

- A. Dampen masonry surfaces to reduce excessive suction.
- B. Clean concrete surfaces of foreign matter using approved acid solutions, solvents, or detergents, and then rinse surfaces thoroughly with clean water.

- C. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.
- D. Apply dash bond coat to solid bases and moist cure for at least 24 hours before applying setting bed.

3.4. INSTALLATION

- A. Install flashings of longest practical length and seal watertight to back-up. Lap end joints minimum 6 inches and seal watertight.
- B. Cut stone at site to produce clean faces.
- C. Size stone units to fit opening dimensions and perimeter conditions.
- D. Wet absorptive stone in preparation for placement to minimize moisture suction from mortar.
- E. Arrange stone pattern to provide color uniformity and minimize visual variations , and provide a uniform blend of stone unit sizes.
- F. Provide setting and pointing mortar:
 - 1) If water is lost by evaporation, re-temper mortar only within two hours after mixing.
 - 2) At ambient air temperature 80 degrees F and above, use mortar within two hours after mixing; at ambient air temperature below 50 degrees F, use mortar within two-and-one-half hours after mixing.
- G. Fill dowel holes in stone units with mortar.
- H. Arrange stone coursing in ashlar bond with consistent joint width.
- I. Set stone in full mortar setting bed to fully support stone over bearing surface. Use setting buttons or shims to maintain correct joint width.
- J. Install weep/cavity vents in vertical stone joints at 24 inches on center horizontally; immediately above horizontal flashings, above shelf angles and supports, and at top of each cavity space; do not permit mortar accumulation in cavity space.

3.5. REINFORCEMENT AND ANCHORAGE

- A. Install horizontal joint reinforcement 16 inches on center.
- B. Place horizontal joint reinforcement in first and second \diamond horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place joint reinforcement continuous in first and second joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches.
- E. Embed wall ties in masonry back-up to bond veneer to back-up at maximum 16 inches on center vertically and 36 inches on center horizontally.
- F. In addition, place wall ties at maximum 3 inches on center each way around perimeter of openings, within 12 inches of openings.

3.6. INSTALLATION - WEATHER-RESISTIVE BARRIER

- A. Where required by thin stone veneer fabricator's instructions or by local codes, install two layers of water-resistive barrier in accordance with water-resistive barrier manufacturer's instructions. Integrate water-resistive barrier with all flashing accessories, adjacent water-resistive barriers, doors, windows, penetrations, and cladding transitions.
- B. Apply water-resistive barrier horizontally with upper layer lapped over lower layer minimum 2 inches.
- C. Lap water-resistive barrier minimum 6 inches at vertical joints.
- D. Lap water-resistive barrier minimum 16 inches past the corner in both directions at inside and outside corners.
- E. In two layer applications, start with two horizontal layers at bottom of exterior wall or structure.

3.7. INSTALLATION - RAINSCREEN DRAINAGE MATERIAL

- A. Install rainscreen drainage material and metal lath with accessories over sheathing material and water-resistive barrier with fastening system in accordance with ASTM C1063 into wood or metal studs. Install drainage material with filter fabric mortar screen to exterior.

3.8. INSTALLATION - SCRATCH COAT

- A. Apply mortar scratch coat of 1/2 inch nominal to cover metal lath in accordance with ASTM C926. Scratch surface when somewhat firm. If scratch coat dries before applying setting bed mortar and thin stone veneer, moisten scratch coat by misting it with water.

3.9. INSTALLATION - ADHERED VENEER

- A. Install thin stone veneer with a cementitious mortar setting bed to a scratch coat backing surface, in accordance with stone fabricator's instructions and applicable sections of the ICC (IBC), TMS 402/602 and ASTM C1242 that apply to adhered masonry veneer.

B. Mortar Joints: Concave.

C. Pattern Bond:

- 1) Lay out work in advance and distribute color range of stone uniformly over total work area.
- 2) Lay stone with face exposed.
- 3) Take care to avoid concentration of any one color to any one wall surface.
- 4) Maintain approximate 3/8 inch joint, as stone allows.
- 5) Do not use stacked vertical joints.

D. Windows, Doors and Wall Openings: Extend field stone units to edges of wall openings.

E. Sills: Install sills where located on drawings.

F. Caps: Install capstones where located on drawings.

- G. Seal all joints at wall openings and penetrations with sealant approved for use with adhered stone veneer.
- H. Weep Screed and Stone Clearances for Exterior Stud Wall Installations:
 - 1) Above Finished Grade: Terminate a minimum of 4 inches or as per local code and building practices.
 - 2) Above Paved Surfaces: Terminate a minimum of 2 inches or as per local code.
 - 3) Above Paved Walking Surface Supported by Same Foundation Supporting the Wall: Terminate a minimum of 1/2 inch or as per local code.

3.10. INSTALLATION - 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.
- B. Extend metal flashings through exterior face of stone and terminate in an angled drip with hemmed edge.
- C. Extend plastic flashings to within 1/2 inch of exterior face of stone and adhere to top of stainless steel angled drip with hemmed edge.
- D. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.11. TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- F. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.12. CLEANING

- A. Remove excess mortar as work progresses, and upon completion of work.
- B. Clean soiled surfaces with cleaning solution.
- C. Use non-metallic tools in cleaning operations.

3.13. PROTECTION

- A. During temporary storage on site, at the end of working day, and during rainy weather, cover stone work exposed to weather with non-staining waterproof coverings, securely anchored.

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 "cast stone".
- C. Units required are:
 - 1) Exterior wall units, including wall caps, sills, and water tables.

1.2. RELATED REQUIREMENTS

- A. Section 04 2000 - Unit Masonry: Installation of cast stone in conjunction with masonry.
- B. Section 04 4313 - Stone Masonry Veneer: Installation of cast stone in conjunction with stone veneer.
- C. Section 07 9200 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.3. REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- D. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.
- E. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2017.
- F. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2014.
- G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- H. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- I. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- J. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- K. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.

- L. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2013.
- M. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- N. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2017.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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. Mortar Color Selection Samples.
- E. 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) Current producer member of the Cast Stone Institute or the Architectural Precast Association.
 - 3) Manufacturer's production facility currently holds a Plant Certification from the Cast Stone Institute or the Architectural Precast Association.
 - 4) Adequate plant capacity to furnish quality, sizes, and quantity of cast stone required without delaying progress of the work.

1.6. MOCK-UP

- A. Provide full size cast stone components for installation in mock-up of exterior wall.
- B. See Section 01 4000 - Quality Requirements for additional requirements.
 - 1) 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. Number each piece individually to match shop drawings and schedule.
- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.

- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- F. Store mortar materials where contamination can be avoided.
- G. 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) Any current producer member of the Cast Stone Institute.
- 2) Premier Stoneworks, LLC; <>: www.premier-stoneworks.com/#sle.
- 3) Caliber Cast Stone; www.calibercaststone.com/
- 4) Continental Cast Stone. www.continentalcaststone.com

2.2. ARCHITECTURAL CAST STONE

A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural limestone, complying with ASTM C1364.

- 1) Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 - a. Compressive Strength - ASTM C 1194: 6,500 psi minimum for products at 28 days.
- 2) Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
 - a. Air Content – ASTM C 173 or C 231, for wet cast product shall be 4.0-8.0% for units exposed to freeze-thaw environments. Air entrainment is not required for Vibrant Dry Tamp (VDT) products.
 - b. Freeze-thaw – ASTM C 1364: The CPWL shall be less than 5.0% after 300 cycles of freezing and thawing.
- 3) Absorption - ASTM C 1195: 6.0% maximum by the cold water method.
- 4) Surface Texture: Fine grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
- 5) Color: Selected by Architect from manufacturer's full range.
- 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. Raised fillets at back of sills and at ends to be built in.

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, white or gray as required to match Architect 's sample.
- 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. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.

E. Admixtures: ASTM C494/C494M.

F. Water: Potable.

G. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.

- 1) Reinforce the units as required by the drawings and for safe handling and structural stress.
- 2) Minimum reinforcing shall be 0.25 percent of the cross section area.
- 3) Reinforcement shall be noncorrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.
- 4) Units greater than 24 in. (600 mm) in one direction shall be reinforced in that direction. Units less than 24 in. (600 mm) in both their length and width dimension shall be non-reinforced unless otherwise specified.
- 5) Welded wire fabric reinforcing shall not be used in dry cast products.
- 6) Galvanized in accordance with ASTM A767/A767M, Class I.

7) Epoxy coated in accordance with ASTM A775/A775M.

- H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- I. Embedded Anchors, Dowels, and Inserts: Type 304 stainless steel, of type and size as required for conditions.
- J. Shelf Angles and Similar Structural Items: Hot-dip galvanized steel per ASTM A123/A123M, of shapes and sizes as required for conditions.
- K. Mortar: Portland cement-lime; do not use masonry cement.
- L. 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. CURING

- A. Cure units in a warm curing chamber approximately 100°F (37.8°C) at 95 percent relative humidity for approximately 12 hours, or cure in a 95 percent moist environment at a minimum 70°F (21.1°C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350 degree-days (i.e. 7 days @ 50°F (10°C) or 5 days @ 70°F (21°C) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.5. MANUFACTURING TOLERANCES

- A. Cross section dimensions shall not deviate by more than $\pm 1/8$ in. from approved dimensions.
- B. Length of units shall not deviate by more than length/ 360 or $\pm 1/8$ in., whichever is greater, not to exceed $\pm 1/4$ in.
 - 1) Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- C. Warp, bow or twist of units shall not exceed length/ 360 or $\pm 1/8$ in., whichever is greater.
- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features – On formed sides of unit, 1/8 in., on unformed sides of unit, 3/8 in. maximum deviation.

2.6. 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. Joints: Make all joints 3/8 inch, except as otherwise detailed.
 - 1) Rake mortar joints 3/4 inch for pointing.
 - 2) Remove excess mortar from face of stone before pointing joints.
 - 3) Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
 - 4) Leave the following joints open for sealant:
 - a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
 - b. Joints in projecting units.
 - c. Joints between rigidly anchored units, including soffits, panels, and column covers.
 - d. Joints below lugged sills and stair treads.
 - e. Joints below ledge and relieving angles.
 - f. Joints labeled "expansion joint".
- B. 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. CLEANING

A. 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.
- 5) Apply water repellent in accordance with Cast Stone Institute® Technical Bulletin #35 or water repellent manufacturer's directions.

3.5. 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.
- B. Base plates, expansion joint plates.
- C. Grouting under base plates.

1.2. RELATED REQUIREMENTS

Not applicable

1.3. REFERENCE STANDARDS

- A. AISC (MAN) - Steel Construction Manual; 2017.
- B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2016.
- C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- E. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2014.
- F. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2014.
- G. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2015.
- H. ASTM A992/A992M - Standard Specification for Structural Steel Shapes; 2011 (Reapproved 2015).
- I. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength; 2015, with Editorial Revision (2018).
- J. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- K. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Shop Drawings:
 - 1) Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.

- 2) Connections not detailed.
- 3) Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Fabricator's Qualification Statement.

1.5. QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."
- B. Fabricator: Company specializing in performing the work of this section with minimum 3 years of documented experience.
- C. Erector: Company specializing in performing the work of this section with minimum 3 years of documented experience.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Steel Angles and Plates: ASTM A36/A36M.
- B. Steel W Shapes and Tees: ASTM A992/A992M.
- C. Steel Shapes, Plates, and Bars: ASTM A529/A529M high-strength, carbon-manganese structural steel, Grade 50.
- D. Hot-Formed Structural Tubing: ASTM A501/A501M, seamless or welded.
- E. Headed Anchor Rods: ASTM F1554 Grade 55, plain.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.2. FABRICATION

- A. Shop fabricate to greatest extent possible.

2.3. FINISH

- A. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.4. SOURCE QUALITY CONTROL

- A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts", testing at least 10 percent of bolts at each connection.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.2. ERECTION

- A. Erect structural steel in compliance with AISC 303.
- B. 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.
- C. Field weld components indicated on shop drawings.
- D. Do not field cut or alter structural members without approval of Architect.
- E. 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.

3.3. TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

3.4. FIELD QUALITY CONTROL

END OF SECTION

SECTION 05 5000 - METAL FABRICATIONS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Shop fabricated steel items.

1.2. RELATED REQUIREMENTS

- A. Section 04 2000 - Unit Masonry: Placement of metal fabrications in masonry.

1.3. REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- D. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.
- E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- H. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).
- I. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- J. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

PART 2 PRODUCTS

2.1. MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Plates: ASTM A283/A283M.

- C. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- D. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.
- E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2. FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3. FABRICATED ITEMS

- A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; galvanized finish.
- B. Lintels: As detailed; galvanized finish.

2.4. FINISHES - STEEL

- A. Prime paint steel items.
 - 1) Exceptions: Galvanize items to be embedded in concrete, items to be embedded in masonry, and items specified for paint finish.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2. INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.3. TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 5133 - METAL LADDERS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Prefabricated ship ladders.

1.2. REFERENCE STANDARDS

- A. 29 CFR 1910.23 - Ladders; current edition.
- B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- C. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008.
- D. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2014, with Editorial Revision (2015).
- E. ASTM B85/B85M - Standard Specification for Aluminum-Alloy Die Castings; 2018.
- F. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- G. ASTM B210/B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2019.
- H. ASTM B211/B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2019.
- I. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- J. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Shop Drawings:
 - 1) Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 2) Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.1. MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B211/B211M, 6063 alloy, T6 temper.
- B. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.
- C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210/B210M, 6063 alloy, T6 temper.
- D. Aluminum-Alloy Bars: ASTM B211/B211M, 6061 alloy, T6 temper.
- E. Aluminum-Alloy Sand Castings: ASTM B26/B26M.
- F. Aluminum-Alloy Die Castings: ASTM B85/B85M .
- G. Bolts, Nuts, and Washers: Stainless steel.
- H. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.2. FABRICATION

- A. Fit and shop assemble items in largest practical sections, for delivery to site.
- B. Fabricate items with joints tightly fitted and secured.
- C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3. PREFABRICATED LADDERS

- A. Prefabricated Ship Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
 - 1) Components: Manufacturer's standard rails, rungs, treads, handrails. returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
 - 2) Materials: Aluminum; ASTM B211/B211M 6063 alloy, T52 temper.
 - 3) Incline: 60 degrees. OSHA compliant
 - 4) Finish Pigmented Organic Coating System: AAMA 2603 polyester or acrylic baked enamel finish; color as selected from manufacturer's standard colors. Caution Yellow (RAL 1018).
 - 5) Manufacturers:

- a. O'Keeffe's Inc; Model 520: www.okeeffes.com/#sle.
- b. Precision Ladders, LLC; Aluminium Ship Stairs: www.precisionladders.com/#sle.
- c. FS Industries welded aluminum ships ladder 60-degree incline:
www.fsindustries.com.
- d. Fixfast USA Kombi Aluminum Ships Ladder.
- e. Alaco Ladder Company

2.4. FINISHES - ALUMINUM

- A. Pigmented Organic Coating System: AAMA 2603 polyester or acrylic baked enamel finish; color as selected from manufacturer's standard colors. Caution Yellow (RAL 1018).

2.5. FABRICATION TOLERANCES

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.
- F. Rungs: Not less than 1-1/4 inches (32 mm) in section and 18-3/8 inches (467mm) long, formed from tubular aluminum extrusions, square and deeply serrated on all sides.
- G. Channel Side Rails: Not less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide.
- H. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8 inch (3 mm) wall thickness by 3 inches (76 mm) wide. Construction shall be self-locking stainless steel fasteners, full penetration TIG welds and clean, smooth and burr free.
- I. Ship Ladders: Not less than 1-1/4 inches (32mm) high, 4-1/8 inch (105 mm) deep and 2 feet(610 mm) wide; tread spacing shall be 1 foot (305 mm) on center. Handrails shall be aluminum pipe, not less than 1-1/2 inches (38 mm) in diameter with hemispheric end caps
- J. Walk-Through Rail and Rail Extension: Not less than 3 feet 6 inches (1067 mm) above mezzanine level.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.2. INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.

- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION

SECTION 06 1000 - ROUGH CARPENTRY

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Structural dimension lumber framing.
- B. Exposed timber structural framing.
- C. Non-structural dimension lumber framing.
- D. Rough opening framing for doors, windows, and roof openings.
- E. Sheathing.
- F. Subflooring.
- G. Preservative treated wood materials.
- H. Fire retardant treated wood materials.
- I. Miscellaneous framing and sheathing.
- J. Concealed wood blocking, nailers, and supports.

1.2. RELATED REQUIREMENTS

- A. Section 06 1323 - Heavy Timber Framing.
- B. Section 07 6200 - Sheet Metal Flashing and Trim: Sill flashings.

1.3. REFERENCE STANDARDS

- A. AWP A U1 - Use Category System: User Specification for Treated Wood; 2017.
- B. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. PS 1 - Structural Plywood; 2009.
- D. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.
- E. PS 20 - American Softwood Lumber Standard; 2015.
- F. SPIB (GR) - Grading Rules; 2014.
- G. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2015.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide technical data on wood preservative materials and application instructions.

- C. Samples: For rough carpentry members that will be exposed to view, submit two samples, 4by8 inch in size illustrating wood grain, color, and general appearance.

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.

PART 2 PRODUCTS

2.1. GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1) Species: Southern Pine, unless otherwise indicated.
 - 2) If no species is specified, provide 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.
 - 4) Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
- B. Lumber fabricated from old growth timber is not permitted.

2.2. DIMENSION LUMBER FOR CONCEALED APPLICATIONS

- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing (2 by 2 through 2 by 6):
 - 1) Species: Southern Pine.
 - 2) Grade: No. 2.
- E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
 - 1) Species: Southern Pine.
 - 2) Grade: No. 1 & Btr.
- F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

- 1) Lumber: S4S, No. 2 or Standard Grade.
- 2) Boards: Standard or No. 3.

2.3. EXPOSED DIMENSION LUMBER

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).
- C. Sizes: Nominal sizes as indicated on drawings.
- D. Surfacing: S4S.
- E. Moisture Content: S-dry or MC19.
- F. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
 - 1) Species: Western Cedar.
 - 2) Grade: Select Structural.

2.4. EXPOSED TIMBERS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Moisture Content: Kiln-dry (20 percent maximum).
- C. Surfacing: S4S.
- D. Species: Redwood.
- E. Grade: Clear Structural.

2.5. STRUCTURAL COMPOSITE LUMBER

- A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.
- B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.
 - 1) Columns: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published E (modulus of elasticity): 1,800,000 psi, minimum.
 - 2) Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published E (modulus of elasticity): 1,800,000 psi, minimum.
 - 3) Headers Not Longer Than 48 inches: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber.

- 4) Manufacturers:
 - a. Boise Cascade Company: www.bc.com/#sle.
 - b. Weyerhaeuser Company: www.weyerhaeuser.com/#sle.
 - c. Pacific Woodtech formerly Louisiana-Pacific Corp.: www.pwtewp.com.

2.6. EXPOSED BOARDS

- A. Submit manufacturer's certificate that products meet or exceed specified requirements, in lieu of grade stamping.
- B. Moisture Content: Kiln-dry (15 percent maximum).
- C. Surfacing: S4S.
- D. Species: Western Cedar.
- E. Grade: Clear.

2.7. CONSTRUCTION PANELS

- A. Mezzanine Subfloor/Underlayment Combination: Oriented strand board wood structural panel; PS 2, rated Single Floor.
 - 1) Bond Classification: Exposure 1.
 - 2) Performance Category: 19/32 PERF CAT.
 - 3) Span Rating: 20.
 - 4) Edges: Tongue and groove.
 - 5) Surface Finish: Fully sanded face.
 - 6) Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 200 days.
 - 7) Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches, 19.2 inches and 24 inches on center, respectively.
 - 8) Manufacturers:
 - a. Georgia-Pacific LLC; DryGuard Enhanced OSB Sub-Floor: www.buildgp.com/#sle.
 - b. Huber Engineered Woods, LLC; AdvanTech Flooring with AdvanTech Subfloor Adhesive: www.huberwood.com/#sle.
 - c. Weyerhaeuser Company: www.weyerhaeuser.com/#sle.
- B. Roof Sheathing: Oriented strand board wood structural panel; PS 2.

- 1) Grade: Structural 1 Sheathing.
- 2) Bond Classification: Exposure 1.
- 3) Performance Category: 5/8 PERF CAT.
- 4) Span Rating: 40/20.
- 5) Edges: Square.
- 6) Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
- 7) Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
- 8) Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.
- 9) Manufacturers:
 - a. Huber Engineered Woods, LLC; AdvanTech Sheathing: www.huberwood.com/#sle.
 - b. Georgia-Pacific LLC; DryGuard Enhanced OSB sheathing: www.buildgp.com/#sle.
 - c. Weyerhaeuser Company: www.weyerhaeuser.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
- 1) Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.

C. Wall Sheathing: Oriented strand board wood structural panel; PS 2.

- 1) Grade: Structural 1 Sheathing.
- 2) Bond Classification: Exposure 1.
- 3) Performance Category: 5/8 PERF CAT.
- 4) Span Rating: 40/20.
- 5) Edges: Square.
- 6) Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
- 7) Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.

- 8) Warranty: Manufacturer's standard lifetime limited warranty against manufacturing defects and that panels will not delaminate or require sanding due to moisture absorption damage from exposure to weather for up to the stated period.
 - 9) Manufacturers:
 - a. Huber Engineered Woods, LLC; AdvanTech Sheathing: www.huberwood.com/#sle.
 - b. Georgia-Pacific LLC; Blue Ribbon OSB wall sheathing: www.buildgp.com/#sle.
 - c. Weyerhaeuser Company; www.weyerhaeuser.com/#sle.
 - d. Substitutions: See Section 01 6000 - Product Requirements.
 - 1) Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.
- D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- E. Other Applications:
- 1) Plywood Concealed From View But Located Within Exterior Enclosure: PS 1, C-C Plugged or better, Exterior grade.
 - 2) Plywood Exposed to View But Not Exposed to Weather: PS 1, A-D, or better.
 - 3) Other Locations: PS 1, C-D Plugged or better.

2.8. 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.
- B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
- 1) For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
- 1) For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.
- D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
- E. Sill Flashing: As specified in Section 07 6200.

- F. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.

1) Manufacturers:

- a. Franklin International, Inc; Titebond PROvantage Weatherproof Subfloor Adhesive: www.titebond.com/#sle.
- b. Huber Engineered Woods, LLC; AdvanTech Subfloor Adhesive: www.huberwood.com/#sle.
- c. Liquid Nails, a brand of PPG Architectural Coatings; LN-950 Polyurethane Adhesive (Low VOC): www.liquidnails.com/#sle.

- G. Water-Resistive Barrier: As specified in Section 07 2500. Weather Barriers

2.9. FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA 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 AWWA standards.

- B. Fire Retardant Treatment:

1) Manufacturers:

- a. Lonza Group; <: www.wolmanizedwood.com/#sle.
- b. Hoover Treated Wood Products, Inc; <: www.frtw.com/#sle.
- c. Koppers, Inc; <: www.koppersperformancechemicals.com/#sle.
- d. Viance, LLC; D-Blaze: www.treatedwood.com/#sle.

- 2) Interior Type A: AWWA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.

- a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
- b. Treat rough carpentry items as indicated .
- c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

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: AWWA 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 or flashing.
 - c. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.1. PREPARATION

- A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches and seal.
- B. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.
- C. 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. FRAMING INSTALLATION

- A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
- B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
- C. Install structural members full length without splices unless otherwise specifically detailed.

- D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes and AWC (WFCM) Wood Frame Construction Manual.
- E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
- F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.
- G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.
- H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.4. 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 framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- D. 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.
- E. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- F. Provide the following specific non-structural framing and blocking:
 - 1) Wall mounted TV brackets.
 - 2) Cabinets and shelf supports.
 - 3) Wall brackets.
 - 4) Handrails.
 - 5) Grab bars.
 - 6) Towel and bath accessories.
 - 7) Wall-mounted door stops.
 - 8) Chalkboards and marker boards.
 - 9) Wall paneling and trim.
 - 10) Joints of rigid wall coverings that occur between studs.

3.5. 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 prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.6. INSTALLATION OF CONSTRUCTION PANELS

- A. Mezzanine Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.
- B. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
 - 1) At long edges use sheathing clips where joints occur between roof framing members.
 - 2) At long edges provide solid edge blocking where joints occur between roof framing members.
 - 3) Nail panels to framing; staples are not permitted.
- C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails or screws.
 - 1) Use plywood or other acceptable structural panels at building corners, for not less than 96 inches, measured horizontally.
- D. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 - 1) At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2) Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3) Install adjacent boards without gaps.

3.7. 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.

3.8. FIELD QUALITY CONTROL

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

3.9. CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7400 - Cleaning:

- 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 1323 - HEAVY TIMBER FRAMING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Structural design, fabrication and installation of Heavy structural timber for posts, beams, joists, purlins, and roof decking.
- B. Provide all labor, materials, staging, scaffolding, temporary bracing, crane, hoists, rigging, equipment, and services necessary to perform the Work of this Section. The work includes, but is not necessarily limited to the following:
 - 1) Timber components of every description, including beams, girts, plates, braces, ties, pegs, webs.
 - 2) Miscellaneous hardware for heavy timber construction, including but not limited to: Plate connectors and bolts.
- C. Connection hardware.

1.2. RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories: Placement of steel support fabrications.
- B. Section 05 1200 - Structural Steel Framing: Steel support fabrications.
- C. Section 06 1000 - Rough Carpentry:

1.3. REFERENCE STANDARDS

- A. AITC 108 - Standard for Heavy Timber Construction; 1993.
- 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. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- E. SPIB (GR) - Grading Rules; 2014.
- F. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Shop Drawings: Indicate dimensions, wood species and grades, component profiles, drilled holes, fasteners, connectors, erection details and sequence.
 - 1) Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

- 2) Include the design engineer's seal and signature on each sheet of shop drawings.
 - 3) Shop Drawings shall include stress analysis and joint design by a practicing registered professional engineer with structural engineering credentials, licensed to practice in the state of Missouri. The Shop Drawings shall bear the seal of the Missouri registered professional engineer.
 - 4) Truss design shall provide the required stability and resistance to gravity loads.
 - 5) No trusses shall be ordered or fabricated prior to the approval of the Shop Drawings by the Structural Engineer and Architect.
- C. Product Data: Submit data on proprietary connection devices.
- D. Product Data: Submit technical data on wood preservative materials, application instructions.
- E. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- F. Delegated-Design Submittal: For timber framing systems and connections.
- G. Manufacturer's Qualification Statement.

1.5. QUALITY ASSURANCE

- A. Designer Qualifications: Design members 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. Lumber Grading Agency: Certified by American Lumber Standards Committee.
- C. Manufacturer Qualifications: Company specializing in manufacture of heavy timber framing, certified by American Institute of Timber Construction, with Five years minimum experience.
- D. Structural Performance: Timber system and connections shall withstand the effects of gravity and lateral structural design criteria as shown on the Drawings and comply with ASCE 7, AF&PA NDS, TFEC1, and TCM.

1.6. MEASUREMENTS

- A. The Contractor shall obtain and verify all measurements and conditions at the building as required for the proper installation of his work. He shall be responsible for the accuracy and fit of the various parts of his work and the proper building-in of same.

1.7. PROTECTION, STORAGE AND HANDLING

- A. Protect trusses and keep under cover in transit and at the job site. Stack to ensure proper ventilation and drainage. Store under cover in a well-ventilated area. Trusses damaged in shipment or at the job site shall be repaired or replaced at no cost to the Owner.

PART 2 PRODUCTS

2.1. FABRICATORS

- A. Heavy Timber Truss Fabricators:

- 1) Vermont Timber Works, Inc.
- 2) MEI Timbermac, Elkland Missouri. Timbermac.com
- 3) American Pole and Timber; americanpoleandtimber.com

2.2. WOOD MATERIALS

- A. Wood fabricated from old growth timber is not permitted.
- B. Provide sustainably harvested wood; see Section 01 6000 - Product Requirements for requirements.
- C. Lumber Grading Rules: SPIB (GR).
- D. Timber shall be sized according to engineering requirements. Minimum size shall be 6" x 6" in all directions.
- E. Timber species shall be Douglas Fir, Select Structural, S4S Or #1 & Better Douglas Fir, S4S, FOHC or Native Hemlock/Pine, S4S.
 - 1) Timber exposed edges shall have a 1/2" wide chamfer (S4S spec).
 - 2) Roof deck: 2x6 nominal Tongue and Groove species fir larch select structural center match stained to match heavy timber.

2.3. TIMBER CONNECTORS / ACCESSORIES

- A. Furnish and install all necessary hardware and metal shapes required for assembly and erection of the trusses.
- B. Fabricate beam seats from steel with dimensions as required for structural performance.
- C. Fabricate beam hangers from steel with dimensions as required for structural performance.
- D. Fabricate strap ties from steel with dimensions as required for structural performance.
- E. Fabricate tie rods from round steel bars with upset threads connected with forged-steel turnbuckles complying with ASTM A 668/A 668M.
- F. Provide bolts, 3/4 inch minimum or larger as required for structural performance, complying with ASTM A 307, Grade A; provide nuts complying with ASTM A 563; and, where required for structural performance, provide flat washers.
- G. Provide stainless-steel bolts, 3/4 inch minimum or larger as required for structural performance, complying with ASTM F 593, Alloy Group 1 or 2 ; provide nuts complying with ASTM F 594, Alloy Group 1 or 2; and, where indicated, provide flat washers.
- H. Provide shear plates, with dimensions as require for structural performance, complying with ASTM D 5933.
- I. Connectors: Type weldable steel.
 - 1) Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123/A 123M or ASTM A 153/A 153M.

- J. Bolts, Nuts, Washers, Lags, and Screws, Untreated Wood: Medium carbon steel; galvanized coating per {\rs\#1}; size and type to suit application.
- K. Bolts, Nuts, Washers, Lags, and Screws, Preservative-Treated Wood: Stainless steel; size and type to suit application.
- L. All steel shapes, plates, and tubes, unless otherwise specified, shall conform to ASTM A-36, as amended to date. Steel pipe shall conform to ASTM 53, Grade B.
- M. Where welding is called for, it shall be by the electric arc process in accordance with the American Welding Society's Code for Arc and Gas Welding in Building Construction.
- N. All other steel shapes, plates, tubes, etc. shall be thoroughly cleaned and given one heavy shop coat of an approved red lead primer (black), well worked into all joints and open spaces. After erection, touch-up as required. Surfaces which are not accessible for field painting shall have one shop coat of black paint before leaving the shop.

2.4. FABRICATION

- A. Fabricate components in accordance with AITC 108, with joints neatly fitted, welded, and ground smooth.
- B. Camber: Fabricate horizontal members and inclined members with a slope of less than 1:1, with natural convex bow (crown) up, to provide camber.
- C. Shop fabricate members by cutting and restoring exposed surfaces to match specified surfacing. Finish exposed surfaces to remove planning or surfacing marks, and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
- D. Predrill for fasteners and assembly of units.
- E. Coat crosscuts with end sealer.
- F. Seal Coat: After fabricating and surfacing each unit, apply a saturation coat of penetrating sealer on surfaces of each unit except for treated wood where the treatment included a water repellent.

2.5. WOOD TREATMENT

- A. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.
- B. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.
- C. Trusses shall be prefinished on all surfaces and joints with one coat of water-based Ultra-low VOC Polyurethane for exterior wood construction.
 - 1) Wood Preservative (Surface Application Products):
 - a. Seal-Once Nono+Poly Premium Wood Sealer
 - b. Sherwin Williams / Minwax Water Based Helmsman Spar Urethane.

- c. Varathane Ultimate Spar Urethane water based

PART 3 EXECUTION

3.1. PREPARATION

- A. Ensure that steel support fabrications are installed in correct locations and anchored securely.

3.2. JOINERY

- A. Joinery shall be in the best of the early English and early American traditions, designed for strength, shrinkage, checking, and twisting.
- 1) Metal connections shall not be used unless required by the structural design, and, in those cases, must be concealed and held at an absolute minimum, meeting the Architect's approval. All workmanship shall be of the very highest quality.
 - 2) All joinery shall be accurately cut so as to make a neat, snug fit.

3.3. ERECTION

- A. Installation of trusses shall be in accordance with the details and notes on the Drawings, the approved Shop Drawings, code requirements, and the best trade practices.
- B. Truss components and assemblies must be checked for dimensions and anchorage accuracy before erection.
- C. Temporary bracing and guy lines shall be provided to adequately protect all persons and property and to insure proper alignment.
- D. Padding or non-marking slings shall be used, and corners shall be protected with blocking.
- E. Set structural members level and plumb, in correct position.
- F. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- G. Do not field cut or alter structural members without approval of Architect.
- H. All joints that require pegging shall have pegs driven until snug or flush. Pegs shall protrude 1" – 2" on both sides of truss except where they should be flush as directed above. Broken pegs shall be removed and replaced. Pegs with a mushroomed head shall be cut off below that portion.
- I. Tools used to drive or pull joints together shall not permanently mar the finished surfaces of the trusses.
- J. After erection, touch-up galvanized surfaces with primer.

3.4. SITE APPLIED WOOD TREATMENT

- A. Brush apply two coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings.
- B. Apply preservative treatment in accordance with manufacturer's instructions.

- C. Treat site-sawn ends.
- D. Allow preservative to cure prior to erecting members.

END OF SECTION

SECTION 06 1753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Shop fabricated wood trusses for roof and floor framing.
- B. Bridging, bracing, and anchorage.

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Installation requirements for miscellaneous framing.

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; 2017.
- B. SPIB (GR) - Grading Rules; 2014.
- C. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction; 2014.
- D. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses; 2015.
- E. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses; 1989.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.
- C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
 - 1) Include identification of engineering software used for design. Do not reproduce Contract Documents or Project Files to create shop drawings.
 - 2) Provide shop drawings stamped or sealed by design engineer.
- D. Designer's Qualification Statement.
- E. Fabricator's Qualification Statement.

1.5. QUALITY ASSURANCE

- A. Designer Qualifications: Perform design by or 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. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Handle and erect trusses in accordance with TPI BCSI 1.
- B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Truss Plate Connectors:

- 1) Alpine, an ITW Company; <: www.alpineitw.com/#sle.
- 2) MiTek Industries, Inc; <: www.mii.com/#sle.
- 3) Simpson Strong-Tie: www.stongtie.com
- 4) Eagle Metal; www.eaglemetal.com

2.2. TRUSSES

- A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
 - 1) Species and Grade: Southern Pine, SPIB (GR) Grade 1.
 - 2) Structural Design: Comply with applicable code for structural loading criteria.
 - 3) Roof Deflection: 1/240, maximum.

2.3. MATERIALS

A. Lumber:

- 1) Moisture Content: Between 7 and 9 percent.
- 2) Lumber fabricated from old growth timber is not permitted.

- B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.

- C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.4. ACCESSORIES

- A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 06 1000.
- B. Fasteners: Electrogalvanized steel, type to suit application.
- C. Bearing Plates: Electrogalvanized steel.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that supports and openings are ready to receive trusses.

3.2. PREPARATION

- A. Coordinate placement of bearing items.

3.3. ERECTION

- A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.
- B. Set members level and plumb, in correct position.
- C. Install permanent bridging and bracing.
- D. Install headers and supports to frame openings required.
- E. Frame openings between trusses with lumber in accordance with Section 06 1000.
- F. Coordinate placement of decking with work of this section.

3.4. TOLERANCES

- A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06 2000 - FINISH CARPENTRY

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Finish carpentry items.
- B. Wood casings and moldings.
- C. Exterior PVC casing and moldings.
- D. Interior Factory Fabricated Polyurethane False / Faux Box Beams and Trusses.
- E. Hardware and attachment accessories.

1.2. RELATED REQUIREMENTS

- A. Section 06 4100 - Architectural Wood Casework: Shop fabricated custom cabinet work.

1.3. REFERENCE STANDARDS

- A. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- B. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2017.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- F. PS 1 - Structural Plywood; 2009.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data:
 - 1) Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.
 - 2) Provide data on fire retardant treatment materials and application instructions.
 - 3) Provide instructions for attachment hardware and finish hardware.

- C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

- 1) Scale of Drawings: 3/4 inch to 1'-0" foot, minimum.

- D. Samples: Submit two samples of wood trim and faux beam 12 inch long.

- E. Manufacturer's Instructions: Provide manufacturer's installation instructions for factory-fabricated units.

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 within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.

- 2) Single Source Responsibility: Provide and install this faux beam and truss work from single fabricator.

1.7. MOCK-UP

- A. Provide Faux Beam and Truss mock-up, full size, illustrating finish, construction, and joinery.

- B. Locate where directed.

- C. Mock-up may remain as part of the Work.

1.8. DELIVERY, STORAGE, AND HANDLING

- A. Deliver factory-fabricated units to project site in original packages, containers or bundles bearing brand name and identification.

- B. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

- C. Protect work from moisture damage.

PART 2 PRODUCTS

2.1. FINISH CARPENTRY ITEMS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

- B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

- 1) Shall have a flame spread index (FSI) of less than 25 when tested in accordance with ASTM 84, which is a Class A (Class 1) Flame Spread Classification

- C. Exterior Woodwork Items:

- 1) See paragraph 2.6 Exterior PVC Trim below for manufacturers and more information.

- 2) Window Casings, Brick Molds, Crown Molds, Trim and Moldings: Cellular PVC; prepare for paint finish.

D. Interior Woodwork Items:

- 1) Moldings, Bases, Casings, and Miscellaneous Trim: Cellular PVC; prepare for paint finish.
 - a. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; Class "A" when system tested in accordance with ASTM E84.
 - b. Basis of Design Manufacturer and Products: Azek Exterior Trims.
- 2) Loose Shelving: Birch plywood; prepare for paint finish.
- 3) False / Faux Box Beams and Trusses: Factory Finished Polyurethane. Color and texture to be selected by architect from manufactures full range.

E. Interior Factory Fabricated Polyurethane False / Faux Beams and Trusses, complying with ASTM D5319.

- 1) Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; Class "A" when system tested in accordance with ASTM E84.
- 2) Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
- 3) Material: High Density Fire-Rated Polyurethane formed to look like real wood.
- 4) Faux truss designed by manufacture capable of clear spanning room as indicated on drawings.
- 5) Basis of Design Manufacture and Products:
 - a. Barron Designs, LLC.
- 6) Other Acceptable Manufacture subject to compliance with Basis of Design product.
 - a. Volterra Architectural Products.
 - b. AZ Faux.

2.2. WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.3. SHEET MATERIALS

- A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.
- B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

2.4. FASTENINGS

- A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.
- B. Adhesive for factory-fabricated units: Manufacturer's recommended adhesive for application.
- C. Fasteners for Exterior Applications: Stainless steel; length required to penetrate wood substrate 1-1/2 inch minimum.
- D. Concealed Joint Fasteners: Threaded steel.

2.5. ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Lumber for Shimming and Blocking: Softwood lumber of pine species.

2.6. EXTERIOR PVC TRIM

- A. Cellular PVC Trim: Extruded, expanded PVC; UV-resistant, heat-stabilized, and rigid material.
 - 1) Physical Properties: Free foam cellular PVC material with a small-cell microstructure of 0.60 grams/cm³ in accordance with ASTM D 792 with the following physical and performance properties:
 - 2) Density: 31 pounds per cubic foot, minimum.
 - 3) Flame Spread: ASTM E84, 75, maximum.
 - 4) Window Casings, Brick moulds, bead board and Moldings: Cellular PVC; prepare for paint finish.
 - 5) Surface Patterns: Smooth/Smooth and Woodgrain Texture/Smooth.
- B. Manufacturers:
 - 1) AZEK Building Products, Inc; Frontier Trim: www.azek.com.
 - 2) Basis of Design; CertainTeed Restoration Millwork. www.certainteed.com.
 - 3) Vi-Lux Building Products Inc; <> : www.vi-lux.com.
- C. Specialty Profile Sizes: Provide the following PVC Millwork Specialty profiles.
 - 1) Trimboard and Sheet Sizes: Millwork Trimboards are available in nominal widths of 3 inches to 16 inches and nominal thickness of 5/8, 1, 5/4 inches.
 - 2) Millwork Sheets are available in 4-foot widths and in lengths of 8, 10, 12, 18, and 20 feet, with actual thickness of 3/8, 1/2, 5/8, 3/4, 1, 1-1/4 inch. .
 - 3) Millwork Cornerboards are available in a nominal thickness of 5/4 inches and nominal 4-inch and 6-inch outside corner sizes. Lengths available are 10 and 20 feet, and vary by product.

- 4) PVC Millwork comes in Natural White and does not require painting for protection. Painting is possible with 100% acrylic latex paint with an LRV (light reflective value) of 55 or higher. VinylSafe Technology colors should be used for darker colors with an LRV of 54 or lower.
- 5) Adhesives:
 - a. Glue all trim joints (scarf or miter) with a cellular PVC cement/adhesive such as TrimTight or Extreme PVC TrimWelder.
 - b. Glue joints should be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.
 - c. Surfaces to be glued should be smooth, clean and in complete contact with each other.
 - d. Various adhesives may be used. Consult adhesive manufacturer to determine suitability.
- 6) Texture: Frontier Wood Grain.
- 7) Sealants: Use urethane, polyurethane or acrylic based sealants without silicone as specified in Division 7.
- 8) Wood Primer: Alkyd primer sealer.
- 9) Wood Filler: Solvent base, tinted to match surface finish color.
- 10) Paint: See Div 09 9123 Interior Painting.
- 11) Fasteners such as nails and screws shall be stainless steel or hot-dipped galvanized. Fasteners shall be approved box nails or finish wood screws and shall be designed for wood trim and wood siding with a thinner shank. Nails shall have blunt points and full-rounded heads. The fasteners shall be long enough to penetrate the solid wood substrate a minimum of 1-1/2 inches. The fasteners located at board ends shall be placed no more than 3/4 inches from the end of the board

2.7. FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.8. SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

- D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1) Transparent:

- a. System - 1, Lacquer, Nitrocellulose.
- b. Stain: As selected by Architect.
- c. Sheen: Flat.

2) Opaque:

- a. System - 1, Lacquer, Nitrocellulose.
- b. Color: As selected by Architect.
- c. Sheen: Flat.

- E. Prime paint surfaces in contact with cementitious materials.

- F. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2. INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Install factory-fabricated units in accordance with manufacturer's printed installation instructions.
- C. Set and secure materials and components in place, plumb and level.
- D. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.3. SITE APPLIED WOOD TREATMENT

- A. Apply preservative treatment in accordance with manufacturer's instructions.
- B. Brush apply one coats of preservative treatment on wood in contact with cementitious materials. Treat site-sawn cuts.
- C. Allow preservative to dry prior to erecting members.

3.4. PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
- B. Site Finishing: See Section 09 9113 and 09 9123.
- C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.5. TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 4100 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Cabinet hardware.
- C. Preparation for installing utilities.
- D. Wardrobe cabinet mirrors.
- E. Plastic laminate shelving.

1.2. RELATED REQUIREMENTS

- A. Section 08 8000 - Glazing: Glass for casework.
- B. Section 12 3600 - Countertops.

1.3. REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- C. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.
- 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 3300 - Submittals 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).
- 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, and locksets, demonstrating hardware design, quality, and finish.

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.
- 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.

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) or AWMAC/WI (NAAWS), 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: Decorative laminate
 - 4) Finish - Concealed Surfaces: Manufacturer's option.
 - 5) Door and Drawer Front Edge Profiles: Square edge with thick applied band.
 - 6) Door and Drawer Front Retention Profiles: Fixed panel.
 - 7) Casework Construction Type: Type A - Frameless.
 - 8) Interface Style for Cabinet and Door: Style 1 - Overlay; flush overlay.
 - 9) Grained Face 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.

10) Cabinet Design Series: As indicated on drawings.

11) Adjustable Shelf Loading: 50 lbs. per sq. ft.

12) Cabinet Style: Flush overlay.

13) Drawer Side Construction: Multiple-dovetailed.

14) Drawer Construction Technique: Dovetail joints.

2.2. WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.3. LAMINATE MATERIALS

- A. Manufacturers:

1) Formica Corporation; <>: www.formica.com/#sle.

2) Panolam Industries International, Inc; Nevamar; <>: www.nevamar.com/#sle.

3) Panolam Industries International, Inc: www.panolam.com/#sle.

4) Wilsonart LLC; <>: www.wilsonart.com/#sle.

- B. Thermally Fused Laminate (TFL): Melamine resin, NEMA LD 3, Type VGL laminate panels.

- C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

- D. Provide specific types as indicated.

1) Horizontal Surfaces: HGS, 0.048 inch nominal thickness, <> color, finish as indicated.

2) Vertical Surfaces: VGS, 0.028 inch nominal thickness, <> color, finish as indicated.

3) Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, <> color, finish as indicated.

2.4. COUNTERTOPS

- A. Countertops are specified in Section 12 3600.

2.5. STORAGE ROOM SHELVING

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

- C. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, color, finish as indicated.
- D. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; self locking serrated tongue; of width to match component thickness.

2.6. 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.
 - 1) Color: To match face of laminate.
- C. Resident Room Wardrobe Glassless Mirrors:
 - 1) Basis of Design Mirrorlite® / Physical Activity Glassless Mirror. www.gomirrorlite.com
 - 2) Other Acceptable Manufacturers:
 - a. Rose Brand; www.rosebrand.com
 - b. Dulles Glass & Mirror; www.dullesglassandmirror.com
 - 3) Description: Mirror consists of a rigid foam core framed by an aluminum extrusion. The frame has a raised lip around the four edges. A polyester film, metalized on the backside, is stretched across the raised edges to form the mirror surface. Because the film is mounted on raised edges, an air space is created between the back of the film and the core. This air space, 1/8", allows the film to flex under minor impact without damage
 - 4) Size: 16- inches wide x 48-inches high x .75-inches thick.
 - 5) Weight: Approximately 6 oz. per square foot. A 4 ft. x 8 ft. (32 sq. ft.) MirrorLite Mirror weighs 12 lbs.
 - 6) Core Composition: Aluminum foil-faced isocyanurate foam.
 - 7) Frame: Aluminum extrusion-nonflammable.
 - 8) Provide unit with pre-drilled holes and mounting kit.
- D. Fasteners: Size and type to suit application.

2.7. HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Cabinet Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, satin chrome finish, for nominal 1 inch spacing adjustments.
- C. Adjustable Wall mounted Shelf Supports: Extra duty, double slot back-mounted system using surface mounted metal shelf standards and coordinated cantilevered shelf brackets, satin chrome finish, for nominal 1 inch spacing adjustments. BHMA Grade 2 compliant.

- 1) Product: 85/185 Series manufactured by Knappe and Vogt. www.knappeandvogt.com
- D. Drawer and Door Pulls: "U" shaped wire pull, steel with satin finish, 4 inch centers.
- E. Sliding Door Pulls: Circular shape for recessed installation, steel with satin finish.
- F. Cabinet Locks: As indicated on drawings
 - 1) Keyed cylinder cam lock, two keys per lock, master keyed, steel with chrome finish.
 - a. Product: C3186 5/8" double bitted Cam Lock manufactured by CompX Chicago.
 - 2) Combination / Keyed cylinder cam lock, two keys per lock, master keyed, steel with polished nickel finish.
 - a. Product: Combi-Cam Ultra, 7440S manufactured by Combi-Cam.
- G. Catches: Magnetic.
- H. Drawer Slides:
 - 1) Type: Full extension.
 - 2) Static Load Capacity: Commercial grade.
 - 3) Mounting: Side mounted.
 - 4) Stops: Integral type.
 - 5) Features: Provide self closing/stay closed type.
 - 6) Manufacturers:
 - a. Accuride International, Inc; <>: www.accuride.com/#sle.
 - b. Grass America Inc; Dynapro: www.grassusa.com/#sle.
 - c. Knappe & Vogt Manufacturing Company; <>: www.knappeandvogt.com/#sle.
- I. Drawer Systems: Integrated drawer slide and side.
 - 1) Side Type: Double Wall.
 - 2) Drawer Side Height: 4-3/4 inches.
 - 3) Drawer Length: 18 inch.
 - 4) Extension Type: Full extension with overtravel.
 - 5) Static Load Capacity: Heavy Duty grade.
 - 6) Mounting: Side mounted.
 - 7) Stops: Integral type.

- 8) Features: Provide self closing/stay closed and metallic finish type.
- J. Hinges: European style concealed self-closing type, steel with satin finish.
 - 1) Manufacturers:
 - a. Grass America Inc; TEC Soft-Close: www.grassusa.com/#sle.
 - b. Hettich America, LP; <>: www.hettich.com/#sle.
 - c. Blum, Inc; <>: www.blum.com/#sle.
- K. Sliding Door Track Assemblies: Upper and lower track of satin anodized aluminum, with matching shoe equipped with nylon rollers.

2.8. 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. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
 - 1) Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
 - 2) Cap exposed plastic laminate finish edges with material of same finish and pattern.
- E. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
 - 1) Provide center matched panels at each elevation.
 - 2) Provide sequence matching across each elevation.
 - 3) Carry figure of cabinet fronts to toe kicks.
- F. Mechanically fasten back splash to countertops as recommended by laminate manufacturer at 16 inches on center.
- G. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.
- H. Shop glaze glass materials using the Interior Dry method as specified in Section 08 8000.

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) or AWMAC/WI (NAAWS) 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. Adjust installed work.
- 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, with Editorial Revision (2015).
- 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; 2016.
- 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; 2018.
- G. ISO 846 - Plastics -- Evaluation of the action of microorganisms; 1997.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals 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 4x4 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) Crane Composites, Inc: www.cranecomposites.com.
- 2) Marlite, Inc: www.marlite.com/#sle.
- 3) Nudo Products, Inc: www.nudo.com/#sle.

2.2. PANEL SYSTEMS

A. Wall Panels FRP-1:

- 1) Panel Size: 4 by 8 feet.
- 2) Panel Thickness: 0.09 inch.
- 3) Surface Design: Embossed.
- 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) Biological Resistance: Rating of 0, when tested in accordance with ISO 846.

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 2100 - THERMAL INSULATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, and underside of floor slabs.
- B. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
- C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.
- B. Section 07 2126 - Blown Insulation: Blown-in, gravity-held fibrous insulation.

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; 2017.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- D. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016a.
- E. 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 3300 - Submittals 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.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Thermal Insulation:

- 1) Dow Chemical Company.
- 2) CertainTeed Corporation.
- 3) Kingspan Insulation LLC.
- 4) Owens Corning Corporation.
- 5) Knauf Insulation.
- 6) Johns Manville.
- 7) Substitutions: See Section 01 6000 - Product Requirements.

2.2. APPLICATIONS

- A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.
- B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.
- C. Insulation in Wood Framed Walls: Batt insulation with separate vapor retarder.

2.3. 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.
 - 5) Complies with fire resistance requirements shown on the drawings as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
 - 6) Board Edges: Square.
 - 7) Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
 - 8) Manufacturers:

- a. Dow Chemical Company; STYROFOAM HIGHLOAD 40: www.dowbuildingsolutions.com/#sle.
- b. Kingspan Insulation LLC; GreenGuard XPS TYPE VI 40 PSI: www.trustgreenguard.com/#sle.
- c. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.

2.4. BATT INSULATION MATERIALS

- A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.
- B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
 - 1) Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
 - 2) Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
 - 3) Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
 - 4) Formaldehyde Content: Zero.
 - 5) Thermal Resistance: R-value of 21 minimum or as specified on drawings.
 - 6) Thickness: 5 1/2 inch minimum or as specified on drawings.
 - 7) Manufacturers:
 - a. CertainTeed Corporation; R-21: www.certainteed.com/#sle.
 - b. Johns Manville; R-21: www.jm.com/#sle.
 - c. Knauf: Ecobatt R-21 HD
 - d. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: Next Gen www.ocbuildingspec.com/#sle.

2.5. ACCESSORIES

- A. Sheet Vapor Retarder: Black polyethylene film for above grade application, 10 mil, 0.010 inch thick.
- B. 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.
 - 3) Temperature Resistance: Minus 40 degrees F to 212 degrees F
- C. Flashing Tape: Special polyolefin film with high performance adhesive.

- 1) Application: Interior window and door sill flashing tape.
- 2) Width: Are required for application.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.
- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2. 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.
 - 1) Tape seal joints.
 - 2) Extend sheet full height of joint.
- B. Apply adhesive to back of boards:
 - 1) Three continuous beads per board length.
 - 2) Full bed 1/8 inch thick.
- C. Install boards horizontally on foundation perimeter.
 - 1) Place boards to maximize adhesive contact.
 - 2) Install in running bond pattern.
 - 3) Butt edges and ends tightly to adjacent boards and to protrusions.
- D. Extend boards over expansion joints, unbonded to foundation on one side of joint.
- E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- F. Immediately following application of board insulation, place protective boards over exposed insulation surfaces.
 - 1) Apply adhesive in five continuous beads per board length.
 - 2) Install boards horizontally from base of foundation to top of insulation.
 - 3) Butt boards tightly, with joints staggered from insulation joints.

3.3. BOARD INSTALLATION AT CAVITY WALLS

- A. Secure impale fasteners to substrate at following frequency:

- B. Adhere a 6 inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
 - 1) Tape seal joints between sheets.
 - 2) Extend sheet full height of joint.
- C. Apply adhesive to back of boards:
 - 1) Three continuous beads per board length.
 - 2) Full bed 1/8 inch thick.
- D. Install boards to fit snugly between wall ties.
 - 1) Place membrane surface against adhesive.
 - 2) Place membrane surface facing out, and tape seal board joints.
- E. Install boards horizontally on walls.
 - 1) Place boards to maximize adhesive contact.
 - 2) Install in running bond pattern.
 - 3) Butt edges and ends tightly to adjacent boards and to protrusions.
 - 4) Place impale fastener locking discs.
- F. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4. BOARD INSTALLATION UNDER CONCRETE SLABS

- A. Place insulation under slabs on grade after base for slab has been compacted.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
- C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.5. BATT INSTALLATION

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. At wood framing, place vapor retarder on warm side of insulation by stapling at 6 inches on center. Lap and seal sheet retarder joints over member face.
- F. Tape seal tears or cuts in vapor retarder.

- G. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.6. PROTECTION

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

END OF SECTION

SECTION 07 2126 - BLOWN INSULATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Ceiling and Attic: Blown insulation pneumatically placed into joist spaces through access holes.

1.2. REFERENCE STANDARDS

- A. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. ASTM C764 - Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation; 2017.
- C. ASTM C1015 - Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation; 2017.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and limitations.
- C. Certificates: Certify that products of this section meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Indicate procedure for preparation and installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Blown Insulation:
 - 1) CertainTeed Corporation; InsulSafe SP Premium : www.certainteed.com/#sle.
 - 2) Knauf; Jet Steam Max.
 - 3) Owens Corning; AtticCat
 - 4) Johns Manville: www.jm.com/#sle.
 - 5) Thermafiber, Inc: www.thermafiber.com/#sle.

2.2. MATERIALS

- A. Applications: Provide blown insulation in attic, exterior walls, and ceiling as indicated on drawings.
- B. Provide blown insulation in accordance with requirements of Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- C. Thermal Resistance [R-value]: Provided minimum values in accordance with applicable edition of ASHRAE Std 90.1 I-P for envelope requirements of building location and climate zone.

D. Blown Insulation: ASTM C764, fiberglass type, bulk for pneumatic placement.

- 1) Thermal Resistance (R-value: 11.0 sq ft hr deg F/BTU inch, minimum.

2.3. Accessories

A. Roof Ventilation Baffles: Prefabricated ventilation channels for placement under roof sheathing with baffles to prevent wind-washing.

- 1) Material: Polyvinyl chloride (PVC).
- 2) Roof Joist/Truss Spacing: 24 inch on center, nominal.
- 3) Manufacturers:
 - a. Brentwood Industries, Inc; AccuVent
Original: www.brentwoodindustries.com/#sle.
 - b. Owens Corning Raft-R-Mate.
 - c. Ado Products Durovent

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that substrate and adjacent materials are dry and ready to receive insulation.
- B. Verify that light fixtures have thermal cut-out device to restrict over-heating in soffit or ceiling spaces.
- C. Verify spaces are unobstructed to allow for proper placement of insulation.
- D. Follow ASTM C1015. The inspection shall include checking for the following:
 - 1) Defects in electrical fixtures, equipment, wiring, junction boxes, receptacles, and switches that will cause hazards.
 - 2) Openings through which the loose fill insulation material may escape.
 - 3) Air ducts which appear to have joints that are not secure or sealed.
- E. Prior to the installation of insulation, provide blocking as specified herein and in accordance with ASTM C1015.
 - 1) Install blocking around ceiling access-panel(s), and vents if the level to which the unsettled insulation will be installed exceeds their height. Cover openings into the attic with temporary blocking to prevent insulation from falling into the opening, including spaces enclosed by blockings.
 - 2) Install blocking or baffles around heat producing devices with minimum 3-inch clearances as specified herein.

- 3) Install blocking 50 mm (two inches) above the height of the finished insulation installation and in a manner that ensures that devices which may require maintenance or servicing remain accessible after the insulation is installed.
- 4) Minimum clearances for blocking around heat producing devices shall be as follows:
 - a. Vents and vent connectors: Minimum clearances as required by NFPA 211.

3.2. INSTALLATION

- A. Install insulation and ventilation baffle and other baffle accessories around heat producing fixtures in accordance with ASTM C1015 and manufacturer's instructions.
- B. Install insulation in accordance with ASTM C1015 and the requirements specified.
- C. Do not install insulation until the requirements specified in the INSPECTION and PREPARATION paragraphs have been carried out and any defects which were identified have been corrected and their cause eliminated.
- D. Pneumatic installation of thermal insulation shall comply with OSHA. Supply and utilize the personnel protective equipment and engineering controls necessary for a safe effective installation. Use only pneumatic equipment in accordance with the manufacturer's instructions.
- E. Install the insulation allowing it to settle to its natural density. Do not tamp or rod the insulation.
- F. Install insulation in sufficient depth to provide the thermal value specified after settlement of the insulation. To obtain a minimum "R" value of 49 in Attic .
- G. For pneumatic installations, use the least air pressure meeting the manufacturer's instructions.
- H. Do not blow the insulation into electrical devices and vents which open into the attic and other spaces to be insulated.
- I. Fit the attic side of access panels with perlite or mineral fiber insulation boards.
- J. Place insulation pneumatically to completely fill joist, rafter, and truss spaces.
- K. Place insulation against baffles, and do not impede natural attic ventilation to soffit.
- L. Completely fill intended spaces leaving no gaps or voids.

3.3. CLEANING

- A. Remove loose insulation residue.

3.4. SCHEDULES

- A. Attic Spaces: Place insulation between ceiling joists to achieve an R-value of 49. Approximate minimum thickness of 19-inches.

END OF SECTION

SECTION 07 2500 - WEATHER BARRIERS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Weather / 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 03 3000 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.
- B. Section 06 1000 - Rough Carpentry: Water-resistive barrier under exterior cladding.
- C. Section 07 9200 - Joint Sealants: Sealing building expansion joints.

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.

1.4. REFERENCE STANDARDS

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension; 2016.
- B. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2017.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- D. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials; 2013.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data on material characteristics.
- C. Manufacturer's Installation Instructions: Indicate preparation.
- D. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

1.6. QUALITY ASSURANCE

- A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:

- 1) Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.7. FIELD CONDITIONS

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

PART 2 PRODUCTS

2.1. WEATHER BARRIER ASSEMBLIES

- A. Air Barrier:

- 1) On outside surface of sheathing of exterior walls use air barrier coating.

2.2. AIR BARRIER MATERIALS (WATER VAPOR PERMEABLE AND WATER-RESISTIVE)

- A. Air Barrier, Fluid Applied: Vapor permeable, elastomeric waterproofing.

- 1) Air Barrier Membrane:

- a. Material: Water-based acrylic.
- b. Dry Film Thickness (DFT) 60 mil, 0.060 inch minimum.
- c. Air Permeance: 0.004 cubic feet per minute per square foot, maximum, when tested in accordance with ASTM E2178.
- d. Water Vapor Permeance: 5 perms, minimum, when tested in accordance with ASTM E96/E96M, Procedure B.
- e. Ultraviolet (UV) and Weathering Resistance: Approved in writing by manufacturer for up to three months of weather exposure.
- f. Elongation: 300 percent, minimum, when tested in accordance with ASTM D412.
- g. Surface Burning Characteristics: Flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- h. Nail Sealability: Pass, when tested in accordance with ASTM D1970/D1970M.
- i. VOC Content: 100 g per L or less.
- j. Sealants, Tapes and Accessories: As recommended by coating manufacturer.
- k. Manufacturers:

- 1) Carlisle Coatings and Waterproofing, Inc; Fire Resist Barritech-VP: www.carlisleccw.com/#sle.

- 2) Henry Company; Air-Bloc 31MR: www.henry.com/#sle.

- 3) Tremco Commercial Sealants & Waterproofing; ExoAir
230: www.tremcosealants.com/#sle.
- 4) W.R. Meadows, Inc; Air-Shield LMP: www.wrmeadows.com/#sle.
- 5) Substitutions: See Section 01 6000 - Product Requirements.

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. Flexible Flashing: Self-adhesive sheet flashing complying with ASTM D1970/D1970M, except slip resistance requirement is waived if not installed on a roof.
- C. Stainless Steel Flashing: Flexible flashing with 8 mil, 0.008 inch thick sheet of Type 304 stainless steel, 8 mil, 0.008 inch of butyl adhesive and a siliconized release liner.

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 adhesives in accordance with manufacturer's instructions.

3.3. INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Air Barriers: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.
- C. 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) Use flashing to seal to adjacent construction and to bridge joints.
- D. 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. PROTECTION

- A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 07 3113 - ASPHALT SHINGLES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Asphalt shingle roofing.
- B. Flexible sheet membranes for eave protection, underlayment, and valley protection.
- C. Associated metal flashings and accessories.

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Roof sheathing.
- B. Section 07 6200 - Sheet Metal Flashing and Trim: Edge and cap flashings.

1.3. REFERENCE STANDARDS

- A. ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2017.
- B. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method); 2016a.
- C. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules; 2016.
- D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- F. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2017.
- G. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples; 2017.
- H. ICC-ES AC207 - Acceptance Criteria for Polypropylene Roof Underlayments; 2012, with Editorial Revision (2015).
- I. NRCA (RM) - The NRCA Roofing Manual; 2018.
- J. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data indicating material characteristics.
- C. Shop Drawings: For metal flashings, indicate specially configured metal flashings.

- D. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern ; for color selection. Design intent is for new shingles to match existing.
- E. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.5. QUALITY ASSURANCE

- A. Products are Required to Comply with Fire Resistance Criteria: UL (DIR) listed and labeled.

1.6. FIELD CONDITIONS

- A. Do not install shingles or eave protection membrane when surface temperatures are below 45 degrees F.

1.7. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Algae Resistant Asphalt Shingles:
 - 1) GAF; Timberline Ultra HD Shingles with StainGuard Plus: www.gaf.com/#sle.
 - 2) IKO Industries Inc; Cambridge IR with ArmourZone: www.iko.com/#sle.
 - 3) Owens Corning Corp; Duration: www.owenscorning.com/#sle.
 - 4) Basis of Design Existing Shingles are CertainTeed Landmark Pro - Architectural Shingle .

2.2. ASPHALT SHINGLES

- A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462/D3462M.
 - 1) Fire Resistance: Class A, complying with ASTM E108.
 - 2) Wind Resistance: Class F, 110-mph when tested in accordance with ASTM D3161/D3161M.
 - 3) Warranted Wind Speed: Not greater than 110 mph.
 - 4) Algae Resistant.
 - 5) Weight: 229 / 240 lb/100 sq ft.
 - 6) Self-sealing type.

- 7) Style: Architectural to match existing.
- 8) Color: Certain Teed - Existing "Discontinued color Harbor Gray 6105 new color to match existing.

2.3. SHEET MATERIALS

A. Eave Protection Membrane:

- 1) Eave Protection Membrane: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil minimum total thickness; with strippable treated release paper and smooth asphalt top surface.
- 2) Slip resistant top surface in accordance with ASTM D1984
- 3) Provide products from same manufacturer as asphalt shingles to ensure roof weathertight warranty requirements are met.
- 4) Manufacturers:
 - a. Atlas Roofing Corporation: WeatherMaster Ice & Water. www.atlasroofing.com/#sle.
 - b. GAF: Storm Guard Film -Surfaced Leak Barrier. www.gaf.com/#sle.
 - c. Owens Corning Corp; WeatherLock Flex: www.owenscorning.com/#sle.

B. Underlayment: Synthetic non-asphaltic sheet, intended by manufacturer for mechanically fastened roofing underlayment without sealed seams.

- 1) Type: Woven polypropylene with anti-slip polyolefin coating on both sides.
- 2) Minimum Requirements: Comply with requirements of ICC-ES AC207 for non-self-adhesive sheet.
- 3) Self Sealability: Passing nail sealability test specified in ASTM D1970/D1970M.
- 4) Flammability: Minimum of Class A, when tested in accordance with ASTM E108.
- 5) Ultraviolet (UV) Resistance and Weatherability: Approved in writing by manufacturer for exposure to weather for minimum of six months.
- 6) Low Temperature Flexibility: Passing test specified in ASTM D1970/D1970M.
- 7) Water Vapor Permeance: Vapor retarder; maximum of 1 perm, when tested in accordance with ASTM E96/E96M Procedure A (desiccant method).
- 8) Fasteners: Plastic cap nails as recommended by manufacturer or building code qualification report or approval.
- 9) Manufacturers:
 - a. Atlas Roofing Corporation: Summit 180. www.atlasroofing.com/#sle.

- b. GAF: Storm Guard Film -Deck-Armor. www.gaf.com/#sle.
 - c. Owens Corning Corp; Pro Armor: www.owenscorning.com/#sle.
 - d. System Components Corporation, Inc; ProTex: www.systemcomponents.net/#sle.
- C. Flexible Flashing: Self-adhering polymer-modified asphalt sheet complying with ASTM D1970/D1970M; 40 mil total thickness; with strippable treated release paper and polyethylene sheet top surface.
 - 1) Manufacturers:
 - a. Same material and manufacturers as eave protection membrane

2.4. ACCESSORIES

- A. Roofing Nails: Standard round wire shingle type, galvanized steel, minimum 3/8 inch head diameter, 12 gage, 0.109 inch nail shank diameter, 1-1/2 inch long and conforming to ASTM F1667.
- B. Plastic Cement: ASTM D4586/D4586M, asphalt roof cement.
- C. Lap Cement: Fibrated cutback asphalt type, recommended for use in application of underlayment, free of toxic solvents.
- D. Plastic Ridge Vents: Extruded plastic with vent openings that do not permit direct water or weather entry; flanged to receive shingles.

2.5. METAL FLASHINGS

- A. Metal Flashings: Provide sheet metal eave edge, gable edge, ridge, ridge vents, open valley flashing, chimney flashing, dormer flashing, and other flashing indicated.
 - 1) Form flashings to profiles indicated on drawings.
 - 2) Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
 - 3) Hem exposed edges of flashings minimum 1/4 inch on underside.
 - 4) Coat concealed surfaces of flashings with bituminous paint.
- B. Steel Sheet Metal: Prefinished and galvanized steel sheet, 26 gage, 0.0179 inch minimum thickness, G90/Z275 hot-dipped galvanized; PVC coated, color as selected.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions prior to beginning work.
- B. Verify that roof deck is of sufficient thickness to accept fasteners.
- C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

- D. Verify roof openings are correctly framed.
- E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.2. PREPARATION

- A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.
- B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.
- C. Broom clean deck surfaces before installing underlayment or eave protection.
- D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with plastic cement, and secure flange with nails spaced 6 inches on center.

3.3. INSTALLATION - EAVE PROTECTION MEMBRANE

- A. Install eave protection membrane from eave edge to minimum 4 ft up-slope beyond interior face of exterior wall.
- B. Install eave protection membrane in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

3.4. INSTALLATION - UNDERLAYMENT

- A. Underlayment At Roof Slopes Greater Than 4:12: Install underlayment perpendicular to slope of roof, with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer, nail in place, and weather lap minimum 4 inches over eave protection.
- B. Install underlayment felt over the entire roof area. Install with a 2 inch horizontal lap, and a 4 inch vertical lap, including the valley ice & water dam sheet. Do not nail within 8 inches of a valley centerline.
- C. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.

3.5. INSTALLATION - VALLEY PROTECTION

- A. Install one ply of self adhered ice and water shield membrane flexible flashing, minimum 36 inches wide, centered over and pressed into valley to eliminate any voids. Laps to be 6" with the water flow.
- B. Install flexible flashing in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- C. Weather lap joints minimum 2 inches.
- D. Closed Cut Valleys:
 - 1) Extend shingles from one side of the valley **ONLY** at least 12" beyond the valley centerline. DO NOT nail within 8" of the centerline.
 - 2) Snap a chalk line 2" back from the centerline and trim shingles from the other side of the valley flush with the chalk line.

- 3) Secure shingle tabs within 8" of the valley centerline with plastic roof cement only, no nails.
- 4) **LACED OR WOVEN CLOSED VALLEYS ARE NOT PERMITTED.**

3.6. INSTALLATION - METAL FLASHING AND ACCESSORIES

- A. Install flashings in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.
- B. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.
- C. Secure in place with nails at 6 inches on center, and conceal fastenings.
- D. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

3.7. INSTALLATION - SHINGLES

- A. Install shingles in accordance with manufacturer's instructions manufacturer's instructions and NRCA (RM) applicable requirements.
 - 1) Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.
 - 2) Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.
- B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.
- C. Use a minimum of 4 nails per shingle, placed as recommended by the manufacturer for that particular type of shingles. **STAPLES ARE NOT PERMITTED.**
- D. Secure the portion of the shingles within 8 inches of the valley centerline with plastic cement only. Do not install nails less than 8 inches from the valley centerline. Use shingles at least twenty four inches wide next to the valley.
- E. Project first course of shingles 3/4 inch beyond fascia boards.
- F. Extend shingles 1/2 inch beyond face of gable edge fascia boards.
- G. Extend shingles on one slope across valley and fasten, trim shingles from other slope 2 inches from valley center line to achieve closed cut valley, and concealing valley protection.
- H. Cap hips with individual shingles, maintaining 5 inch weather exposure, and place to avoid exposed nails.
- I. After installation, place one daub of plastic cement, one inch diameter under each individual shingle tab exposed to weather, to prevent lifting.
- J. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counterflashings.

- K. Step flashing on nailable walls: Install 5-1/2" up-roof from the butt of the shingle, or as recommended on the package. Secure with one nail at the top of the roof portion.
- L. Base flashing & Counter flashing on chimney or masonry walls: Install per SMACNA's "Architectural Sheet Metal Manual, 5th edition, Figure 4-17, Page 4.34.
- M. Hip and ridge shingles: use manufacturer's recommended cap shingle for the intended purpose. Use two nails, placed 5½ inches in from the butt end, and 1 inch in from each edge, or as recommended on the package. If the temperature is under 50°, store the shingles for hip and ridge use in a heated area for a sufficient time to allow them to be formed without cracking.
- N. Complete installation to provide weather tight service.

3.8. PROTECTION

- A. Thoroughly inspect all completed work. Replace all shingles or other work that is damaged, and correct all other defects.
- B. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07 4633 - PLASTIC SIDING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Plastic siding and trim.
- B. Thermoplastic polyolefin shingles and shakes.

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Siding substrate.

1.3. REFERENCE STANDARDS

- A. ASTM D3679 - Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding; 2017.
- B. VSI (INST) - Vinyl Siding Installation Manual; 2017.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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) Installation methods.
- C. Samples: Provide samples in colors specified, not less than 12 inches in length.
- D. Color Samples: Where colors are not specified, provide samples of manufacturer's entire color line for selection.

1.5. MOCK-UPS

- A. Construct mock-up on project site incorporating required materials and workmanship, with minimum size of 4 feet long by 6 feet wide.
- B. Locate where directed by Architect.
- C. Mock-up may remain as part of work.

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. WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Extended Correction Period: Correct defective work within 2-year period commencing on Date of Substantial Completion.
- C. Warranty: Manufacturer agrees to replace or refund the purchase price of nonconforming products that fail within the specified warranty period.
 - 1) Failure Methods: Splitting, splintering, cracking, rotting or structural damage from termites or fungal decay.
 - 2) Commercial Warranty Period: 20 years from date of purchase

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Plastic Siding:
 - 1) Basis of Design Manufacturer: AZEK Building Products.
 - 2) Sagiper North America Inc; Sagiwall Exterior Siding: www.sagipernorthamerica.com/#sle.
 - 3) Wolf Home Products; Wolf Portrait Siding: www.wolfhomeproducts.com/#sle.

2.2. MATERIALS

- A. General Requirements:
 - 1) General: ASTM D3679, PVC siding board in accordance with ICC-ES AC227.
 - 2) Basis of Design Product: Bevel Siding and Shingle Siding with PaintPro Technology, by AZEK Building Products.
 - 3) Performance Requirements:
 - a. Rate and Extent of Burn: No sustained combustion beyond 30 seconds or 1 inch (25 mm) when tested in accordance with ASTM D635.
 - b. Ignition Resistance: Pass; when tested in accordance with NFPA 268.
 - 4) Surface-Burning Characteristics: Meet the following values when tested in accordance with ASTM E84:
 - a. Class A Flame-Spread Index: 10.
 - 5) Ignition Temperature of Plastics: No less than the below values when tested in accordance with ASTM D1929.
 - a. Self Ignition: Minimum 450 degrees C.

- b. Flash Ignition: Minimum 380 degrees C.
- 6) Heat Shrinkage: Less than 0.12% linear change when tested in accordance with ASTM D1042.
- 7) Coefficient of Thermal Expansion: Maximum 2.58×10^{-5} in/in/°F; when tested in accordance with ASTM D696.
- 8) Surface Distortion: No effect at 120°F when tested in accordance with ASTM D3679 Section 6.12.
- 9) Flexural Rigidity: Not less than the below values when tested in accordance with ASTM D790.
 - a. Flexural Strength: 1740 psi.
 - b. Modulus of Elasticity: 69,420 psi.
- 10) Water Absorption and Resistance: No observed water droplets when tested in accordance with ASTM D570 and AATCC 127.
- 11) Painting: Provide one of the following in compliance with drawings and Section 099113 "Exterior Painting."
 - a. Acrylic Latex: Subject to compliance with manufacturer's recommendations, provide 100% acrylic latex exterior paint with light reflective value greater than 55.
 - b. Vinyl-Safe Latex: Subject to compliance with manufacturer's recommendations, provide 100% acrylic latex exterior paint from a pre-set vinyl-safe palette.
- B. Horizontal Plastic Siding, Type PVS-1 and PVS-2:
 - 1) Profile: Bevel Siding, Single 5 1/4-inch wide 7/16-inch thick,; 4-inch exposure. 12-foot lengths.
 - 2) Length: 12 feet, minimum.
 - 3) Finish: Woodgrain.
 - 4) Color: Field Painted as indicated on drawings. Field Painted as indicated on drawings.
- C. Shingles and Shakes, Type PVS-3: Injection molded simulated cedar shingles made from thermoplastic polyolefin, complying with ASTM D3679 except for material composition.
 - 1) Basis of Design Product: Shingle Siding with PaintPro Technology, by AZEK Building Products.
 - 2) ASTM D3679, PVC siding board in accordance with ICC-ES AC227.
 - 3) Edge: Staggered with 6-inch exposure.
 - 4) Texture: Woodgrain.
 - 5) Length: 48-inches.

- 6) Thickness: 1/4 inch, minimum.
- 7) Nailing Hem: Single layer, with 1-1/8 inch long nail holes at maximum 18 inches on center.
- 8) Color: Match siding.

2.3. ACCESSORIES

- A. Accessories: Provide coordinating accessories made of same material as required for complete and proper installation even when not specifically indicated on drawings.
 - 1) Color: field painted as indicated on drawings.
 - 2) Length:
 - a. Corner Posts: 10 feet, minimum.
 - b. Other Trim: 12.5 feet, minimum.
 - 3) Door, window casings trims and Profiles: Provide types as indicated on drawings.
 - 4) Other Linear Trim: 3-1/2 inch wide, unless otherwise indicated.
- B. Fasteners: Aluminum nails, alloy 5056 or 6110, with minimum tensile strength of 63,000 psi; length as required to penetrate framing at least 3/4 inch. Provide fasteners in accordance with manufacturer's written instructions and authorities having jurisdiction.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine substrate conditions before beginning installation; verify dimensions and acceptability of substrate.
- B. Do not proceed with installation until unacceptable conditions have been corrected.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2. PREPARATION

- A. Protect surrounding areas and adjacent surfaces during execution of this work.

3.3. INSTALLATION

- A. Install siding, soffit, and trim in accordance with manufacturer's printed installation instructions and VSI (INST).
- B. Attach securely to framing, not sheathing, with horizontal components true to level and vertical components true to plumb, providing a weather resistant installation.
- C. Clean dirt from surface of installed products, using mild soap and water.

3.4. CLEANING

- A. See Section 01 7000 - Execution and Closeout Requirements for additional requirements.
- B. Clean exposed work upon completion of installation; remove grease and oil films, excess joint sealer, handling marks, and debris from installation, leaving work clean and unmarked, free from dents, creases, waves, scratch marks, or other damage to finish.

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 4646 - FIBER-CEMENT SIDING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Fiber-cement siding and trim

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Siding substrate.
- B. Section 07 2500 - Weather Barriers: Weather barrier under siding.
- C. Section 07 9200 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

1.3. REFERENCE STANDARDS

- A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets; 2008 (Reapproved 2016).

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1) Manufacturer's requirements for related materials to be installed by others.
 - 2) Preparation instructions and recommendations.
 - 3) Storage and handling requirements and recommendations.
 - 4) Installation methods, including nail patterns.
- C. Test Report: Applicable model code authority evaluation report (e.g. ICC-ES).
- D. Installer's Qualification Statement.
- E. Samples: Submit two samples of each siding color indicating color range and finish texture; for color selection.
- F. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.
- G. Warranty: Submit copy of manufacturer's warranty, made out in Owner's name, showing that it has been registered with manufacturer.

1.5. QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.7. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1. FIBER-CEMENT SIDING

- A. Lap Siding (Exterior Use): Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
- 1) Style: Standard lap style.
 - 2) Texture: Smooth.
 - 3) Length: 12 ft, nominal.
 - 4) Width (Height): 5-1/4 inches.
 - 5) Thickness: 5/16 inch, nominal.
 - 6) Finish: Factory applied topcoat.
 - 7) Color: As selected by Architect from manufacturers full range of available colors.
 - 8) Warranty: 30 year limited; transferable.
 - 9) Manufacturers:
 - a. Allura, a division of Plycem USA, Inc; <>: www.allurausa.com/#sle.
 - b. James Hardie Building Products, Inc; <>: www.jameshardie.com/#sle.
 - c. Nichiha USA, Inc; <>: www.nichiha.com/#sle.
- B. Lap Siding (SID-1, SID-2, SID-3): Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
- 1) Style: Standard lap style.
 - 2) Texture: Smooth.
 - 3) Length: 12 ft, nominal.
 - 4) Width (Height): 8-1/4 inches.
 - 5) Thickness: 5/16 inch, nominal.
 - 6) Finish: Factory applied topcoat.
 - 7) Color: As selected by Architect from manufacturers full range of available colors.
 - 8) Warranty: 30 year limited; transferable.

- 9) Manufacturers:
 - a. Allura, a division of Plycem USA, Inc; [\diamond]: www.allurausa.com/#sle.
 - b. James Hardie Building Products, Inc; [\diamond]: www.jameshardie.com/#sle.
 - c. Nichiha USA, Inc; [\diamond]: www.nichiha.com/#sle.
- C. Shingle Panels: Panels giving appearance of multiple shingles made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
 - 1) Style: Random width, staggered edge.
 - 2) Texture: Wood grain textured.
 - 3) Length: 48 inches.
 - 4) Width (Height): 15.25 inches.
 - 5) Thickness: 1/4 inch, nominal.
 - 6) Finish: Factory applied topcoat.
 - 7) Color: As selected by Architect from manufacturers full range of available colors.
 - 8) Warranty: 30 year limited; transferable.
 - 9) Manufacturers:
 - a. Allura, a division of Plycem USA, Inc; ____: www.allurausa.com/#sle.
 - b. James Hardie Building Products, Inc; ____: www.jameshardie.com/#sle.
 - c. Nichiha USA, Inc; ____: www.nichiha.com/#sle.

2.2. ACCESSORIES

- A. Trim: Same material and texture as siding.
 - 1) Mainstreet Corridor 010 SID-4 Size: 9-1/4 inch wide by 3/4 inch thick.
 - 2) Mainstreet Corridor 010 SID-5 Size: 3-1/2 inch wide by 3/4 inch thick.
- B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.
- C. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

- B. Verify that weather barrier has been installed over substrate completely and correctly.
- C. Do not begin until unacceptable conditions have been corrected.
- D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2. PREPARATION

- A. Install Sheet Metal Flashing:
 - 1) Above door and window trim and casings.
 - 2) Above horizontal trim in field of siding.

3.3. INSTALLATION

- A. Install in accordance with manufacturer's instructions and recommendations.
 - 1) Read warranty and comply with terms necessary to maintain warranty coverage.
 - 2) Install in accordance with conditions stated in model code evaluation report applicable to location of project.
 - 3) Use trim details indicated on drawings.
 - 4) Touch up field cut edges before installing.
 - 5) Pre-drill nail holes if necessary to prevent breakage.
- B. Over Wood and Wood-Composite Sheathing: Fasten siding through sheathing into studs.
- C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.
- D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.
- E. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.
- F. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

3.4. PROTECTION

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

END OF SECTION

SECTION 07 6200 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Fabricated sheet metal items, including flashings, counterflashings, gutters, downspouts, and soffit panels.
- B. Sealants for joints within sheet metal fabrications.
- C. Precast concrete splash pads.

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Field fabricated roof curbs.
- B. Section 07 3113 - Asphalt Shingles: Non-metallic flashings associated with shingle roofing.
- C. Section 07 4646 - Fiber Cement Siding: Flashings at roof to siding transitions.
- D. 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); 2017a.
- B. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007, with Editorial Revision (2012).
- G. CDA A4050 - Copper in Architecture - Handbook; current edition.
- H. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

- C. Product Data: Indicate product material and factory paint finish.
- D. Samples: Submit two samples 4 x 4 inch in size illustrating metal finish color.

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 5 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. Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; anodized finish of color as selected.
- B. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; plain finish shop pre-coated with modified silicone coating.
 - 1) Modified Silicone Polyester Coating: Pigmented Organic Coating System, AAMA 2603; baked enamel finish system.
 - 2) Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
 - 3) Color: As selected by Architect from manufacturer's standard colors.

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. GUTTER AND DOWNSPOUT FABRICATION

- A. Gutters: Profile as indicated. SMACNA Style "K" Ogee
- B. Downspouts: Rectangular profile.
- C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 10 years in accordance with SMACNA (ASMM).
- D. Accessories: Profiled to suit gutters and downspouts.
 - 1) Anchorage Devices: In accordance with SMACNA (ASMM) requirements.
 - 2) Gutter Supports: Brackets.
 - 3) Downspout Supports: Straps.
- E. Tie downspouts to existing PVC storm piping. Provide new PVC transition fitting from downspout to PVC piping.
- F. Splash Pads where required: Precast concrete type, of size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.
- G. Downspout Extenders: Same material and finish as downspouts.
- H. Seal metal joints.

2.4. ACCESSORIES

- A. Fasteners: Galvanized steel, with soft neoprene washers.
- B. Primer: Zinc chromate type.
- C. Concealed Sealants: Non-curing butyl sealant.
- D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.
- E. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
- B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2. 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.
- E. Secure gutters and downspouts in place with concealed fasteners.
- F. Slope gutters 1/4 inch per 10 feet, minimum.
- G. Connect downspouts to downspout boots, and grout connection watertight.
- H. Set splash pads under downspouts.

3.3. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for field inspection requirements.
- B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

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 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 01 7000 - Execution and Closeout Requirements: Cutting and patching.
- C. Section 09 2116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.3. REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- C. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013 (Reapproved 2017).
- D. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- E. ITS (DIR) - Directory of Listed Products; current edition.
- F. FM (AG) - FM Approval Guide; current edition.
- G. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).
- H. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- I. UL (DIR) - Online Certifications Directory; Current Edition.
- J. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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.

- D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.
- E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Installer Qualification: Submit qualification statements for installing mechanics.

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.
 - 2) Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
 - 3) Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

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) Specified Technologies Inc: www.stifirestop.com/#sle.

2.2. MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- C. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- E. Fire Ratings: Refer to drawings for required systems and ratings.

2.3. FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
- B. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 - 1) Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 - 2) Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 3) Listing by FM (AG), ITS (DIR), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

2.4. FIRESTOPPING FOR PERIMETER CONTAINMENT

2.5. FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Blank Openings:

- 1) 2 Hour Construction: UL System W-L-0038; Specified Technologies Inc. FP Intumescent Firestop Plug.
- 2) 2 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
- 3) 1 Hour Construction: UL System W-L-0032; Specified Technologies Inc. FP Intumescent Firestop Plug.
- 4) 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

B. Penetrations By:

- 1) Multiple Penetrations in Large Openings:
 - a. 2 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 2 Hour Construction: UL System W-L-8025; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
- 2) Uninsulated Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System W-L-1042; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).
 - b. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
- 3) Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
 - a. 2 Hour Construction: UL System W-L-2074; Specified Technologies Inc. SSC collars.

- b. 2 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
- 4) Electrical Cables Not In Conduit:
 - a. 2 Hour Construction: UL System W-L-3024; Specified Technologies Inc. SSP Firestop Putty.
 - b. 2 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
 - c. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.
- 5) HVAC Ducts, Insulated:
 - a. 2 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.
 - b. 2 Hour Construction: UL System W-L-7164; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.
 - c. 1 Hour Construction: UL System W-L-7238; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.
 - d. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.6. FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.

- 1) Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), 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.

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.
- C. Install backing materials to prevent liquid material from leakage.

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 Owner's Facility Representative.
- C. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- D. Install labeling required by code.

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 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.
- B. Section 07 2500 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.
- C. Section 07 8400 - Firestopping: Firestopping sealants.
- D. Section 08 8000 - Glazing: Glazing sealants and accessories.
- E. Section 09 3000 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.
- F. Section 23 3100 - HVAC Ducts and Casings: Duct sealants.

1.3. REFERENCE STANDARDS

- A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.
- B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012 (Reapproved 2017).
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- D. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- E. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).
- F. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2014.
- G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).
- H. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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) Installation instructions, including precautions, limitations, and recommended backing materials and tools.
- 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.

1.5. QUALITY ASSURANCE

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.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
- 1) Bostik Inc; <>: www.bostik-us.com.
 - 2) DAP; www.dap.com.
 - 3) Dow Chemical Company; <>: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - 4) Pecora Corporation; <>: www.pecora.com.
 - 5) Sherwin-Williams Company; <>: www.sherwin-williams.com/#sle.
 - 6) Sika Corporation; <>: www.usa-sika.com/#sle.

- 7) Tremco Commercial Sealants & Waterproofing; <>: www.tremcosealants.com/#sle.
- 8) W.R. Meadows, Inc; <>: www.wrmeadows.com.

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) Bostik Inc; <>: www.bostik-us.com.
- 2) Dow Chemical Company; <>: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
- 3) Pecora Corporation; <>: www.pecora.com.
- 4) QUIKRETE Companies; <>: www.quikrete.com/#sle.
- 5) Sherwin-Williams Company; <>: www.sherwin-williams.com/#sle.
- 6) Sika Corporation; <>: www.usa-sika.com/#sle.
- 7) Tremco Commercial Sealants & Waterproofing; <>: www.tremcosealants.com/#sle.
- 8) W.R. Meadows, Inc; <>: www.wrmeadows.com.

2.2. 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. 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. Type S-1 - Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
 - 1) Type S-5 - Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.
 - 2) Type SL-1 - Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
- C. Type S-4 - Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
 - 1) Type S-2 - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; clear or white verify with Architect.
 - 2) Type S-3 - Interior masonry control joints
 - 3) Type SL-2 - Narrow Control Joints in Interior Concrete Slabs: Self-leveling polyurethane sealant.
- D. Type S-2 - Interior Wet Areas: Bathrooms, restrooms, kitchens, food service areas, food processing areas, and <>; fixtures in wet areas include plumbing fixtures, food service equipment, countertops, cabinets, and other similar items.

2.3. JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
- B. Colors: As indicated on drawings.

2.4. NONSAG JOINT SEALANTS

- A. Type S-1 - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
 - 1) Movement Capability: +100/-50, 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) Hardness Range: 15 to 35, Shore A, when tested in accordance with ASTM C661.
 - 5) Color: To be selected by Architect from manufacturer's standard range.

- 6) Cure Type: Single-component, neutral moisture curing.
 - 7) Service Temperature Range: Minus 65 to 180 degrees F.
 - 8) Manufacturers:
 - a. Dow Chemical Company; 790 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - b. Sika Corporation; Sikasil WS-295: www.usa-sika.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Spectrem 3: www.tremcosealants.com/#sle.
- B. Type S-2 - 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: White.
 - 2) Manufacturers:
 - a. Pecora Corporation; 898 NST: www.pecora.com.
 - b. Sika Corporation; Sikasil GP: www.usa-sika.com/#sle.
 - c. Dow Chemical Company; RTV 786 Mildew Resistant Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
 - d. DAP; Dynaflex Ultra.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- C. Type S-3 - Hybrid Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.
- 1) Movement Capability: Plus and minus 35 percent, minimum.
 - 2) Hardness Range: 20 to 40, Shore A, when tested in accordance with ASTM C661.
 - 3) Color: To be selected by Architect from manufacturer's standard range.
 - 4) Service Temperature Range: Minus 40 to 180 degrees F.
 - 5) Manufacturers:
 - a. Sherwin-Williams Company; Stampede 100 Low-Modulus Hybrid Urethane Sealant: www.sherwin-williams.com/#sle.
 - b. Pecora Corporation; DynaTred: www.pecora.com.
 - c. Tremco Commercial Sealants and Waterproofing; Dymonic FC: www.tremcosealants.com/#sle.

D. Type S-4 - Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.

- 1) Movement Capability: Plus and minus 25 percent, minimum.
- 2) Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
- 3) Color: To be selected by Architect from manufacturer's standard range.
- 4) Service Temperature Range: Minus 40 to 180 degrees F.
- 5) Manufacturers:
 - a. Pecora Corporation; DynaTrol I-XL: www.pecora.com.
 - b. Sika Corporation; Sikaflex-15 LM: www.usa-sika.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Dymeric 240 FC: www.tremcosealants.com/#sle.
 - d. W. R. Meadows, Inc; POURTHANE NS: www.wrmeadows.com/#sle.
 - e. Substitutions: See Section 01 6000 - Product Requirements.

E. Type S-5 - Butyl Sealant: Solvent-based; ASTM C1311; single component, nonsag; not expected to withstand continuous water immersion or traffic.

- 1) Hardness Range: 10 to 30, Shore A, when tested in accordance with ASTM C661.
- 2) Color: Match adjacent finished surfaces.
- 3) Service Temperature Range: Minus 13 to 180 degrees F.
- 4) Manufacturers:
 - a. Sherwin-Williams Company; Storm Blaster All Season Sealant: www.sherwin-williams.com/#sle.
 - b. Tremco Commercial Sealants & Waterproofing; Butyl Sealant: www.tremcosealants.com/#sle.
 - c. DAP Products Inc; Butyl-Flex Sealant: www.dapspecline.com/#sle.
 - d. Pecora Corporation; BC-158: www.pecora.com.

2.5. SELF-LEVELING SEALANTS

A. Type SL-1 - 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) Hardness Range: 35 to 55, Shore A, when tested in accordance with ASTM C661.

- 3) Color: To be selected by Architect from manufacturer's standard range.
 - 4) Service Temperature Range: Minus 40 to 180 degrees F.
 - 5) Manufacturers:
 - a. The QUIKRETE Companies; QUIKRETE® Polyurethane Self-Leveling Sealant: www.quikrete.com/#sle.
 - b. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant: www.sherwin-williams.com/#sle.
 - c. Sika Corporation; Sikaflex-1c SL: www.usa-sika.com/#sle.
 - d. Tremco Commercial Sealants & Waterproofing; Vulkem 45 SSL: www.tremcosealants.com/#sle.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- B. Type SL-2 - Rigid Self-Leveling Polyurethane Joint Filler: Two part, low viscosity, fast setting; intended for cracks and control joints not subject to significant movement.
- 1) Hardness Range: Greater than 100, Shore A, and 50 to 80, Shore D, when tested in accordance with ASTM C661.

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 Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
 - 2) Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
 - 3) Manufacturers:
 - a. Nomaco, Inc; HBR: www.nomaco.com/#sle.
 - b. Backer Rod Manufacturing, Inc. Titan Foam: www.backerrod.com
 - c. Foam N More, Inc.
 - d. R.W. sidley, Inc.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

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.

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.

END OF SECTION

SECTION 07 9513 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Expansion joint cover assemblies for wall, ceiling, and roof surfaces.

1.2. RELATED REQUIREMENTS

- A. Section 04 4313 - Stone Masonry Veneer: Placement of joint cover assembly frames in masonry.

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; 2010.

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 3300 - Submittals 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 3 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:
 - 1) Construction Specialties, Inc: www.c-sgroup.com/#sle.
 - 2) EMSEAL Joint Systems, Ltd: www.emseal.com/#sle.
 - 3) Inpro: www.inprocorp.com/#sle.

- 4) MM Systems Corp: www.mmsystemscorp.com/#sle.
- 5) Sika; Watson Bowman Acme

2.2. EXPANSION JOINT COVER ASSEMBLY APPLICATIONS

A. Roof Bellow Expansion Joints

- 1) Roof Expansion Joint Cover: Elastomeric Bellows with Metal Flange
- 2) Joint Width: 2 inch.
- 3) Include special formed corners, tees, intersections, and wall flashings, each sealed watertight.
- 4) Provide manufacturers optional fire blanket system at fire rated assemblies.
- 5) Provide vapor barrier accessories at all locations.
- 6) Assembly to be approved by roofing system manufacture to meet roofing system warranty requirements.

B. Basis of Design: Jointmaster, a division of Inpro; Series 672-G02-050; www.inprocorp.com

C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:

- 1) MM Systems Corp; Elastomeric roof joint system: www.mmsystemscorp.com/#sle.
- 2) Balco, Inc; Roof Bellows, Aluminum Flanges (BRBA): www.balcousa.com/#sle.
- 3) Construction Specialties, Inc; BRJ series: www.c-sgroup.com/#sle.
- 4) EMSEAL Joint Systems, Ltd; Roof Joint System: www.emseal.com/#sle.

D. Exterior Wall Joints Subject to Seismic Movement:

- 1) Pre-compressed open micro-cell polyurethane foam impregnated with a polymer sealing compound (2% wax content required for optimal hydrophobic qualities). Manufactured of monolithic piece of non-laminated, open cell, high density (1.5lb/sqft min.) The foam sealant shall have a fully cured, modified silicone rubber top coat, factory applied when the material is fully expanded. The sealant shall be provided in a pre-compressed state. Bonding Adhesive the adhesive shall be waterproof epoxy adhesive that is compatible with concrete and steel as recommended by the manufacturer. Splice Adhesive the splice adhesive may be any polyurethane adhesive recommended by the manufacturer of the foam sealant.
- 2) Surface coated with a colorized, elastomeric layer of silicone in (26) standard color options.
- 3) Joint operating range 50%+- of total nominal joint width
- 4) Standard Joint range applications 2-12" [50-300mm]

- 5) Manufacturers:
 - a. EMSEAL Joint Systems, Ltd; Emshield Seismic Colorseal System:
www.emseal.com/#sle.
 - b. Inpro; 1250 Series Foam Seal.
 - c. Construction Specialties, Inc; VFR series: www.c-sgroup.com/#sle.
 - d. 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 Cover Styles: As indicated on drawings.
 - 4) Joint Movement Capability: If not indicated, provide minimum plus/minus 25 percent joint movement capability.
 - 5) Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
 - 6) 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) Elastomeric Seals: Synthetic rubber seals comprised of a dual extrusion Santoprene rubber for heat welding of all transitions and seams for a monolithic, weathertight installation. EPDM and Neoprene substitutions are not allowed due to their lack of ability to meet this specific requirement.
- C. Anchors and Fasteners: As recommended by cover manufacturer.
- D. Threaded Fasteners: Aluminum.
- E. 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.

3.3. PROTECTION

- A. Do not permit traffic over unprotected floor joint surfaces.
- B. 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. Non-fire-rated hollow metal doors and frames.
- B. Hollow metal frames for wood doors.
- C. Fire-rated hollow metal doors and frames.
- D. Thermally insulated hollow metal doors with frames.
- E. Section 08 8000 - Glazing: Glass for doors and borrowed lites.
- F. Section 09 9123 - Interior Painting: Field painting.

1.2. 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.

1.3. 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 A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.

- G. 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; 2016.
- H. 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; 2017.
- I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
- J. ASTM C476 - Standard Specification for Grout for Masonry; 2018.
- K. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.
- L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- M. ITS (DIR) - Directory of Listed Products; current edition.
- N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.
- O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.
- P. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.
- Q. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- R. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- S. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.
- T. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2018.
- U. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.
- V. UL (DIR) - Online Certifications Directory; Current Edition.
- W. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- X. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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. Samples: Submit two samples of metal, 2 by 2 inches in size, showing factory finishes, colors, and surface texture.

1.5. 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.

1.6. 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.

1.7. PROJECT CONDITIONS

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

1.8. COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to 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) 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 Edge Profile: Manufacturers standard for application indicated.
 - 4) Typical Door Face Sheets: Flush.
 - 5) Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Flush.
 - 6) Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
 - 7) Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) 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 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) 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 DOORS

- A. Door Finish: Factory primed and field finished.
- B. Exterior Doors: Thermally insulated.
- 1) Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 2 - Seamless.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvannealed coating; ASTM A653/A653M.
 - 2) Flush Panel Exterior Doors Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".
 - a. Provide 22 gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.

- b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.7, including insulated door, thermal-break frame and threshold.
- c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.
- 3) Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
- 4) Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
- 5) Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
- 6) Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- 7) Door Thickness: 1-3/4 inches, nominal.

C. Interior Doors, Non-Fire Rated:

- 1) Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
 - e. Zinc Coating: A60/ZF180 galvanized coating; ASTM A653/A653M.
- 2) Door Thickness: 1-3/4 inches, nominal.

D. Fire-Rated Doors:

- 1) Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 3 - Extra Heavy-duty.
 - b. Physical Performance Level A 1 000 000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
- 2) Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").

- 3) Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.
- 4) Provide units listed and labeled by UL (DIR) or ITS (DIR).
 - a. Attach fire rating label to each fire rated unit.
- 5) Smoke and Draft Control Doors (Indicated with letter "S" on Drawings and/or Door Schedule): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;
 - a. Maximum Air Leakage: 3.0 cfm/sq ft of door opening at 0.10 inch w.g. pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
 - b. Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
 - c. Label: Include the "S" label on fire-rating label of door.
- 6) Door Core Material: Manufacturers standard core material/construction in compliance with requirements.
- 7) Door Thickness: 1-3/4 inches, nominal.

2.4. HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Frame Finish: Factory primed and field finished.
- C. Exterior Door Frames: Full profile/continuously welded type.
 - 1) Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A40/ZF120 coating.
 - 2) Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
 - 3) Weatherstripping: Separate, see Section 08 7100.
- D. Interior Door Frames, Non-Fire Rated: Face welded type.
 - 1) Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- E. Door Frames, Fire-Rated: Face welded type.
 - 1) Fire Rating: Same as door, labeled.
 - 2) Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
- F. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

- G. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
- H. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
- I. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
- J. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
- K. Jamb Anchors: Provide number and spacing of anchors as follows:
 - 1) Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - a. Two anchors per jamb up to 60 inches high.
 - b. Three anchors per jamb from 60 to 90 inches high.
 - c. Four anchors per jamb from 90 to 120 inches high.
 - d. Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - 2) Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - a. Three anchors per jamb up to 60 inches high.
 - b. Four anchors per jamb from 60 to 90 inches high.
 - c. Five anchors per jamb from 90 to 96 inches high.
 - d. Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - e. Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
- L. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- M. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 - 1) Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - 2) Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
 - 3) Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

- 4) Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.5. FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.6. ACCESSORIES

- A. Glazing: As specified in Section 08 8000.
- B. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.
- C. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.
- D. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions before starting work. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify that opening sizes and tolerances are acceptable. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Verify that finished walls are in plane to ensure proper door alignment.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

- A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.
- B. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- C. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- D. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- E. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.3. INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- C. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
 - 1) Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
 - 2) Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - 3) Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
 - 4) Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- D. Install fire rated units in accordance with NFPA 80.
- E. Coordinate frame anchor placement with wall construction.
- F. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.
- G. Install door hardware as specified in Section 08 7100.
 - 1) Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.
- H. Comply with glazing installation requirements of Section 08 8000.
- I. Coordinate installation of electrical connections to electrical hardware items.
- J. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1) Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

2) Fire-Rated Doors: Install doors with clearances according to NFPA 80.

- K. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
- L. Touch up damaged factory finishes. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.4. 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.
- B. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

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. ANSI A208.1 - American National Standard for Particleboard; 2009.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- D. ITS (DIR) - Directory of Listed Products; current edition.
- E. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.
- F. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2016.
- G. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2018.
- H. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- I. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.
- J. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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, 4 inch in size illustrating wood grain, stain color, and sheen.
- E. Manufacturer's Installation Instructions: Indicate special installation instructions.

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. Quality Certification:

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. 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. WARRANTY

- A. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Wood Veneer Faced Doors:
 - 1) Masonite Architectural; Aspiro Series: www.architectural.masonite.com
 - 2) Marshfield Door Systems, Inc; Signature Series: www.marshfielddoors.com.
 - 3) VT Industries, Inc Heritage Collection: www.vtindustries.com/#sle.

2.2. DOORS AND PANELS

- A. Doors:
 - 1) Quality Standard: Premium Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
 - 2) Wood Veneer Faced Doors: 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 (Indicated as "S" on Drawings): In addition to required fire rating, provide door assemblies tested in accordance with UL 1784 with maximum air leakage of 3.0 cfm per sq ft of door opening at 0.10 inch wg pressure at both ambient and elevated temperatures for "S" label; if necessary, provide additional gasketing or edge sealing.
- 4) Smoke and Draft Control Doors (Indicated as "S" on Drawings): 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.

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 Transparent Finish: Red oak, veneer grade in accordance with quality standard indicated, rift cut (only red and white oak), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 - 1) Vertical Edges: Any option allowed by quality standard for grade.
 - 2) "Running Match" each pair of doors and doors in close proximity to each other.
 - 3) "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.
 - 4) Transoms: Continuous match to doors.
 - 5) Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors
 - 6) Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.

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 for hardware reinforcement.
 - 2) Provide solid blocking for other throughbolted hardware.

- C. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.
- D. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- E. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- F. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- G. 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-8, UV Cured Acrylated Polyester/Urethane.
 - b. Stain: As selected by Architect. New to Match Existing.
 - c. Sheen: Satin.

2.7. ACCESSORIES

- A. Hollow Metal Door Frames: As specified in Section 08 1113.
- B. Glazing: As specified in Section 08 8000.
- C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
- D. Astragals and Edges for Double Doors: Pairs of doors astragals, and door edge sealing and protection devices. Refer to Section 08 7100 - Door Hardware.

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.
- F. Install door louvers plumb and level.

3.3. TOLERANCES

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to specified quality standard for telegraphing, warp, and squareness.

3.4. ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

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. RELATED REQUIREMENTS

- A. Section 04 2000: Openings in masonry.

1.3. REFERENCE STANDARDS

- A. ITS (DIR) - Directory of Listed Products; current edition.
- B. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Manufacturer's Installation Instructions: Indicate installation requirements.

1.5. QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.1. ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1) Location: As indicated on drawings.
 - 2) Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
 - 3) Size: 12 inch by 12 inch.
 - 4) Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
 - 5) Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
 - 6) Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.

- 7) Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

B. Wall-Mounted Units in Wet Areas:

- 1) Location: As indicated on drawings.
- 2) Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
- 3) Size: 12 inch by 12 inch.
- 4) Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.
- 5) Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
- 6) Gypsum Board Mounting Criteria: Provide drywall bead frame with door surface flush with wall surface.
- 7) Masonry Mounting Criteria: Provide surface-mounted frame with door surface flush with frame surface.

C. Fire-Rated Wall-Mounted Units:

- 1) Location: As indicated on drawings.
- 2) Wall Fire-Rating: As indicated on drawings.
- 3) Material: Steel.
- 4) Size: 12 inch by 12 inch.
- 5) Door/Panel: Insulated double-surface panel, with tool-operated spring or cam lock and no handle.

D. Ceiling-Mounted Units:

- 1) Location: As indicated on drawings.
- 2) Material: Steel.
- 3) Size - Lay-In Grid Ceilings: To match module of ceiling grid.
- 4) Size - Other Ceilings: 12 inch by 12 inch.
- 5) Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

E. Fire-Rated Ceiling-Mounted Units:

- 1) Location: As indicated on drawings.
- 2) Ceiling Fire-Rating: As indicated on drawings.

- 3) Material: Steel.
- 4) Size: 12 inch by 12 inch.
- 5) Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.2. WALL-MOUNTED UNITS

A. Manufacturers:

- 1) Basis of Design Manufacture: ACUDOR Products Inc: www.acudor.com/#sle.
 - a. Air-Tight, Water-Tight, Wall and Ceiling Mounted Units: ACUDOR ADWT.
 - b. Fire-Rated Ceiling-Mounted Units - 2 Hours or Less: ACUDOR FWC-5015.
 - c. Fire-Rated Wall-Mounted Units - 2 Hours or Less: ACUDOR FW-5015.
- 2) Activar Construction Products Group - JL Industries; <>: www.activarcpg.com/#sle.
- 3) Babcock-Davis; <>: www.babcockdavis.com/#sle.
- 4) Cendrex, Inc: www.cendrex.com/#sle.
- 5) Karp Associates, Inc; <>: www.karpinc.com.
- 6) Milcor, Inc; <>: www.milcorinc.com.
- 7) Nystrom, Inc; <>: www.nystrom.com/#sle.
- 8) 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) Material: Steel, hot-dipped zinc or zinc-aluminum-alloy coated.
- 2) Style: Exposed frame with door surface flush with frame surface.
 - a. Gypsum Board Mounting Criteria: Use drywall bead type frame.
- 3) Door Style: Single thickness with rolled or turned in edges.
- 4) Frames: 16 gage, 0.0598 inch, minimum thickness.
- 5) Heavy Duty Single Steel Sheet Door Panels: 14 gage, 0.0747 inch, minimum thickness.
- 6) Units in Fire-Rated Assemblies: Fire rating as required by applicable code for fire-rated assembly that access doors are being installed.
 - a. Provide products listed by ITS (DIR) or UL (FRD) as suitable for purpose indicated.

- b. Provide certificate of compliance from authorities having jurisdiction indicating approval of fire rated doors.
- 7) Steel Finish: Primed.
- 8) Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
- 9) Door/Panel Size: As indicated on the drawings.
- 10) 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. Handle: Fixed.
 - d. Latch/Lock: Tamperproof tool-operated cam latch.
 - e. Gasketing: Extruded neoprene, around perimeter of door panel.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2. PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.3. 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 - SLIDING AUTOMATIC ENTRANCES

GENERAL

1.1. SECTION INCLUDES

- A. This Section includes the following types of automatic entrances:
 - 1) Exterior and interior sliding automatic entrances.
- B. Related Sections:
 - 1) Division 7 Sections for caulking to the extent not specified in this section.
 - 2) Division 8 Section "Aluminum-Framed Entrances and Storefronts" for entrances furnished and installed separately in Division 8 Section.
 - 3) Division 8 Section "Door Hardware" for hardware to the extent not specified in this Section.
 - 4) Division 8 Section Glazing for materials and installation requirements of glazing for automatic entrances.
 - 5) Division 26 Sections for electrical connections provided separately, including conduit and wiring for power to sliding automatic entrances.

1.2. REFERENCE STANDARDS

- A. General: Standards listed by reference, including revisions by issuing authority, form a part of this specification section to extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.
- B. Underwriters Laboratories (UL):
 - 1) UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems.
- C. American National Standards Institute (ANSI) / Builders' Hardware Manufacturers Association (BHMA):
 - 1) ANSI/BHMA A156.10: Standard for Power Operated Pedestrian Doors.
 - 2) ANSI/BHMA A156.5: Standard for Auxiliary Locks and Associated Products
- D. American Society for Testing and Materials (ASTM):
 - 1) ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 2) ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- E. American Association of Automatic Door Manufacturers (AAADM):

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F. National Fire Protection Association (NFPA):

- 1) NFPA 101 - Life Safety Code.
- 2) NFPA 70 - National Electric Code.

G. International Code Council (ICC):

- 1) IBC: International Building Code

H. Building Officials and Code Administrators International (BOCA), 1999:

I. International Organization for Standardization (ISO):

- 1) ISO 9001 - Quality Management Systems

J. National Association of Architectural Metal Manufacturers (NAAMM):

- 1) Metal Finishes Manual for Architectural and Metal Products.

K. American Architectural Manufacturers Association (AAMA):

- 1) AAMA 607.1 - Clear Anodic Finishes for Architectural Aluminum.
- 2) AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
- 3) AAMA 701 Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals.

1.3. DEFINITIONS

- A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to open the door.
- B. Safety Device: Device that prevents a door from opening or closing, as appropriate.

1.4. PERFORMANCE REQUIREMENTS

- A. General: Provide automatic entrance door assemblies capable of withstanding loads and thermal movements based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Operating Range: Minus 30 deg F (Minus 34 deg C) to 130 deg F (54 deg C).
- C. Opening-Force Requirements for Egress Doors: Force shall be adjustable; but, not more than 50 lbf (222 N) required to manually set swinging egress door panel(s) in motion.
- D. Closing-Force Requirements: Not more than 30 lbf (133 N) required to prevent door from closing.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.

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- B. Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.
 - 1) Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, wiring diagram, 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. Color Samples for selection of factory-applied color finishes.
- E. Closeout Submittals:
 - 1) Owner's Manual and operating instructions.
 - 2) Maintenance Data
 - 3) Warranties.

1.6. QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative, with certificate issued by AAADM, who is trained for installation and maintenance of units required for this Project.
- B. Manufacturer Qualifications: A qualified manufacturer with a manufacturing facility certified under ISO 9001.
- C. Manufacturer shall have in place a national service dispatch center providing 24 hours a day, 7 days a week, emergency call back service.
- D. Certifications: Automatic sliding door systems shall be certified by the manufacturer to meet performance design criteria in accordance with the following standards:
 - 1) ANSI/BHMA A156.10.
 - 2) NFPA 101.
 - 3) UL 325 listed.
 - 4) IBC 2012
- E. Source Limitations: Obtain automatic entrance door assemblies through one source from a single manufacturer.
- F. Product Options: Drawings indicate sizes, profiles, and dimensional requirements of automatic entrance door assemblies and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- H. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

1.7. PROJECT CONDITIONS

- A. Field Measurements: General Contractor shall verify openings to receive automatic entrance door assemblies by field measurements before fabrication and indicate measurements on Shop Drawings.
- B. Mounting Surfaces: General Contractor shall verify all surfaces to be plumb, straight and secure; substrates to be of proper dimension and material.
- C. Other trades: General Contractor shall advise of any inadequate conditions or equipment.

1.8. COORDINATION

- A. Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic entrances to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of automatic entrance door assemblies with connections to power supplies.

1.9. WARRANTY

- A. Automatic Entrances shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.
- B. During the warranty period the Contractor shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the Owner.
- C. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

PRODUCTS

2.1. AUTOMATIC ENTRANCES

- A. Manufacturer: Stanley Access Technologies; Dura-Glide™ 2000 Series sliding automatic entrances.
 - 1) Contact: Stanley Access Technologies, 1920 Talbridge Square, St. Charles MO 63303; Attn: Neil Kimes; Phone: 636-395-7642, Fax: 636-443-2281, Email: Niel.Kimes@sbdinc.com.
- B. Other Acceptable Manufacturers Subject to compliance with requirements:
 - 1) Horton Automatic.
 - 2) Besam Entrance Solutions

2.2. MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1) Headers, stiles, rails, and frames: 6063-T6.

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- 2) Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
- 3) Sheet and Plate: ASTM B 209.

B. Sealants and Joint Fillers: Performed under Division 7 Section "Joint Sealants".

2.3. AUTOMATIC ENTRANCE DOOR ASSEMBLIES

A. General: Provide manufacturer's standard automatic entrance door assemblies including doors, sidelights, framing, headers, carrier assemblies, roller tracks, door operators, activation and safety devices, and accessories required for a complete installation.

B. Sliding Automatic Entrances:

- 1) Configuration: Two sliding leaves and two full sidelights; bi-parting.
- 2) Traffic Pattern: Two-way.
- 3) Emergency Breakaway Capability: Sliding leaves.
- 4) Mounting: Between jambs.

2.4. COMPONENTS

A. Framing Members: Manufacturer's standard extruded aluminum reinforced as required to support imposed loads.

- 1) Nominal Size: 1 3/4 inch by 4 1/2 inch (45 by 115 mm).
- 2) Concealed Fastening: Framing shall incorporate a concealed fastening pocket, and continuous flush insert cover, extending full length of each framing member.

B. Stile and Rail Doors and Sidelights: Manufacturer's standard 1 3/4 inch (45 mm) thick glazed doors with extruded-aluminum tubular stile and rail members. Incorporate concealed tie-rods that span full length of top and bottom rails.

- 1) Glazing Stops and Gaskets: Snap-on, extruded-security aluminum stops and preformed gaskets.
- 2) Stile Design: Medium stile; 3 1/2 inch (89 mm) nominal width.
- 3) Bottom Rail Design: Minimum 4 inch (102 mm) nominal height.
- 4) Muntin Bars: Horizontal tubular rail member for each door; 4 1/4 inch (108 mm) nominal height.

C. Glazing: Furnished under Division 8 Section Glazing. All Glazing furnished under separate section shall be 1 inch (25 mm) insulated glazing units with not less than 1/2 inch (13 mm) air space.

D. Headers: Fabricated from extruded aluminum and extending full width of automatic entrance door units to conceal door operators, carrier assemblies, and roller tracks. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.

- 1) Mounting: Concealed, with one side of header flush with framing.
 - 2) Capacity: Capable of supporting up to 220 lb (100 kg) per panel, up to four panels, over spans up to 14 feet (4.3 m) without intermediate supports.
- E. Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment of at least 1/8 inch (3 mm); consisting of urethane with precision steel lubricated ball-bearing wheels, operating on a continuous roller track. Support panels from carrier assembly by load wheels and anti-riser wheels with factory adjusted cantilever and pivot assembly. Minimum two ball-bearing load wheels and two anti-rise rollers for each active leaf. Minimum load wheel diameter shall be 2 1/2 inch (64 mm); minimum anti-rise roller diameter shall be 2 inch (51 mm).
- F. Thresholds: Manufacturer's standard thresholds as indicated below:
- 1) Continuous standard tapered extrusion double bevel.
 - 2) All thresholds to conform to details and requirements for code compliance.
- G. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
- H. Signage: Provide signage in accordance with ANSI/BHMA A156.10.

2.5. DOOR OPERATORS

- A. General: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, operation under normal traffic load for type of occupancy indicated.
- B. Electromechanical Operators: Self-contained overhead unit powered by a minimum of 1/4 horsepower, permanent-magnet DC motor with gear reduction drive, microprocessor controller; and encoder.
- 1) Operation: Power opening and power closing.
 - 2) Features:
 - a. Adjustable opening and closing speeds.
 - b. Adjustable back-check and latching.
 - c. Adjustable braking.
 - d. Adjustable hold-open time between 0 and 30 seconds.
 - e. Obstruction recycle.
 - f. On/Off switch to control electric power to operator.
 - g. Energy conservation switch that reduces door-opening width.
 - h. Closed loop speed control with active braking and acceleration.
 - i. Adjustable obstruction recycle time delay.

- j. Self adjusting stop position.
 - k. Self adjusting closing compression force.
 - l. Onboard sensor power supply.
 - m. Onboard sensor monitoring.
 - n. Optional Switch to open/Switch to close operation.
- 3) Mounting: Concealed.
 - 4) Drive System: Synchronous belt type.

C. Electrical service to door operators shall be provided under Division 16 Electrical. Minimum service to be 120 VAC, 5 amps.

2.6. ELECTRICAL CONTROLS

A. Electrical Control System: Electrical control system shall include a microprocessor controller and position encoder. The encoder shall monitor revolutions of the operator shaft and send signals to microprocessor controller to define door position and speed. Systems utilizing external magnets and magnetic switches are not acceptable.

B. Performance Data: The microprocessor shall collect and store performance data as follows:

- 1) Counter: A non-resettable counter to track operating cycles.
- 2) Event Reporting: Unit shall include event and error recording including number of occurrences of events and errors, and cycle count of most recent events and errors.
- 3) LED Display: Display presenting the current operating state of the controller.

C. Controller Protection: The microprocessor controller shall incorporate the following features to ensure trouble free operation:

- 1) Automatic Reset Upon Power Up.
- 2) Main Fuse Protection.
- 3) Electronic Surge Protection.
- 4) Internal Power Supply Protection.
- 5) Auto-Resetting sensor supply protection.
- 6) Motor Protection, over-current protection.

D. Soft Start/Stop: A “soft-start” “soft-stop” motor driving circuit shall be provided for smooth normal opening and recycling.

E. Obstruction Recycle: Provide system to recycle the sliding panels when an obstruction is encountered during the closing cycle. If an obstruction is detected, the system shall search for that object on the next closing cycle by reducing door closing speed prior to the previously encountered obstruction location,

and will continue to close in check speed until doors are fully closed, at which time the doors will reset to normal speed. If obstruction is encountered again, the door will come to a full stop. The doors shall remain stopped until obstruction is removed and operate signal is given, resetting the door to normal operation.

- F. Programmable Controller: Microprocessor controller shall be programmable and shall be designed for connection to a local configuration tool. Local configuration tool shall be a software driven handheld interface. The following parameters may be adjusted via the configuration tool.
- 1) Operating speeds and forces as required to meet ANSI/BHMA A156.10.
 - 2) Adjustable and variable features as specified in 2.5, B., 2.
 - 3) Reduced opening position.
 - 4) Fail Safe/Secure control.
 - 5) Firmware update.
 - 6) Trouble Shooting
 - a. I/O Status.
 - b. Electrical component monitoring including parameter summary.
 - 7) Software for local configuration tool shall be available as a free download from the sliding automatic entrance manufacturer's internet site. Software shall be compatible with the following operating system platforms: Palm®, Android®, and Windows Mobile®.

2.7. ACTIVATION AND SAFETY DEVICES

- A. Motion Sensors: Motion sensors shall be mounted on each side of door header to detect pedestrians in the activating zone, and to provide a signal to open doors in accordance with ANSI/BHMA A156.10. Units shall be programmable for bi-directional or uni-directional operation and shall incorporate K-band microwave frequency to detect all motion in both directions.
- B. Presence Sensors: Presence sensors shall be provided to sense people or objects in the threshold safety zone in accordance with ANSI/BHMA A156.10. Units shall be self-contained, fully adjustable, and shall function accordingly with motion sensors provided. The sensor shall be enabled simultaneously with the door-opening signal and shall emit an elliptical shaped infrared presence zone, centered on the doorway threshold line. Presence sensors shall be capable of selectively retuning to adjust for objects which may enter the safety zone; tuning out, or disregarding, the presence of small nuisance objects and not tuning out large objects regardless of the time the object is present in the safety zone. The door shall close only after all sensors detect a clear surveillance field.
- C. Photoelectric Beams: In addition to the threshold sensor include a minimum of two (2) doorway holding beams. Photoelectric beams shall be pulsed infrared type, including sender receiver assemblies for recessed mounting. Beams shall be monitored by electrical controls for faults and shall fail safe.

- D. Presence Sensor Monitoring: Sliding automatic entrances control system shall include a means to verify the functionality of all active presence sensors in accordance with ANSI/BHMA A156.10. A detected fault shall cause automatic operation to cease until the fault is corrected.

2.8. HARDWARE

- A. General: Provide units in sizes and types recommended by automatic entrance door and hardware manufacturers for entrances and uses indicated.
- B. Emergency Breakaway Feature: Provide release hardware that allows panel(s) to swing out in direction of egress to full 90 degrees from any position in sliding mode. Maximum force to open panel shall be 50 lbf (222 N) according to ANSI/BHMA A156.10. Interrupt powered operation of panel operator while in breakaway mode.
- 1) Emergency breakaway feature shall include at least one adjustable detent device mounted in the top of each breakaway panel to control panel breakaway force.
 - 2) Limit Arms: Limit arms shall be provided to control swing of sliding non-sliding panels on break-out; swing shall not exceed 90 degrees. Limit arms shall be spring loaded to prevent shock, and include adjustable friction damping.
- C. Deadlocks: Manufacturer's standard deadbolt operated by interior and exterior cylinders; with minimum 1 inch (25 mm) long throw bolt; ANSI/BHMA A156.5, Grade 1.
- 1) Cylinders: As specified in Division 8 Section "Door Hardware."
 - 2) Hook Latch: Laminated-steel hook, mortise type.
 - 3) Lock/Unlock Indicator: Provide lock position indicators integrated with locking system. Indicators shall be stile mounted on the secure side of the door and provide a visual display of lock position; "OPEN" in black letters when unlocked, "LOCKED" in red letters when locked.
 - 4) Two-Point Locking: Provide locking system that incorporates a device in the stile of active door leaves that automatically extends a flush bolt into overhead carrier assembly.
- D. Control Switch: Provide manufacturer's standard header mounted rocker switches to allow for full control of the automatic entrance door. Controls to include, but are not limited to:
- 1) One-way traffic
 - 2) Reduced Opening
 - 3) Open/Closed/Automatic
- E. Power Switch: Sliding automatic entrances shall be equipped with a two position "On/Off" illuminated rocker switch to control power to the door.
- F. Sliding Weather Stripping: Manufacturer's standard replaceable components complying with AAMA 701; made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
- G. Weather Sweeps: Manufacturer's standard adjustable nylon brush sweep mounted to underside of door bottom.

2.9. FABRICATION

- A. General: Factory fabricates automatic entrance door assembly components to designs, sizes, and thickness indicated and to comply with indicated standards.
 - 1) Form aluminum shapes before finishing.
 - 2) Use concealed fasteners to greatest extent possible.
 - a. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - b. Reinforce members as required to receive fastener threads.
- B. Framing: Provide automatic entrances as prefabricated assemblies.
 - 1) Fabricate tubular and channel frame assemblies with manufacturer's standard mechanical or welded joints. Provide sub-frames and reinforcement as required for a complete system to support required loads.
 - 2) Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
 - 3) Form profiles that are sharp, straight, and free of defects or deformations.
 - 4) Prepare components to receive concealed fasteners and anchor and connection devices.
 - 5) Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
- C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
- D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.
- E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated.
- F. Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site.

2.10. ALUMINUM FINISHES

- A. General: Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designing finishes. Finish designations prefixed by AA comply with system established by Aluminum Association for designing finishes.
- B. (Exterior Doors) Superior Performing Organic Coatings System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.
 - 1) Manufacturers:

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- a. PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - b. Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.
 - c. Permafluor Architectural Coatings.
- C. Color: Bone White new to match existing.
- D. Touch-Up Materials: As recommended by coating manufacturer for field application.
- E. (Interior Doors) Class I, Natural Anodic Finish: AA-M12C22A42/A44 Mechanical Finish: as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.70 mils minimum complying with AAMA 611-98, and the following:
- 1) Color: Clear Anodized.
 - 2) AAMA 606.1 – Integral Clear Anodic Finishes for Architectural Aluminum
 - 3) Applicator must be fully compliant with all applicable environmental regulations and permits, including wastewater and heavy metal discharge.

EXECUTION

3.1. INSPECTION

- A. Examine conditions for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of automatic entrances. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

- A. Install door assembly in accordance with manufactures instructions.
- B. General: Do not install damaged components. Fit frame joints to produce joints free of burrs and distortion. Rigidly secure non-movement joints.
- C. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
- 1) Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 - 2) Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
- D. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections.
- E. Glazing: Performed under Division 8 Section "Glazing" in accordance with sliding automatic entrance manufacturer's instructions.
- F. Sealants: Comply with requirements specified in Division 7 Section "Joint Sealants".

3.3. FIELD QUALITY CONTROL

- A. Testing Services: Factory Trained Installer shall test and inspect each automatic entrance door to determine compliance of installed systems with applicable ANSI standards.

3.4. ADJUSTING

- A. Adjust door operators, controls, and hardware for smooth and safe operation, for tight closure, and complying with requirements in ANSI/BHMA A156.10.

3.5. CLEANING AND PROTECTION

- A. Clean glass and aluminum surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish. Comply with requirements in Division 8 Section "Glazing", for cleaning and maintaining glass.

END OF SECTION 08 4229

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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. Door hardware.

1.2. RELATED REQUIREMENTS

- A. Section 07 2500 - Weather Barriers: Sealing framing to water-resistive barrier installed on adjacent construction.
- B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.
- D. 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 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.
- C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- D. AAMA 612 - Voluntary Specification, Performance Requirements, and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2017a.
- E. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.
- F. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- G. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- H. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- I. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- J. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- K. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

- L. 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).
- M. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.
- N. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

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 3300 - Submittals 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.
 - 1) Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 2) Include design engineer's stamp or seal on shop drawings for attachments and anchors.
- D. Samples: Submit two samples 4 by 4 inches in size illustrating finished aluminum surface, glass, glazing materials.
- E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.
- F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.
- G. Hardware Schedule: Complete itemization of each item of hardware to be provided for each door, cross-referenced to door identification numbers in Contract Documents.
- H. Designer's Qualification Statement.
- I. Manufacturer's Qualification Statement.
- J. Installer's Qualification Statement.
- K. 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 10-year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Basis of Design Manufacture: YKK AP.
- B. Other Acceptable - Aluminum-Framed Storefronts Manufacturers:
 - 1) Kawneer North America: www.kawneer.com/#sle.
 - 2) Manko Window Systems, Inc: www.mankowindows.com/#sle.
 - 3) Oldcastle Building Envelope: www.oldcastlebe.com/#sle.

2.2. BASIS OF DESIGN -- EXTERIOR FRAMING

- A. Center-Set Style, Thermally Broken Framing System:

- 1) Basis of Design: YKK AP; YES 45 XT; Thermally broken storefront system.
www.ykkap.com. www.ykkap.com/commercial/productguide/storefront/yes60xt/
- 2) Dual Thermal Barrier.
- 3) Horizontal and Vertical Mullion Dimensions: 2 inch wide by 4 1/2 inch.
- 4) Provide header adapter as required.

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. BASIS OF DESIGN -- INTERIOR FRAMING FOR MONOLITHIC GLAZING

A. Center-Set Style, flush glazed storefront / Non-Thermal:

- 1) Basis of Design: YKK AP model YES 45 FI Storefront:
- 2) Vertical / Horizontal Mullion Dimensions: 2 inches wide by 4 1/2 inches deep.
- 3) Finish: Clear Anodized

2.4. BASIS OF DESIGN -- SWINGING DOORS

A. **Exterior Entrance Doors Wide Stile**, with Insulated Glass:

- 1) Basis of Design: YKK AP; Model 50D Commercial Entrance System Doors
- 2) Thickness: 1-3/4 inches.
- 3) Stiles: 5-Inches. Wide Stile.
- 4) Top Rail Height: 5-inches.
- 5) Mid Rail Height: 5-inches.
- 6) Bottom Rail Height: 10-inches. ADA compliant.
- 7) Finish Painted Superior Performing Organic Coatings System.

B. **Interior Entrance Doors Medium Stile**, Monolithic Glazing:

- 1) Basis of Design: YKK AP; Model 35D Commercial Entrance System Doors.
- 2) Thickness: 1-3/4 inches.
- 3) Stiles: 3 1/2 -Inches. Medium Stile.
- 4) Top Rail Height: 3 1/2-inches.
- 5) Bottom Rail Height: 10-inches. ADA compliant.
- 6) Mid Rail Height: 4-inches.

- 7) Finish: Clear Anodized.

C. Substitutions: See Section 01 6000 - Product Requirements.

- 1) For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.5. ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

- 1) Finish: Superior performing organic coatings.
 - a. Factory finish all surfaces that will be exposed in completed assemblies.
 - b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
 - c. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.
- 2) Exterior Finish Color: As selected by Architect from manufacturer's standard line. New to match existing bone white.
- 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.
- 10) Dual Thermal Barrier: Provide dual continuous thermal barriers by means of poured and debridged pockets consisting of a two-part, chemically curing high density polyurethane

which is bonded to the aluminum. Systems employing non-structural thermal barriers are not acceptable.

B. Exterior Performance Requirements:

- 1) Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
 - a. Design Wind Loads: Comply with requirements of ASCE 7.
 - b. Member Deflection: Limit member deflection to 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 12 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) Air Infiltration (Single Acting Butt Hinges, Continuous Hinges, or Offset Pivots): Air infiltration shall be tested in accordance with ASTM E 283 at static pressure of 1.57 PSF (75 Pa). Infiltration shall not exceed 0.50 CFM/FT² for single door or 1.00 CFM/FT² for pair doors.
- 5) Condensation Resistance Factor of Framing: 59, minimum frame and 67, measured in accordance with AAMA 1503.
- 6) Overall U-value Including Glazing: 0.56 Btu/(hr sq ft deg F), maximum.

2.6. COMPONENTS

- A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
- 1) Framing members for interior monolithic glass applications need not be thermally broken.
 - 2) Glazing Stops: Flush.
 - 3) Cross-Section: As indicated on drawings.
 - 4) Structurally Reinforced Members: Extruded aluminum with internal reinforcement of structural steel member.

2.7. MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M).
- B. Sheet Aluminum: ASTM B209 (ASTM B209M).
- C. Fasteners: AISA 300 series Stainless steel.

- D. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.
- E. Concealed Flashings: Sheet aluminum, 26 gauge, 0.017 inch minimum thickness.
- F. 0.050 Aluminum Sill Flashing End Dams must have 3 point attachment.
- G. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.
- H. Sealant for Setting Thresholds: Non-curing butyl type.
- I. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.8. FINISHES

- A. Natural Clear Anodized Finish with Organic Seal: AAMA 612-02 Clear anodic coating with non-aqueous electro-deposited organic seal; not less 0.7 mils thick.
 - 1) This finish to be utilized as indicated on drawings for interior storefront assemblies.
- B. Superior Performing Organic Coatings System: Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.
 - 1) Manufacturers:
 - a. PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
 - b. Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.
 - c. Permafluor Architectural Coatings.
- C. This finish to be utilized for exterior storefront assemblies.
 - 1) Color: White new to match existing.
- D. Touch-Up Materials: As recommended by coating manufacturer for field application.

2.9. 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, of neoprene; provide on all doors.
- F. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all exterior 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. Install hardware using templates provided.
- J. 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. Provide services of storefront manufacturer's field representative to observe for proper installation of system and submit report.

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.
- C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.7. PROTECTION

- A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 5413 - FIBERGLASS WINDOWS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Factory fabricated fiberglass windows with fixed and operating sash.
- B. Glazed by factory.
- C. Operating hardware.
- D. Insect screens.

1.2. RELATED REQUIREMENTS

- A. Section 07 2500 - Weather Barriers: Sealing frames to weather barrier installed on adjacent construction.
- B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

1.3. REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights; 2017.
- 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. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).
- D. ASTM E2112 - Standard Practice for Installation of Exterior Windows, Doors and Skylights; 2007 (Reapproved 2016).

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene one week before starting work of this section.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide component dimensions, anchors, fasteners, glass, and internal drainage details.
- C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.
- D. Samples: Submit , 12 x 12 inch in size, illustrating window frame section.
- E. Submit two samples of operating hardware.
- F. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.

G. Grade Substantiation: Prior to submitting shop drawings or starting fabrication, submit one of the following showing compliance with specified grade:

- 1) Evidence of AAMA Certification.
- 2) Evidence of WDMA Certification.
- 3) Evidence of CSA Certification.
- 4) Test report(s) by independent testing agency itemizing compliance and acceptable to authorities having jurisdiction.

H. Manufacturer's Qualification Statement.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

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.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.8. FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and after installation of sealants.

1.9. WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide ten year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Fiberglass Windows:

- 1) Pella Corporation; Pella Impervia: www.pellacommercial.com/#sle.
- 2) Marvin Window and Door, Ultrex: www.marvin.com./integrity
- 3) Milgard Windows and Doors; www.milgard.com

- 4) Substitutions: See Section 01 6000 - Product Requirements.

2.2. WINDOW UNITS

- A. Fiberglass Windows: Hollow, tubular, multi-layer fiber reinforced material; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.
- 1) Configuration: As indicated on drawings .
 - 2) Product Type: FW - Fixed window and H - Hung window, vertically sliding in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
 - 3) Color: White at interior and exterior.
 - 4) Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
 - 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) Thermal Movement: Design to accommodate thermal movement caused by 100 degrees F temperature change without buckling stress on glass, joint seal failure, damaging loads on structural elements, damaging loads on fasteners, reduction in performance or other detrimental effects.

2.3. PERFORMANCE REQUIREMENTS

- A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
- 1) Performance Class (PC): LC.
 - 2) Performance Grade (PG): 25, with minimum design pressure (DP) of 25.06 psf.
- B. Deflection: Limit member deflection to 1/200 of the longer dimension with full recovery of glazing materials.
- C. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.
- D. Water Leakage: No uncontrolled leakage on interior face when tested in accordance with ASTM E331 at differential pressure of 12.11 pounds per square foot.
- E. Air Leakage: Maximum of 0.1 cu ft/min/sq ft at 6.27 pounds per square foot differential pressure, when tested in accordance with ASTM E283.

2.4. HARDWARE

- A. Balance System:
- 1) Coil spring block and tackle with nylon cord, glass filled nylon shoe and zinc locking mechanism.

- B. Sash Limiters: Available as a field applied option to limit sash travel. ABS material and beige in color with Stone White or Matte Black screws. Applied in the balance tube channel.

2.5. COMPONENTS

- A. Frames: 3 3/32 inch wide by 2 inch deep profile; flush glass stops of screw fastened type.
 - 1) Type: Nailing flange (for new windows).
 - 2) Frame Corners: Mitered and joined with nylon corner locks.
- B. Mullion: 2 inch wide by 1 inch deep profile.
- C. Sills: 1 3/4 inch nominal thickness, composite fiberglass; sloped for positive wash; fit under sash to 1/2 inch beyond wall face; one piece full width of opening.
- D. Stools: 1 inch nominal thickness, fiberglass; fit under sash to project 1/2 inch beyond interior wall face; one piece full width of opening.
- E. Sash Description: Pultruded reinforced fiberglass, 0.077 inch (2mm) thick.
- F. Composite sash thickness: 15/16 inch (24mm)
- G. Grilles: Between-the-glass:
 - 1) Material: Aluminum.
 - 2) Size: 3/4 inch.
 - 3) Shape: Contoured.
 - 4) Color: Match exterior sash.
 - 5) Pattern: Rectangular - 6 lite.
- H. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
- I. Insect Screens: Woven Charcoal fiberglass mesh; 18 by 16 mesh size.
- J. Operable Sash Weather Stripping: Resilient PVC; permanently resilient, profiled to effect weather seal.
- K. Fasteners: Stainless steel.
- L. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.6. GLASS AND GLAZING MATERIALS

- A. Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC when tested in accordance with ASTM E 2190.
- B. Glazing Method: Insulating glass
- C. Glass Type: Low E2, air or Argon gas.

- D. Glass Type Option "frosted" for select windows as identified on drawings: Obscure Glass "frosted glass".
- E. Glass Type Options "tempered" for select windows to be tempered when glazing is within 16-inches of floor line or adjacent to operable door opening.
- F. Glazing Seal: Silicone bedding at exterior and a glazing boot to interior
- G. Perimeter Spacer: Default color is mill finish (stainless). An optional black perimeter spacer color is available for all interior color selections.

2.7. HARDWARE

- A. Double Hung Sash: Metal and nylon spiral friction slide cylinder, each sash, each jamb.
 - 1) Sash Lock: Self-aligning, cam-action lock.
 - 2) Two (2) locks installed on units with a rough opening width greater than 30 inches.
 - 3) Sash Lift: Zinc die cast contoured sash lift
 - 4) Standard Color: White, Bronze, Ebony (Matches interior finish)
- B. Top and Bottom Tilt Latches: Ergonomic tilt latches attached to the upper corners of the top and bottom sash for easy tilting and sash removal

2.8. FABRICATION

- A. Fabricate framing, mullions and sash members with fusion welded corners and joints, in a rigid jig. Supplement frame sections with internal reinforcement where required for structural rigidity.
- B. Form sills and stools in one piece. Slope sills for wash.
- C. Form snap-in glass stops, closure molds, weather stops, and flashings for tight fit into window frame section.
- D. Form weather stop flange to perimeter of unit.
- E. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- F. Arrange fasteners to be concealed from view.
- G. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.
- H. Assemble insect screen frame, miter and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.
- I. Double weatherstrip operable units.
- J. Factory glaze window units.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.2. INSTALLATION

- A. Install windows in accordance with manufacturer's instructions.
- B. Install windows in accordance with ASTM E2112.
- C. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- D. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- E. Set sill members and sill flashing in continuous bead of sealant.
- F. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- G. Install operating hardware.

3.3. TOLERANCES

3.4. FIELD QUALITY CONTROL

- A. Provide services of fiberglass window manufacturer's field representative to observe for proper installation of system and submit report.
- B. See Section 01 4000 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

3.5. ADJUSTING

- A. Adjust hardware for smooth operation and secure weathertight closure.

3.6. CLEANING

- A. See Section 01 7400 - Cleanng, for additional requirements.
- B. Remove protective material from pre-finished surfaces.
- C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.
- D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 5659 - SERVICE AND TELLER WINDOW UNITS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Service and teller window units.

1.2. REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

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 3300 - Submittals 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. Samples for Selection of Finishes:
 - 1) Color / Clear Anodized Finishes: Frame member sections showing range of color to be expected in finished work.
- E. 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 at least ten years documented experience, and with ability to provide test reports showing that their standard manufactured products meet the specified requirements.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Deliver units in manufacturer's original packaging and unopened containers with identification labels intact.

- B. Store units in area protected from exposure to weather and vandalism.

1.7. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1. SERVICE AND TELLER WINDOW UNITS

- A. Location: Built within interior wall, as indicated on drawings.
- B. Type of Use: Walk-up.
- C. Window Type: S.
 - 1) Operation: Manual.
 - 2) Mounting: Flush with wall surface.
 - 3) Window Unit Size: 60 inch wide by 48 inch high.
 - 4) Size of Counter Space: As indicated on drawings.
 - 5) Material: Aluminum.
 - a. Finish: Clear anodized
 - 6) Header: Manufacturer's standard type.
- D. Glazing: Single (monolithic), clear.
 - 1) 1/4-inch Tempered safety glazing.
- E. Products:
 - 1) Easi-Serv Products; SS Series Side Sliding Window, Model SS200-C: www.easi-serv.com/#sle.
 - 2) CR Laurence; DW Series Manual Deluxe Sliding Service Window: www.crlaurence.com.
 - 3) Ready Access; Model 275 -Low Profile Single Panel Sliding Transaction Window.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.

2.2. ASSEMBLY COMPONENTS

- A. Windows: Factory-fabricated, finished, and glazed, with extruded aluminum frame and glazing stops; complete with hardware and anchors.
 - 1) Provide window units that are re-glazable from the secure side without dismantling the non-secure side of framing.

- 2) Rigidly fit and secure joints and corners with internal reinforcement. Make joints and connections flush, hairline, and weatherproof. Fully weld corners.
- 3) Apply factory finish to exposed surfaces.
- 4) Horizontal Sliding Windows: Top-hung operable sash; with thumb-turn release and drop down security bar.

B. Deal Tray: Integral with window sill.

- 1) Material: One piece stainless steel tray construction, 18 gage, 0.0500 inch minimum thickness.
- 2) Overall Size with Curved Tray Bottom: 8 inch deep by 11-1/2 inch wide.

2.3. MATERIALS

- A. Aluminum Extrusions: Minimum 1/8 inch thick frame and sash material complying with ASTM B221 and ASTM B221M.
- B. Stainless Steel: Type 304 with No. 3 - Coarse finish.
- C. Monolithic Glass: Fully tempered float glass; minimum 1/4 inch thickness.
- D. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

2.4. FINISHES

- A. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils thick.
- B. Color: As indicated on drawings.

2.5. ACCESSORIES

- A. Hardware and Security Devices for Sliding Windows:
 - 1) Night Security Lock Bar: Sliding aluminum lock bar.
 - 2) Weatherstripping and Glazing Sealant: Factory applied.
 - 3) Bottom Sills: Stainless steel construction, no bottom tracks and no pop rivets.
 - 4) Handles: Stainless steel, manufacturer's standard profile and finish.

PART 3 EXECUTION

3.1. 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.

3.2. 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.
- D. Set sill members and sill flashing in continuous bead of sealant.

3.3. 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.

3.4. CLEANING

- A. Remove protective material from factory finished surfaces.
- B. Clean exposed surfaces promptly after installation without damaging finishes.

3.5. DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain operable units.
 - 1) Instructor: Manufacturer's training personnel.
 - 2) Location: At project site.
 - 3) Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

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 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Automatic operators.
 - 4. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 - 4. Division 08 Section "Sliding Automatic Entrances".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
 - 8. State Building Codes, Local Amendments.

- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. Content: Include the following information:
 - a. Type, style, function, size, label, hand, and finish of each door hardware item.
 - b. Manufacturer of each item.
 - c. Fastenings and other pertinent information.
 - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - e. Explanation of abbreviations, symbols, and codes contained in schedule.
 - f. Mounting locations for door hardware.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
1. Maintenance manual must be provided for tornado/hurricane storm shelter impact protective systems.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.
- C. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) or acceptable integrated file format for updating of Openings Studio™ management software and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
 3. Review sequence of operation narratives for each unique access controlled opening.
 4. Review and finalize construction schedule and verify availability of materials.
 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of the hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
 - 1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.

- b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.
 - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
 - a. Hager Companies (HA) - BB Series, 5-knuckle.
 - b. McKinney (MK) - TA/T4A Series, 5-knuckle.
 - c. dormakaba BEST (ST) - F/FBB Series, 5-knuckle.

2.3 SLIDING AND FOLDING HARDWARE

- A. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should conform with ANSI/BHMA A156.14.
 1. Sliding Bi-Passing Pocket Door Hardware: Provide complete sets consisting of track, hangers, stops, bumpers, floor channel, guides, and accessories indicated.
 2. Manufacturers:
 - a. Hafele Manufacturing (HF).
 - b. Johnson Hardware (JO).
 - c. Pemko (PE).

2.4 POWER TRANSFER DEVICES

- A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to

accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:

- a. Architectural Builders Hardware (AH) - PT1000-EZ Series.
- b. Pemko (PE) - EL-CEPT Series.
- c. Securitron (SU) - EL-CEPT Series.

- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:

- a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
- b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:

- a. Hager Companies (HA) - Quick Connect.
- b. McKinney (MK) - QC-C Series.
- c. dormakaba BEST (ST) - WH Series.

2.5 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

- 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
- 2. Furnish dust proof strikes for bottom bolts.
- 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
- 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
- 5. Manufacturers:

- a. Burns Manufacturing (BU).
- b. Rockwood (RO).
- c. Trimco (TC).

- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
 6. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.6 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
1. Manufacturers:
 - a. dormakaba BEST (BE)
 - b. Sargent Manufacturing (SA)
 - c. Schlage (SC)
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 6. Keyway: Manufacturer's Standard.
- C. Large Format Interchangeable Cores: Provide Large format interchangeable cores (LFIC) as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.

D. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. Existing System: Field verify and key cylinders to match Owner's existing system.

E. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

F. Construction Keying: Provide construction master keyed cylinders.

G. Construction Keying: Provide temporary keyed construction cores.

H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:
 - a. Meets ANSI/BHMA A156.41 for single motion egress.
 - b. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
 - c. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
 - d. Extended cycle test: Locks to have been cycle tested in ordinance with ANSI/BHMA 156.13 requirements to 20 million cycles or greater.
 - e. Exceeds ANSI/BHMA A156.2 requirements by 2.6 times for 3,100 in-lb. abusive locked lever torque with no entry while maintaining egress.
 - f. Exceeds ANSI/BHMA A156.2 requirements by 8 times for 1,600 lbs. offset lever pull with no entry for protection against attacks.
 - g. Exceeds ANSI/BHMA A156.3 requirements by 2 times for latch retraction with 100 lb. preload while maintaining operation in warped doors.
 - h. Exceeds ANSI/BHMA A156.3 requirements by 20 times for no access with minimum 100 vertical impacts for protection against vandalism attempts.
 - i. Independent return springs allow lock to exceed ANSI/BHMA A156.2 Grade 1 cycle requirements without lever sag.

- j. Ten-year limited warranty for mechanical functions.

2. Manufacturers:

- a. DormaKaba BEST (BE) – 9K.
- b. Sargent Manufacturing (SA) - 10X Line.
- c. Schlage (SC) – ND.

B.

2.8 DEADLOCKS AND LATCHES

- A. Cylindrical Deadlocks: ANSI/BHMA A156.36 Grade 1 Certified Products Directory (CPD) listed deadlocks to fit standard ANSI 161 preparation. Provide tapered collars to resist vandalism and 1" throw solid steel bolt with hardened steel roller pins. Deadlocks to be products of the same source manufacturer and keyway as other locksets.

1. Manufacturers:

- a. dormakaba BEST (BE) - T Series.
- b. Sargent Manufacturing (SA) - 480 Series.
- c. Schlage (SC) - B600 Series.

2.9 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

- 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
- 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
- 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

- B. Standards: Comply with the following:

- 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
- 2. Strikes for Bored Locks and Latches: BHMA A156.2.
- 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
- 4. Dustproof Strikes: BHMA A156.16.

2.10 ELECTROMAGNETIC LOCKING DEVICES

- A. Surface Electromagnetic Locks (Heavy Duty): Electromagnetic locks to be surface mounted type conforming to ANSI A156.23, Grade 2 with minimum holding force strength of 1,200 pounds. Locks to be capable of accepting between 12 to 24 volts direct current and be UL listed

for use on fire rated door assemblies. Electromagnetic coils are to consume no more than 1.5W during normal operation. Locks are to have an integrated door position switch, tamper switch, and lock bond sensor. Locks are to have integrated motion sensor and/or security camera as indicated in the hardware sets. Locks to be capable of detecting door prop conditions and entering low power mode. Provide mounting accessories as needed to suit opening conditions. Power supply to be by the same manufacturer as the lock with combined products having a lifetime replacement warranty.

1. Manufacturers:
 - a. Securitron (SU) - M680E Series.

2.11 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Electromechanical exit devices shall have the following functions and features:
 - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
 - c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.
 - d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.
 - e. Five-year limited warranty for electromechanical features.
2. Manufacturers:
 - a. Dormakaba BEST (BE) - APEX Series.
 - b. Sargent Manufacturing (SA) - 80 Series.
 - c. VonDuprin (VD) – 33/35 – 98/99 Series.

2.12 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece

cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Manufacturers:
 - a. LCN Closers (LC) - 4040XP Series.
 - b. Norton Rixson (NO) - 9500 Series.
 - c. Sargent Manufacturing (SA) - 281 Series.

2.13 ELECTROMECHANICAL DOOR OPERATORS

- A. Electromechanical Door Operators (Moderate Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that are UL325/991 and UL10C certified and comply with requirements for the Americans with Disabilities Act (ADA). Operators shall accommodate openings up to 200 pounds and 48" wide.

1. Provide operators with features as follows:
 - a. Non-handed with push and pull side mounting.
 - b. Activation by push button, hands-free or radio frequency devices.
 - c. Adjustable opening force and closing power.
 - d. Two-year limited warranty.
 - e. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building's IT required.
 - 1) Simple setup with no app required.
 - 2) View status and make adjustments without removing the cover.
 - 3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
 - f. Mounting backplate to simplify and speed up installation.
2. Operators shall have the following functionality:
 - a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
 - b. Emergency Interface Relay: Door closes and ignores any activation input until signal is discontinued.
 - c. Infinite Hold Open: Door will hold open at set position until power is turned off.
 - d. Latch Assist: At closed position, after an activation, the door is pulled in. After the door has closed, the door is pulled in to assist with latch release/engagement.
 - e. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
 - f. Open Delay: Delays operator opening for locking hardware.
 - g. Outside Wall Switch Disable: When contact is closed, outside wall switch is disabled.
 - h. Power Assist: Senses the door is being opened manually and applies small amount of power to assist the user in opening the door with force less than 5 lbs. The door opens only as far as it is moved manually, then closes once released.
 - i. Power Close: Additional force to assist door closing between 7° and 2°.

- j. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
 - k. Selector Mode Switch: Off disables the signal inputs, on activates the signal inputs, hold open activates the unit to the hold open position.
 - l. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open the second door will open once vestibule door delay has expired. Delay shall be adjustable.
 - m. Executive Mode Feature: When the door receives an activation signal it opens and remains open until either a second signal is received, or the door is manually moved in closing direction.
3. Manufacturers:
- a. ASSA ABLOY Entrance Systems (BE) - SW100 Series.
 - b. LCN (LC) - 9530/9540 Series.
 - c. Norton Rixson (NO) - 6200 Series.

2.14 SURFACE MOUNTED CLOSER HOLDERS

- A. Electromagnetic Door Holders: ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate 12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.
1. Manufacturers:
- a. LCN Door Closers (LC) - SEM7800 Series.
 - b. Norton Rixson (RF) - 980/990 Series.
 - c. Sargent Manufacturing (SA) - 1560 Series.

2.15 ARCHITECTURAL TRIM

- A. Door Protective Trim
- 1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
 - 2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
 - 3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
 - 4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.

5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
 - c. Trimco (TC).

2.16 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. Burns Manufacturing (BU).
 - b. Rockwood (RO).
 - c. Trimco (TC).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
 1. Manufacturers:
 - a. Norton Rixson (RF).
 - b. Rockwood (RO).
 - c. Sargent Manufacturing (SA).

2.17 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 - 1. National Guard Products (NG).
 - 2. Pemko (PE).
 - 3. Reese Enterprises, Inc. (RE).

2.18 ELECTRONIC ACCESSORIES

- A. Key Switches: Key switches furnished standard with stainless steel single gang face plate with a 12/24VDC bi-color LED indicator. Integral backing bracket permits integration with any 1 1/4" or 1 1/2" mortise type cylinder. Key switches available as momentary or maintained action and in narrow face plate options.
 - 1. Manufacturers:
 - a. Alarm Controls (AK) - MCK Series.
 - b. Security Door Controls (SD) - 800 Series.
 - c. Securitron (SU) - MK Series.
- B. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.
 - 1. Manufacturers:
 - a. Sargent Manufacturing (SA) - 3280 Series.
 - b. Security Door Controls (SD) - DPS Series.
 - c. Securitron (SU) - DPS Series.
- C. Switching Power Supplies: Provide power supplies with either single or dual voltage configurations at 12 or 24VDC. Power supplies shall have battery backup function with an integrated battery charging circuit and shall provide capability for power distribution, direct lock control and Fire Alarm Interface (FAI) through add on modules. Power supplies shall be

expandable up to 16 individually protected outputs. Output modules shall provide individually protected, continuous outputs and/or individually protected, relay controlled outputs.

1. Manufacturers:

- a. Securitron (SU) - AQD Series.
- b. Altronix (AS) - Maximal 3.
- c. VonDuprn (VD) – PS Series

2.19 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.5 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.6 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.7 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
 - 1. Quantities listed are for each pair of doors, or for each single door.
 - 2. The supplier is responsible for handing and sizing all products.
 - 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
- B. Manufacturer's Abbreviations:
 - 1. MK - McKinney
 - 2. OT - Other
 - 3. PE - Pemko
 - 4. RO - Rockwood
 - 5. SA - SARGENT
 - 6. SU - Securitron
 - 7. RF - Rixson
 - 8. NO - Norton
 - 9. NG - National Guard Products

Hardware Sets

Set: 1.0

Doors: 001C

4 Hinge (heavy weight) ++	T4A3386-USA (NRP and Size as Required)	US32D	MK	087100
1 Magnetic Lock w/REX **	M680EBDX	630	SU	087100
1 Rim Exit Device (NL, CD) ++	16 43 8804 Less Pull	US32D	SA	087100
2 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
2 Cylinder ++	type as required	US32D	SA	087100
1 Offset Door Pull ++	TBF157	US32D	RO	087100
1 Automatic Opener ++	6211 / 6231 (As Required)	689	NO	087113
1 Sweep **	3452CNB x Length Required 273x3AFG		PE	087100
1 Threshold ++	MSES25SS x Length Required MKA		PE	087100
1 Keyswitch **	505		SU	087100
2 Auto Operator Actuator Switch **	AQD (Size and Options as required)		NO	087100
1 Power Supply **	Elevation and Point to Point as Specified		SU	087100
1 Wiring Diagram			OT	

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Coordinate all Wiring and conduit with electrical contractor.

Operation:

Day Time Operation:

- The exit device latch is normally dogged to allow push/pull operation. Key switch is in the "OFF" position, the magnetic lock is not engaged, allowing manual Push/Pull operation or assisted entry and egress with by pressing the auto operator actuator.
- Cylinder Dogging will hold the latch in the retracted position (Dogged) allowing PUSH/PULL operation.
- Key Switch in the Vestibule will turn the magnetic lock ON/OFF as required.
- Magnetic lock is Fail Safe and will be released to allow free entry or egress in the event of a fire emergency or power outage.

Night Time Operation:

- The exit device latch is normally dogged to allow push/pull operation. Key switch is in the "ON" position engaging the magnetic lock, securing the door and shunting the auto operator actuator switches.
- Cylinder Dogging will hold the latch in the retracted position (Dogged) allowing PUSH/PULL operation, door is secured with the magnetic lock.
- Door Position Switch integrated in the magnetic lock will monitor the doors OPEN/CLOSED status.
- Key Switch in the Vestibule will turn the magnetic lock ON/OFF as required.
- Magnetic lock is Fail Safe and will be released to allow free entry or egress in the event of a fire emergency or power outage.

Set: 2.0

Doors: [A222B](#), [A222C](#)

3 Hinge (heavy weight) ++	T4A3386-USA (NRP and Size as Required)	US32D	MK	087100
1 Magnetic Lock w/REX **	M680EBDX	630	SU	087100
1 Rim Exit Device (NL, CD) ++	16 43 8804 Less Pull	US32D	SA	087100
2 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
2 Cylinder ++	type as required	US32D	SA	087100
1 Offset Door Pull ++	TBF157	US32D	RO	087100
1 Surface Closer **	UNI9500 (HD PA SPG STP Arm)	689	NO	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
1 Gasketing ++	312CR (Head & Jambs)		PE	087100
1 Rain Guard **	346C x Width of Frame Head		PE	087100
1 Sweep **	3452CNB x Length Required		PE	087100
1 Threshold ++	273x3AFG MSES25SS x Length Required		PE	087100
1 ElectroLynx Harness (Frame) **	QC-C3000P		MK	087100
2 Key Pad **	Linear Keypad		OT	
1 Power Supply **	AQD (Size and Options as required)		SU	087100
1 Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Coordinate all Wiring and conduit with electrical contractor.

Operation:

- The exit device latch is normally dogged to allow push/pull operation. the magnetic lock is engaged, securing the door.
- Cylinder Dogging will hold the latch in the retracted position (Dogged) allowing PUSH/PULL operation when magnetic lock is not engaged.
- Entering the correct code into the key pad will release the magnetic lock and allow it to remain disengaged until the correct digital code is re-entered securing the door by re-engaging the magnetic lock.
- Door Position Switch integrated in the magnetic lock will monitor the doors OPEN/CLOSED status.
- Magnetic lock is Fail Safe and will be released to allow free entry or egress in the event of a fire emergency or power outage.

Set: 3.0

Notes: NOT USED

Set: 4.0

Doors: [A223](#)

3 Hinge (heavy weight) ++	T4A3386-USA (NRP and Size as Required)	US32D	MK	087100
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1 Classroom Lock ++	BAA 10XG37 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Surface Closer (Tri-Pack) **	9500 (RA or PA Arm as Required)	689	NO	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
1 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
1 Gasketing ++	312CR (Head & Jambs)		PE	087100
1 Rain Guard **	346C x Width of Frame Head		PE	087100
1 Sweep **	3452CNB x Length Required		PE	087100
1 Threshold ++	172A x Length Required x MSES25SS		PE	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Mount Lockset to allow Free egress from the Patio Area at all times.

Set: 5.0

Notes: NOT USED

Set: 6.0

Doors: B038

6 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
2 Magnetic Lock **	M680EBD	630	SU	087100

1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Cylinder ++	type as required	US32D	SA	087100
2 Push Plate ++	70C-RKW	US32D	RO	087100
2 Offset Door Pull ++	TBF157	US32D	RO	087100
2 Automatic Opener ++	6211 / 6231 (As Required)	689	NO	087113
2 Armor Plate ++	K1050 30" high CSK BEV	US32D	RO	087100
2 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
2 Silencer **	608		RO	087100
2 ElectroLynx Harness (Frame) **	QC-C3000P		MK	087100
1 Keyswitch **	MKA		SU	087100
1 Motion Sensor **	XMS		SU	087100
2 Auto Operator Actuator Switch **	505		NO	087100
1 Power Supply **	AQD (Size and Options as required)		SU	087100
1 Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Coordinate all Wiring and conduit with electrical contractor.

Operation:

Doors are Secured With Magnetic Locks:

- Wall Mounted Key Switch is "ON", magnetic locks are engaged. No access from the pull side of the door and auto operator actuator push button on the pull side is inactive.
- Egress from the PUSH Side by pressing the auto operator actuator switch to signal the power supply to momentarily release the magnetic locks and activate the auto operators to open the doors for assisted egress.
- Manual Egress from the PUSH side is always available by pushing the doors open. Request to Exit motion sensor on the push side will release the magnetic lock when motion is detected near the push side of the door.
- Door Position Switch integrated in the magnetic lock will monitor the doors OPEN/CLOSED status.
- The magnetic locks are fail safe and will be deactivated in the absence of power to allow free entry or egress.

Doors are Not Secured by Magnetic Locks:

- Wall Mounted Key Switch is "OFF", magnetic locks are Disengaged. Auto operator Actuators on Both PUSH and PULL sides are active.
- Entry or Egress from either Side by pressing the auto operator actuator switch to signal the auto operators to open the doors for assisted entry or egress.
- Manual Entry or Egress from either side is always available by pushing or pulling the doors open.

Set: 7.0

Doors: 018, 040, 043, A100, A200, A300, B100, B200, B300, B400, C001, C100, C200, C300

6 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
2 Fire Rated SVRod Exit Device (EO, LBR, w, Fire Pin)	12 43 NB8710 EO	630	SA	087100
2 Surface Closer **	9500 (RA or PA Arm as Required)	689	NO	087100
2 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
2 Electromagnetic Holder **	998 x Voltage as Required	689	RF	087100
2 Astragal Edge Guard (Rated) ++	552-AST UL (Door Height & Cut Outs as required)	US32D	NG	087100
1 Gasketing ++	S88D (Head & Jambs)		PE	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Operation:

Doors normally held open by electromagnetic holders and will be released to close upon activation of fire alarm.

Power to electromagnetic holders and relay to fire alarm by others.

At Opening 043: Wanderguard Magnetic Locks and System to be installed (by Wanderguard Contractor)

Operation:

Wanderguard Management System (By Wanderguard Contractor) to be installed. All Magnetic locks, power supply and controllers to be provided by Wanderguard supplier.

- When a patient comes within the preset range of the Wanderguard system the magnetic locks will engage preventing a person equipped with a Wanderguard Device from exiting through the door opening.
- Once the person wearing the Wanderguard Device moves away from the door opening, the magnetic locks dis-engage.

Set: 7.1

Doors: A222A

6 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
2 Magnetic Lock **	M680EBD	630	SU	087100
2 Fire Rated SVRod Exit Device (EO, LBR, w, Fire Pin)	12 43 NB8710 EO	630	SA	087100
2 Surface Closer **	9500 (RA or PA Arm as Required)	689	NO	087100
2 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
2 Electromagnetic Holder **	998 x Voltage as Required	689	RF	087100
2 Astragal Edge Guard (Rated) ++	552-AST UL (Door Height & Cut Outs as required)	US32D	NG	087100
1 Gasketing ++	S88D (Head & Jambs)		PE	087100
1 ElectroLynx Harness (Frame) **	QC-C3000P		MK	087100
1 Key Pad **	Linear Keypad		OT	

1 Motion Sensor **	XMS	SU	087100
1 Power Supply **	AQD (Size and Options as required)	SU	087100
1 Wiring Diagram	Elevation and Point to Point as Specified	OT	

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Coordinate all Wiring and conduit with electrical contractor.

Operation:

Doors can be held open by electromagnetic holders and will be released to close upon activation of fire alarm.

Power to electromagnetic holders and relay to fire alarm by others.

When doors are closed and secure:

- The doors are secured by Magnetic Lock.
- On the Secure Side of the opening a correct code entered into the keypad, will release the magnetic locks allowing authorized entry by pushing the exit device push bar in the direction of travel.
- Manual Egress from the unsecured side is always available by pressing the exit device push bar in the Direction of Travel. Request to Exit sensor will release the magnetic lock when motion is detected near the push side of the door on the unsecure side of the opening.
- Door Position Switches integrated in the magnetic lock will monitor the doors OPEN/CLOSED status.
- Magnetic locks are Fail Safe and will be released to allow free entry or egress in the event of a fire emergency or power outage.

Set: 8.0

Doors: 045

6 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
2 Push Bar & Offset Pull (Back-to-Back Mount) ++	TBF15747 T5	US32D	RO	087100
2 Surface Closer **	CLP9500T (HD PA STP Arm w/HO)	689	NO	087100
2 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
2 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 9.0

Doors: 046

6 Hinges by Door Manufacturer **	Hinges by Door/Frame Manufacturer		OT	
2 Push/Pull by Door Manufacturer **	Push/Pull by Door Manufacturer		OT	
2 Surface Closer **	CLP9500T (HD PA STP Arm w/HO)	689	NO	087100
2 Drop Plate ++	9588	689	NO	087100
2 Blade Stop Spacer ++	9500-1/2SP or 5/8SP (as Required)	689	NO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 10.0

Doors: 041

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Magnetic Lock **	M680EBD	630	SU	087100
1 Offset Pull ++	TBF157	US32D	RO	087100
1 Automatic Opener ++	6211 / 6231 (As Required)	689	NO	087113
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
3 Silencer **	608		RO	087100
1 ElectroLynx Harness (Frame) **	QC-C3000P		MK	087100
1 Key Pad **	Linear Keypad		OT	
1 Motion Sensor **	XMS		SU	087100
1 Auto Operator Actuator Switch **	505		NO	087100
1 Power Supply **	AQD (Size and Options as required)		SU	087100
1 Wiring Diagram	Elevation and Point to Point as Specified		OT	

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Coordinate all Wiring and conduit with electrical contractor.

Operation:

- The door is normally closed and secured with the magnetic lock.
- Entering the correct code into the key pad will release the magnetic lock and activate the auto operator actuator on the secure side of

the opening to allow manual or assisted entry.

- Assisted entry after entering the correct code into the keypad pressing the auto operator actuator switch to signal the auto operators to open the door for assisted entry.
- Assisted Egress from the unsecure side by pressing the auto operator actuator switch to signal the power supply to momentarily release the magnetic lock and activate the auto operator to open the doors for assisted egress.
- Manual Egress from the unsecured side is always available by pushing the doors open. Request to Exit motion sensor on the push side will release the magnetic lock when motion is detected near the push side of the door.
- Door Position Switch integrated in the magnetic lock will monitor the doors OPEN/CLOSED status.
- The magnetic lock is fail safe and will be deactivated in the absence of power to allow free entry or egress.

Set: 11.0

Doors: 024

6 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Dust Proof Strike **	570	US26D	RO	087100
2 Flush Bolt **	555 / 557 (As Required)	US26D	RO	087100
1 Storeroom/Closet Lock ++	BAA 10XG04 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
2 Conc Overhead Stop ++	6-X36 (Size as Required)	630	RF	087100
2 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 12.0

Doors: C321

6 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Dust Proof Strike **	570	US26D	RO	087100
2 Flush Bolt **	555 / 557 (As Required)	US26D	RO	087100

1 Storeroom/Closet Lock ++	BAA 70 10XG04 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
2 Surface Closer ++	CLP9500 (HD PA STP Arm)	689	NO	087100
2 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 12.1

Doors: 042

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Storeroom/Closet Lock ++	BAA 10XG04 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Surface Closer **	CLP9500 (HD PA STP Arm)	689	NO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 13.0

Doors: A013, B008, C013

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Storeroom/Closet Lock ++	BAA 10XG04 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Surface Closer (Tri-Pack) **	9500 (RA or PA Arm as Required)	689	NO	087100
1 Armor Plate ++	K1050 30" high CSK BEV	US32D	RO	087100
1 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
1 Gasketing ++	S88D (Head & Jambs)		PE	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 13.1

Doors: 048, 053

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Storeroom/Closet Lock ++	BAA 10XG04 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Surface Closer (Tri-Pack) **	9500 (RA or PA Arm as Required)	689	NO	087100
1 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 14.0

Doors: 003, 006, 007, 014, 021, 022, 023, 033, 034

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Classroom Lock ++	BAA 10XG37 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Where Existing Frame is to Remain, Review existing hardware preps and match door preps as required.

Set: 14.1

Doors: 008

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Classroom Lock ++	BAA 10XG37 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
1 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Where Existing Frame is to Remain, Review existing hardware preps and match door preps as required.

Set: 15.0

Doors: 004A, 004B, 004C

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Classroom Lock ++	BAA 10XG37 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 16.0

Doors: 011, 012, 016

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Classroom Lock ++	BAA 10XG37 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Surface Closer (Tri-Pack) ++	9500M (RA or PA Arm as Required)	689	NO	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
1 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Where Existing Frame is to Remain, Review existing hardware preps and match door preps as required.

Set: 16.1

Doors: 035

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
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1 Classroom Lock ++	BAA 10XG37 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Surface Closer (Tri-Pack) ++	9500M (RA or PA Arm as Required)	689	NO	087100
1 Armor Plate ++	K1050 30" high CSK BEV	US32D	RO	087100
1 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Where Existing Frame is to Remain, Review existing hardware preps and match door preps as required.

Set: 17.0

Doors: 005

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Classroom Lock ++	BAA 10XG37 LL	US26D	SA	087100
1 LFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Surface Closer (Tri-Pack) ++	9500M (RA or PA Arm as Required)	689	NO	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
1 Electromagnetic Holder **	998 x Voltage as Required	689	RF	087100
1 Gasketing ++	S88D (Head & Jambs)		PE	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Operation:

Doors normally held open by electromagnetic holders and will be released to close upon activation of fire alarm.

Power to electromagnetic holders and relay to fire alarm by others.

Set: 18.0

Doors: A208, C214, C314

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Passage Latch ++	BAA 10XU15 LL	US26D	SA	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100

1 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 19.0

Doors: [A103](#), [A107](#), [A108](#), [A109](#), [A112](#), [A113](#), [A116](#), [A119](#), [A120A](#), [A120B](#), [A201](#), [A205](#), [A207](#), [A209](#), [A212](#), [A213](#), [A218](#), [A220](#), [A224A](#), [A224B](#), [A301](#), [A305](#), [A306](#), [A307](#), [A310](#), [A311](#), [A314](#), [A317](#), [B101](#), [B105](#), [B107](#), [B109](#), [B113](#), [B116](#), [B119](#), [B120A](#), [B120B](#), [B201](#), [B205](#), [B207](#), [B209](#), [B213](#), [B216](#), [B219](#), [B220A](#), [B220B](#), [B301](#), [B305](#), [B306](#), [B307](#), [B311](#), [B314](#), [B317](#), [C102](#), [C105](#), [C108](#), [C109](#), [C112](#), [C113](#), [C114](#), [C118](#), [C201A](#), [C201B](#), [C202](#), [C205](#), [C208](#), [C212](#), [C213](#), [C215](#), [C219](#), [C301A](#), [C301B](#), [C302](#), [C305](#), [C307](#), [C309](#), [C312](#), [C313](#), [C315](#), [C319](#)

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Passage Latch ++	BAA 10XU15 LL	US26D	SA	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
1 Door Stop **	403 (or) 441CU (As Required)	US26D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 20.0

Doors: [A206](#), [A219](#), [A221](#), [B106](#), [B108](#), [B206](#), [B208](#), [C216](#), [C316](#)

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Passage Latch ++	BAA 10XU15 LL	US26D	SA	087100
1 Conc Overhead Stop ++	6-X36 (Size as Required)	630	RF	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 21.0

Doors: [A115](#), [A215](#), [A313](#), [A318](#), [B112](#), [B115](#), [B212](#), [B215](#), [B310](#), [B313](#), [B318](#), [C101](#), [C106](#), [C206](#), [/AAOS/AAOS/CutSheetViewer.jsp?IDS=167999699,168612583,"](#) [C209](#), [C306](#)

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
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1 Passage Latch ++	BAA 10XU15 LL	US26D	SA	087100
1 Conc Overhead Stop ++	6-X36 (Size as Required)	630	RF	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 22.0

Doors: 038

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Classroom Lock ++	BAA 70 10XG37 LL	US26D	SA	087100
1 SFIC Core **	Keyed per Owner's Direction	US15	SA	087100
1 Surface Closer (Tri-Pack) ++	9500M (RA or PA Arm as Required)	689	NO	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
1 Electromagnetic Holder **	998 x Voltage as Required	689	RF	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Operation:

Doors normally held open by electromagnetic holders and will be released to close upon activation of fire alarm.

Power to electromagnetic holders and relay to fire alarm by others.

Set: 22.1

Doors: 044

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Passage Latch ++	BAA 10XU15 LL	US26D	SA	087100
1 Surface Closer (Tri-Pack) ++	9500M (RA or PA Arm as Required)	689	NO	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
1 Electromagnetic Holder **	998 x Voltage as Required	689	RF	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Operation:

Doors normally held open by electromagnetic holders and will be released to close upon activation of fire alarm.

Power to electromagnetic holders and relay to fire alarm by others.

Set: 23.0

Doors: 039

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Classroom Lock ++	BAA 10XG37 LL	US26D	SA	087100
1 Conc Overhead Stop ++	6-X36 (Size as Required)	630	RF	087100
1 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 24.0

Doors: 050A

6 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
2 Push Bar & Offset Pull (Back-to-Back Mount) ++	TBF15747 T5	US32D	RO	087100
2 Surf Overhead Hold Open **	10-X26 (Size as Required)	630	RF	087100
2 Surface Closer (Tri-Pack) **	9500 (RA or PA Arm as Required)	689	NO	087100
2 Kick Plate ++	K1050 10" high BEV CSK	US32D	RO	087100
2 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 25.0

Doors: 047A, 047B

3 Hinge, Full Mortised, Hvy Wt ++	T4A3786-USA (NRP and Size as Required)	US26D	MK	087100
1 Storeroom/Closet Lock ++	BAA 10XG04 LL	US26D	SA	087100
1 Surface Closer (Tri-Pack) **	9500 (RA or PA Arm as Required)	689	NO	087100
1 Armor Plate ++	K1050 30" high CSK BEV	US32D	RO	087100
1 Electromagnetic Holder **	998 x Voltage as Required	689	RF	087100
3 Silencer **	608		RO	087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Operation:

Doors normally held open by electromagnetic holders and will be released to close upon activation of fire alarm.

Power to electromagnetic holders and relay to fire alarm by others.

Set: 26.0

Doors: 050B

2 Track System

W60 x Length Required

PE 087100

4 Door Pull ++

BF T110 Mtg-Type 5

US32D RO 087100

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Set: 27.0

Notes: NOT USED

Set: 28.0

Doors: 001A, 001B

1 Cylinder ++
1

type as required

US32D SA 087100

All Hardware Provided By Door Supplier

Notes:

++ Product Meets BABA Qualifications

** Product may require a BABA waiver

Door is Push/Push. No Locking function.

END OF SECTION 087100

SECTION 08 8000 - GLAZING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Insulating glass units.
- B. Glazing units.
- C. Glazing compounds and accessories.

1.2. RELATED REQUIREMENTS

- A. Section 06 4100 - Architectural Wood Casework: Cabinets with requirements for glass shelves.
- B. Section 07 2500 - Weather Barriers.
- C. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.
- D. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.
- E. Section 08 4229 - Automatic Entrances: Glazing furnished as part of door assembly. Provide insulated glazing as specified within this section.
- F. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.
- G. Section 08 5413 - Fiberglass Windows: Glazing furnished by window manufacturer.
- H. Section 10 2800 - Toilet, Bath, and Laundry Accessories: Mirrors.

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; 2015.
- 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 2015).
- E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- F. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- G. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

- J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.
- K. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.
- L. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.
- M. GANA (GM) - GANA Glazing Manual; 2008.
- N. GANA (SM) - GANA Sealant Manual; 2008.
- O. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.
- P. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- Q. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).
- R. ITS (DIR) - Directory of Listed Products; current edition.
- S. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2018.
- T. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.
- U. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).
- V. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.
- 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.
- Z. UL 263 - Standard for Fire Tests of Building Construction and Materials; 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 33 00 - Submittal Procedures, for submittal procedures.
- B. Product Data on Insulating Glass Unit and Fire Resistant rated glass 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. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.6. QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
 - 1) Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.7. 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.

1.8. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Insulated Glass Fabricators:
 - 1) Oldcastle Building Envelope™
 - 2) Pilkington North America
 - 3) Vetrotech Saint-Gobain
 - 4) Viracon, Inc
 - 5) Vitro Architectural Glass (formally PPG Glass).
- 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.

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.

D. Etched "frosted Glass Manufacturers:

- 1) AGC Glass North America, Inc; Matelux: www.agcglass.com/#sle.
- 2) GGI - General Glass International; Satin Etched: www.generalglass.com/#sle.
- 3) Walker Glass Company Ltd; Walker Textures - Acid-Etched Glass: www.walkerglass.com/#sle.

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.
 - a. Refer to Section 07 2500.
- 2) To utilize the inner pane of multiple pane insulating glass units for the continuity of the vapor retarder and air barrier seal.
- 3) To maintain a continuous vapor retarder and air barrier throughout the glazed assembly from glass pane to heel bead of glazing sealant.

- 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 noted otherwise.

- 1) Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and FT.
- 2) Kind FT - Fully Tempered Type: Complies with ASTM C1048.
- 3) Fully Tempered Safety Glass: Complies with ANSI Z97.1 and 16 CFR 1201 criteria.
- 4) Tinted Type: ASTM C1036, Class 2 - Tinted, Quality-Q3, color and performance characteristics as indicated.

2.4. INSULATING GLASS UNITS

- A. Insulating Glass Units: Types as indicated.

- 1) Durability: Certified by an independent testing agency to comply with ASTM E2190.
- 2) Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
- 3) 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.

- B. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.

- 1) Applications: Exterior glazing unless otherwise indicated.

- 2) Basis-of-Design Product: (Sungate 400 Low-E Glass) Solargray + Sungate 400 (3) clear as manufactured by Vitro Architectural Glass formally PPG or a comparable product by one of the manufactures specified in paragraph 2.1 above.
- 3) Space between lites filled with air.
- 4) Outboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
 - a. Tint: Clear.
 - b. Coating: Low-E (passive type), on #3 surface.
- 5) Inboard Lite: Heat-strengthened float glass, 1/4 inch thick, minimum.
 - a. Tint: Gray.
 - b. Coating: solar gray tint, on #2 surface.
- 6) Total Thickness: 1 inch.
- 7) Thermal Transmittance (U-Value), Summer - Center of Glass: 0.28, nominal.
- 8) Visible Light Transmittance (VLT): 42 percent, nominal.
- 9) Shading Coefficient: 0.30, nominal.
- 10) Solar Heat Gain Coefficient (SHGC): 0.39, nominal.
- 11) Visible Light Reflectance, Outside: 12 percent, nominal.
- 12) Glazing Method: Dry glazing method, gasket glazing.

C. Type IG-2 - Insulating Glass Units: Tempered Safety glazing.

- 1) Applications:
 - a. Glazed lites in exterior doors.
 - b. Glazed sidelights and panels next to doors.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
- 2) Space between lites filled with air.
- 3) Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.
- 4) Total Thickness: 1 inch.
- 5) Thermal Transmittance (U-Value), Summer - Center of Glass: 0.28, nominal.
- 6) Visible Light Transmittance (VLT): 42 percent, nominal.

- 7) Shading Coefficient: 0.30, nominal.
- 8) Solar Heat Gain Coefficient (SHGC): 0.39, nominal.
- 9) Visible Light Reflectance, Outside: 12 percent, nominal.
- 10) Glazing Method: Dry glazing method, gasket glazing.

2.5. GLAZING UNITS

A. Type G-2 - 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.
- 5) Glazing Method: Dry glazing method, gasket glazing.

B. Type G-3 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flame, smoke, and blocks radiant heat, as required to achieve indicated fire-rating period exceeding 90 minutes or less.

- 1) Applications:
 - a. Glazing in fire-rated door assembly.
 - b. Glazing in fire-rated window assembly.
 - c. Glazing in sidelites, borrowed lites, and other glazed openings in fire-rated wall assemblies.
 - d. Other locations as indicated on drawings.
- 2) Glass Type: Multi-laminate annealed glass with intumescent fire retardant interlayers.
- 3) Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
- 4) Safety Glazing Certification: 16 CFR 1201 Category II.
- 5) Glazing Method: As required for fire rating.
- 6) Fire-Rating Period: As indicated on drawings. 60 minute and 90 minute
- 7) 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. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.

- b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
 - c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
 - d. "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.
 - e. "XXX" - placeholder that represents fire-rating period, in minutes.
- 8) Manufacturers:
- a. GGI - General Glass International; Pyrobel: 60 and 90 min. www.generalglass.com/#sle.
 - b. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL 60 and SuperLite II-XLM 90: www.safti.com/#sle.
 - c. Technical Glass Products; Pilkington Pyrostop 60 and 90: www.fireglass.com/#sle.
 - d. Vetrotech North America; Contraflam60 and 90: www.vetrotechusa.com/#sle.

C. Type G-5 - Monolithic Safety Glazing: Non-fire-rated.

- 1) Applications:
- a. Glazed lites in doors, except fire doors.
 - b. Glazed sidelights to doors, except in fire-rated walls and partitions.
 - c. Other locations required by applicable federal, state, and local codes and regulations.
 - d. Other locations indicated on drawings.
- 2) Glass Type: Fully tempered safety glass as specified.
- 3) Tint: Clear.
- 4) Thickness: 1/4 inch, nominal.

D. Type FG-1 - Etched Glass: Etched patterns on glass as full-coverage or discrete designs.

- 1) Applications: As indicated on drawings.
- 2) Glass Type: Monolithic; tempered safety glass; low-iron glass.
- 3) Thickness: 1/4 inch, nominal.
- 4) Sheet Size: As indicated on drawings
- 5) Finish: F1 - Patterned one side; ASTM C1036.

- 6) Clear Glass: As indicated on drawings
- 7) Glazing Method: Dry glazing method, gasket glazing.
- 8) Manufacturers:
 - a. AGC Glass North America, Inc; Matelux: www.agcglass.com/#sle.
 - b. GGI - General Glass International; Satin Etched Glass: www.generalglass.com/#sle.
 - c. Walker Glass Company Ltd; Walker Textures - Acid-Etched Glass : www.walkerglass.com/#sle.

E. Type G-15 - Glass Shelves:

- 1) Applications: Locations as indicated on drawings.
- 2) Tint: Clear.
- 3) Glass Type: Fully tempered float glass with ground edges and corners; ASTM C1048.
- 4) Thickness: 1/4 inch, nominal.

2.6. FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- 1) Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
 - 2) Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
 - 3) Grind smooth and polish exposed glass edges and corners.

2.7. GLAZING COMPOUNDS

- A. Type GC-2 - Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

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 Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
 - 1) Width: As required for application.
 - 2) Thickness: As required for application.
 - 3) Spacer Rod Diameter: As required for application.
 - 4) Manufacturers:
 - a. Pecora Corporation; <>: www.pecora.com/#sle.
 - b. Tremco Global Sealants; <>: www.tremcosealants.com/#sle.
 - c. 3M: www.3M.com
- D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- E. Glazing Clips: Manufacturer's standard type.

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 the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2. 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 in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
 - 1) Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2) Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Retain both paragraphs below if glazing with wedge-shaped gaskets is required for Project.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.
- M. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- N. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- O. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

- P. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.
- Q. 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. INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.
- B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.
- F. Carefully trim protruding tape with knife.

3.6. INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)

- A. Application - Interior Glazed: Set glazing infills from the interior of the building.
- B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
- E. Place glazing tape on free perimeter of glazing in same manner described above.
- F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- G. Carefully trim protruding tape with knife.

3.7. 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.

3.8. PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 9100 - LOUVERS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Louvers, frames, and accessories.

1.2. RELATED REQUIREMENTS

- A. Section 07 2500 - Weather Barriers: Sealing frames to water-resistive barrier installed on adjacent construction.
- B. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- C. Section 23 3100 - HVAC Ducts and Casings: Ductwork attachment to louvers.

1.3. REFERENCE STANDARDS

- A. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.
- B. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data describing design characteristics, maximum recommended air velocity, design free area, materials and finishes.
- C. Shop Drawings: Indicate louver layout plan and elevations, opening and clearance dimensions, and tolerances; head, jamb and sill details; blade configuration, screens, blank-off areas required, and frames.
- D. Samples: Submit two samples 2 by 2 inches in size illustrating finish and color of exterior and interior surfaces.
- E. Test Reports: Independent agency reports showing compliance with specified performance criteria.

1.5. QUALITY ASSURANCE

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

1.6. WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

- B. Provide five year manufacturer's warranty against distortion, metal degradation, and connection failures of louver components.

- 1) Finish: Include ten year coverage against degradation of exterior finish.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Louvers:

- 1) Airolite Company, LLC; Fixed and Drainable K6744: www.airolite.com/#sle.
- 2) Construction Specialties, Inc; Drainable Louver: www.c-sgroup.com/#sle.
- 3) Industrial Louvers, Inc; 4-inch deep fixed and Drainable : www.industriallouvers.com/#sle.
- 4) Pottorff; EFD 435: www.pottorff.com/#sle.
- 5) Ruskin Company; Fixed Drainable Model EFD-437: www.ruskin.com/#sle.

2.2. LOUVERS

- A. Louvers: Factory fabricated and assembled, complete with frame, mullions, and accessories; AMCA Certified in accordance with AMCA 511.

- 1) Wind Load Resistance: Design to resist positive and negative wind load of 25 psf without damage or permanent deformation.
- 2) Drainable Blades: Continuous rain stop at front or rear of blade aligned with vertical gutter recessed into both jambs of frame.
- 3) Screens: Provide insect screens at intake louvers and bird screens at exhaust louvers.

- B. Stationary Louvers: Horizontal blade, extruded aluminum construction.

- 1) Free Area: 50 percent, minimum.
- 2) Blades: Drainable.
- 3) Frame: 4 inches deep, channel profile; corner joints mitered and , with continuous recessed caulking channel each side.
- 4) Aluminum Thickness: Frame 12 gauge, 0.0808 inch minimum; blades 12 gauge, 0.0808 inch minimum.
- 5) Aluminum Finish: Pigmented organic coatings; finish welded units after fabrication. See finish requirements below.

2.3. MATERIALS

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper.

2.4. FINISHES

- A. Superior Performing Organic Coatings System: Manufacturer's standard multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent polyvinylidene fluoride (PVDF) resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch.
- B. Color: Custom, to match approved sample. Blue to match fiber cement siding.

2.5. ACCESSORIES

- A. Blank-Off Panels: Aluminum face and back sheets, polyisocyanurate foam core, 1-1/2 inch thick, painted black on exterior side; provide where duct connected to louver is smaller than louver frame, sealing off louver area outside duct.
- B. Screens: Frame of same material as louver, with reinforced corners; removable, screw attached; installed on inside face of louver frame.
- C. Bird Screen: Interwoven wire mesh of steel, 14 gauge, 0.0641 inch diameter wire, 1/2 inch open weave, diagonal design.
- D. Fasteners and Anchors: Stainless steel.
- E. Flashings: Of same material as louver frame, formed to required shape, single length in one piece per location.
- F. Sealant for Setting Sills and Sill Flashing: Non-curing butyl type.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that prepared openings and flashings are ready to receive this work and opening dimensions are as indicated on shop drawings.

3.2. INSTALLATION

- A. Install louver assembly in accordance with manufacturer's instructions.
- B. Install louvers level and plumb.
- C. Set sill members and sill flashing in continuous bead of sealant.
- D. Install flashings and align louver assembly to ensure moisture shed from flashings and diversion of moisture to exterior.
- E. Secure louver frames in openings with concealed fasteners.
- F. Coordinate with installation of mechanical ductwork.

3.3. CLEANING

- A. Strip protective finish coverings.

B. Clean surfaces and components.

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.
 - 2) Carpet tile.
 - 3) Fluid applied flooring.
- B. Removal of existing floor coverings.
- C. Preparation of new and existing concrete floor slabs for installation of floor coverings.
- D. Testing of concrete floor slabs for moisture and alkalinity (pH).
- E. 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..
- F. Patching compound.
- G. Remedial floor coatings.
- H. Remedial floor sheet membrane.

1.2. RELATED REQUIREMENTS

- A. Section 01 7400 - Cleaning: Handling of existing floor coverings removed.
- B. 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.
- C. Section 03 3000 - Cast-in-Place Concrete: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.
- D. Section 03 3000 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

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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); 2016a.
- 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; 2017.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.
- F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Visual Observation Report: For existing floor coverings to be removed.
- C. 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.
- D. Testing Agency's Report:
 - 1) Description of areas tested; include floor plans and photographs if helpful.
 - 2) Summary of conditions encountered.
 - 3) Moisture and alkalinity (pH) test reports.
 - 4) Copies of specified test methods.
 - 5) Recommendations for remediation of unsatisfactory surfaces.
 - 6) Product data for recommended remedial coating.
 - 7) Submit report to Architect.
 - 8) Submit report not more than two business days after conclusion of testing.

- E. Adhesive Bond and Compatibility Test Report.
- F. Copy of RFCI (RWP).
- G. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.
 - 1) Manufacturer's statement of compatibility with types of flooring applied over remedial product.
 - 2) Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.
 - 3) Manufacturer's installation instructions.

1.6. QUALITY ASSURANCE

- A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Owner.
- 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 and Facility Representative when specified ambient conditions have been achieved and when testing will start.
- D. Remedial Coating Installer Qualifications: Company specializing in performing work of the type specified in this section, trained by or employed by coating manufacturer, and able to provide at least 3 project references showing at least 3 years' experience installing moisture emission coatings.

1.7. 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.

1.8. 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) Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
 - 3) Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
 - 4) 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. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch: www.usg.com/#sle.
 - d. 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.

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PART 3 EXECUTION

3.1. CONCRETE SLAB PREPARATION

A. Follow recommendations of testing agency.

B. Perform following operations in the order indicated:

- 1) Existing concrete slabs (on-grade and elevated) with existing floor coverings:
 - a. Visual observation of existing floor covering, for adhesion, water damage, alkaline deposits, and other defects.
 - b. Removal of existing floor covering.
- 2) Existing concrete slabs with coatings or penetrating sealers/hardeners/dustproofers:
 - a. Do not attempt to remove coating or penetrating material.
 - b. Do not abrade surface.
- 3) Preliminary cleaning.
- 4) Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
- 5) Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
- 6) Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
- 7) Specified remediation, if required.
- 8) Patching, smoothing, and leveling, as required.
- 9) Other preparation specified.
- 10) Adhesive bond and compatibility test.
- 11) Protection.

C. 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. REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.3. 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.

3.4. 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.

3.5. 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.

3.6. 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.

3.7. 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.

3.8. ADHESIVE BOND AND COMPATIBILITY TESTING

- A. Comply with requirements and recommendations of floor covering manufacturer.

3.9. APPLICATION OF REMEDIAL FLOOR COATING

- A. Comply with requirements and recommendations of remedial coating manufacturer.
- B. Comply with requirements and recommendations of floor covering manu

3.10. PROTECTION

- A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

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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. Cementitious backing board.
- F. Gypsum wallboard.
- G. Joint treatment and accessories.

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 07 2500 - Weather Barriers: Water-resistive barrier over sheathing.

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. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
- C. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
- D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- E. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- F. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014, with Editorial Revision (2015).
- G. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
- H. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2017.

- I. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2017a.
- J. 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.
- K. 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; 2016.
- L. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- M. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2017a.
- N. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- Q. ASTM E413 - Classification for Rating Sound Insulation; 2016.
- R. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.
- S. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
- C. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- D. 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 5 years of experience.

PART 2 PRODUCTS

2.1. GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
 - 1) See PART 3 for finishing requirements.

- B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:
- 1) Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.
- C. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
- 1) Fire Rated Partitions: UL listed assembly No. U407; 1 hour rating.
 - 2) Head of Fire Rated Partitions: UL listed assembly No. HW-D-0079, HW-D-0083; 1 hour rating.
 - 3) Fire Rated Structural Column Framing: UL listed assembly No. X528; 1 hour rating.
 - 4) Fire Rated Structural Column Framing: UL listed assembly No. X528; 2 hour rating.
 - 5) Fire Rated Structural Beam Framing: UL listed assembly No. L524; 1 hour rating.
 - 6) Fire Rated Structural Beam Framing: UL listed assembly No. N501; 2 hour rating.
 - 7) Fire Rated Area Separation Walls: UL listed assembly No. U336; 2 hour rating.
 - 8) UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).
 - 9) Refer to drawings for additional fire rated assemblies

2.2. METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
- 1) Clarkwestern Dietrich Building Systems LLC; <>: www.clarkdietrich.com.
 - 2) Marino; <>: www.marinoware.com.
 - 3) Phillips Manufacturing Co; <>: www.phillipsmfg.com/#sle.
 - 4) Steel Construction Systems; <>: www.steelconsystems.com/#sle.
- 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/120 at 10 psf.
- 1) Studs: "C" shaped with flat or formed webs with knurled faces.
 - 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 both legs; both legs expanded metal mesh.

a. Products:

- 1) Same manufacturer as other framing materials.

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 indicated on drawings.

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.

b. Products:

- 1) FireTrak Corporation; Posi Klip.
- 2) Metal-Lite, Inc; The System.
- 3) Clarkwestern Dietrich Building Systems LLC;Blazframe firestop deflection track.
- 4) Substitutions: See Section 01 6000 - Product Requirements.
- 5) Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 12 feet.

2.3. BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

- 1) American Gypsum Company; <>: www.americangypsum.com.
- 2) CertainTeed Corporation; <>: www.certainteed.com.
- 3) Georgia-Pacific Gypsum; <>: www.gpgypsum.com.
- 4) National Gypsum Company; <>: www.nationalgypsum.com/#sle.
- 5) USG Corporation; <>: www.usg.com.

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.
 - 3) Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
 - c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
- C. Backing Board For Wet Areas: One of the following products:
- 1) Application: Surfaces behind tile in wet areas including tub and shower surrounds.
 - 2) Application: Horizontal surfaces behind tile in wet areas including countertops and _____.
 - 3) Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 4) ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 1/2 inch.
 - b. Products:
 - 1) Custom Building Products: www.custombuildingproducts.com/#sle.
 - 2) National Gypsum Company; PermaBase Cement Board: www.nationalgypsum.com/#sle.
 - 3) USG Corporation: www.usg.com/#sle.
- D. Backing Board For Non-Wet Areas: Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.
- 1) Application: Vertical surfaces behind thinset tile, except in wet areas.
 - 2) Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 3) At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
 - 4) Type: Regular and Type X, in locations indicated.
 - 5) Type X Thickness: 5/8 inch.
 - 6) Regular Board Thickness: 1/2 inch.
 - 7) Edges: Tapered.

8) Products:

- a. American Gypsum Company; M-Bloc.
- b. American Gypsum Company; M-Bloc Type X.
- c. Georgia-Pacific Gypsum; ToughRock Mold-Guard Gypsum Board.
- d. Georgia-Pacific Gypsum; DensArmor Plus.
- e. National Gypsum Company; Gold Bond XP Gypsum Board.

2.4. ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch.
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

1) Products:

- a. Franklin International, Inc; Titebond GREENchoice Professional Acoustical Smoke and Sound Sealant: www.titebond.com/#sle.
- b. Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant: www.liquidnails.com/#sle.
- c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: www.stifirestop.com/#sle.

- C. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.

1) Types: As detailed or required for finished appearance.

2) Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.

3) Products:

- a. Same manufacturer as framing materials.
- b. Phillips Manufacturing Co: www.phillipsmfg.com/#sle.
- c. Trim-tex, Inc: www.trim-tex.com/#sle.

- D. Joint Materials: ASTM C475/C475M 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) Ready-mixed vinyl-based joint compound.

- E. 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.
- F. 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.
- G. 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.
 - 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.

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) Place one bead continuously on substrate before installation of perimeter framing members.
 - 2) Place continuous bead at perimeter of each layer of gypsum board.

- 3) 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 C840, 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. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

3.5. INSTALLATION OF TRIM AND ACCESSORIES

- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - 1) Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.6. JOINT TREATMENT

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1) Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
 - 2) Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - 3) Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
 - 4) Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1) Feather coats of joint compound so that camber is maximum 1/32 inch.

E. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

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 2613 - GYPSUM VENEER PLASTERING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Gypsum veneer plaster (decorative) on gypsum veneer base, existing plaster, and other substrates.
- B. Gypsum veneer base and accessories.

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Partition framing for plaster.
- B. Section 07 8400 - Firestopping: Top-of-wall assemblies and through-wall penetrations at fire rated walls.
- C. Section 09 2116 - Gypsum Board Assemblies: Metal stud framing and furring for plaster.

1.3. REFERENCE STANDARDS

- A. ASTM C587 - Standard Specification for Gypsum Veneer Plaster; 2004 (Reapproved 2014).
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
- C. ASTM C843 - Standard Specification for Application of Gypsum Veneer Plaster; 2017.
- D. ASTM C844 - Standard Specification for Application of Gypsum Base to Receive Gypsum Veneer Plaster; 2015.
- E. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- G. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.
- H. GA-600 - Fire Resistance Design Manual; 2015.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Samples: Submit two sample panels, 6" by 6" inch in size illustrating veneer finish and texture.
- C. Product Data for materials for plaster and plaster base.

1.5. QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.

1.6. QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type required by this section, with minimum 5 years of documented experience.

1.7. MOCK-UP

- A. Construct decorative veneer plaster wall mock-up, 6 feet long by 6 feet wide; include corner condition in mock-up.
- B. Locate where directed.
- C. Mock-up may remain as part of the Work.

1.8. FIELD CONDITIONS

- A. Do not apply veneer plaster when substrate or ambient air temperature is less than 50 degrees F nor more than 80 degrees F; for 24 hours prior to, during operations and after, until building heating system can maintain the above minimum temperature.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Gypsum Veneer Plaster:

- 1) Georgia-Pacific Gypsum LLC: www.buildgp.com/gypsum/#sle.
- 2) Gold Bond Building Products, LLC provided by National Gypsum Company; Kal-Kote Texture finish plaster: www.goldbondbuilding.com/#sle.
- 3) USG; Apex: www.usg.com/#sle.
- 4) Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Veneer Plaster Base:

- 1) CertainTeed Corporation; 5/8" Veneer Plaster Base: www.certainteed.com/#sle.
- 2) Georgia-Pacific Gypsum LLC; Tough Rock: www.buildgp.com/gypsum/#sle.
- 3) Gold Bond Building Products, LLC provided by National Gypsum Company : www.goldbondbuilding.com/#sle.
- 4) USG: www.usg.com/#sle.

2.2. GYPSUM VENEER PLASTER ASSEMBLIES

- A. Decorative Texture as indicated on Interiors. Design intent for Medium Lace Stucco finish.
- B. Interior Partitions Indicated as Sound-Rated: 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.

2.3. MATERIALS

- A. Gypsum Veneer Plaster: ASTM C587, mixed in accordance with manufacturer's instructions.
- B. Maximum Variation From Specified Thickness: Plus or minus 1/64 inch.
- C. Standard Gypsum Veneer Base: ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1) Thickness: 5/8 inch.
 - 2) Edges: Square.
- D. Gypsum Veneer Base Trim Accessories: Zinc-coated steel or plastic, comply with ASTM C1047.
- E. Gypsum Board Accessories: Comply with ASTM C1047, GA-216, and GA-600.
- F. Joint Reinforcing for Gypsum Veneer Base: Comply with ASTM C587.
- G. Fasteners: Comply with ASTM C844.
- H. Bond Coat: ASTM C631, vinyl polymer type, bonding compound.
- I. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; thickness 3 inch..
- J. Silica Sand: Complying with ASTM C 35 Specification for Inorganic Aggregates for Use in gypsum plaster
- K. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that substrates are ready to receive work.
- B. Verify gypsum board substrate is flat, joints are taped and sanded, and surface is ready to receive work of this Section. Verify joint and surface perimeter accessories are in place.
- C. Verify gypsum plaster base is flat, smooth and surface is ready to receive work. Verify joint and surface perimeter accessories are in place.

3.2. PREPARATION

- A. Clean surfaces of dust or loose matter.
- B. Remove projections greater than 1/8 inch and fill depressions greater than 1/4 inch with Portland cement mortar.

- C. Apply color tinted bond coat to prepare masonry surfaces within 24 hours of veneer plaster application. Apply in accordance with manufacturer's instructions.

3.3. INSTALLATION - GYPSUM PLASTER BASE

- A. Install gypsum base in accordance with ASTM C844.
- B. Use drywall screws to fasten gypsum base to framing substrate.
- C. Single Layer Base:
 - 1) Install fire rated gypsum board vertical, with ends and edges occurring over firm bearing.
- D. Install accessories.
- E. Tape, fill, and sand filled joints, edges, corners, openings, and trim to produce surface ready to receive veneer finish.
- F. Feather coats onto adjoining surfaces so that joint camber is maximum 1/32 inch.
- G. Install acoustical sealant at gypsum board perimeter at:
 - 1) Metal Framing: One bead.
 - 2) Perimeter interruptions.
 - 3) Seal penetrations of plaster by conduit, pipe, ducts, and rough-in boxes using acoustic sealant, except where firestopping is provided.

3.4. INSTALLATION - VENEER PLASTER

- A. Install gypsum veneer plaster in accordance with ASTM C843 and manufacturer's instructions.
- B. At All Locations: Apply single coat to a thickness of 3/16 inch.
- C. Finish surface to textured (stucco look) light sand finish.

3.5. PROTECTION

- A. Do not permit traffic near unprotected finished surfaces.

END OF SECTION

SECTION 09 3000 - TILING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Tile for wall applications.
- B. Cementitious backer board as tile substrate.
- C. Ceramic trim.
- D. Non-ceramic trim.

1.2. RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- B. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

1.3. REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).; 2017.
- B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- C. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- D. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
- E. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
- F. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).
- G. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2010 (Reaffirmed 2016).
- H. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
- I. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014.
- J. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2012.
- K. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.

- L. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2017.
- M. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2017.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, and setting details.
- D. Samples: Full size units of each type and composition of tile and for each color and finish required. For mosaic tile, provide full sheet of each type specified.
- 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: 10 square feet of each size, color, and surface finish combination.

1.5. QUALITY ASSURANCE

- A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.7. 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:

- 1) Dal-Tile Corporation: www.daltile.com/#sle.
- 2) Florida Tile: www.floridatile.com.
- 3) Atlas Concorde: www.atlasconcorde.com/en/.
- 4) Marazzi USA: <https://www.marazziusa.com>.
- 5) Landmark Ceramics: <https://www.landmarkceramics.com>.
- 6) Substitutions: See Section 01 6000 - Product Requirements.

B. Metal Mosaic Tile, Type T-6: Basis of Design: Dal Tile, Metallica.

- 1) Shape: Rectangle.
- 2) Surface Finish: Brushed Stainless SS50.
- 3) Color(s): As indicated on drawings.
- 4) Pattern: 1 x 1 x 1 x 2 Small Basketweave Mosaic.
- 5) Mounted Sheet Size: 12 by 12 inches.

C. Glazed Wall Tile, Type T-1: Basis of Design: Dal Tile, Artcrafted

- 1) Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
- 2) Shape: Square.
- 3) Edges: Uneven, cushioned.
- 4) Surface Finish: Glazed.
- 5) Color(s): As indicated on drawings.

D. Glazed Wall Tile, Type T-5, T-10: Basis of Design: Dal Tile, Color Wheel Classics

- 1) Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
- 2) Size: As indicated on drawings.
- 3) Edges: Cushioned.
- 4) Surface Finish: Semi-gloss.
- 5) Color(s): As indicated on drawings.

E. Glazed Porcelain Tile, Type T-7, T-8, T-9: Basis of Design: Landmark Ceramics, Brickworld

- 1) Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
- 2) Size: 3 by 12 inches.
- 3) Edges: Square.

- 4) Surface Finish: Matte glaze.
- 5) Color(s): As indicated on drawings.
- 6) Pattern: Brick.

F. Glazed Porcelain Tile, Type T-2: Basis of Design: Landmark Ceramics, Pro Ledgestone

- 1) Moisture Absorption: less than 20 percent as tested in accordance with ASTM C373.
- 2) Size: 6 by 24 inches.
- 3) Edges: Square.
- 4) Surface Finish: Matte glaze.
- 5) Color(s): As indicated on drawings.
- 6) Pattern: Pro Ledgestone with Smart Corners.

G. Glazed Porcelain Tile, Type T-3: Basis of Design: Dal Tile, Portfolio

- 1) Moisture Absorption: less than 20 percent as tested in accordance with ASTM C373.
- 2) Size: 24 by 24 inch.
- 3) Edges: Square.
- 4) Surface Finish: Matte glaze.
- 5) Color(s): As indicated on drawings.

H. Glazed Porcelain Tile, Type T-4: Basis of Design: Florida Tile, Local

- 1) Moisture Absorption: less than 20 percent as tested in accordance with ASTM C373.
- 2) Size: 8 by 36 inch.
- 3) Edges: Square.
- 4) Surface Finish: Matte glaze.
- 5) Color(s): As indicated on drawings.

I. Glazed Porcelain Tile, Type T-11: Basis of Design: Marazzi Tile, Preservation

- 1) Moisture Absorption: 0.5 to 3.0 percent as tested in accordance with ASTM C373.
- 2) Size: 6 by 36 inch, nominal.
- 3) Thickness: 3/8 inch, nominal.
- 4) Edges: Square.
- 5) Surface Finish: Matte glazed.

- 6) Color(s): As indicated on drawings.

2.2. TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.

- 1) Applications:

- a. Open edges of wall tile.
- b. Wall corners, outside.

- 2) Manufacturers:

- a. Basis of Design: Schluter-Systems: www.schluter.com/#sle.; Scheine.

- 1) Location: Wall tile exposed edge cap, to terminate tile finish.

- b. Basis of Design: Schluter-Systems: www.schluter.com/#sle.; Eck-E.

- 1) Location: Outside corner at tile installations in Mainstreet Corridor 010.

- c. Other acceptable manufacturers:

- 1) Blanke Corporation: <http://www.blankecorp.com/blanke-usa/>.

- 2) Ceramic Tool Company: <http://www.ceramictool.com/index.html>.

2.3. SETTING MATERIALS

- A. Manufacturers:

- 1) Custom Building Products; <>: www.custombuildingproducts.com/#sle.

- 2) LATICRETE International, Inc; <>: www.laticrete.com/#sle.

- 3) TEC, an H.B. Fuller Construction Products Brand; <>: www.tecspecialty.com/#sle.

- 4) Mapei; www.mapei.com/US-EN/.

- 5) Substitutions: See Section 01 6000 - Product Requirements.

- B. Improved Latex-Portland Cement Mortar Bond Coat: ANSI A118.15.

- 1) Applications: Use this type of bond coat where indicated.

- 2) Products:

- a. Custom Building Products; Complete Contact-LFT Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.

- b. LATICRETE International, Inc; LATICRETE 254 Platinum: www.laticrete.com/#sle.

- c. TEC, an H.B. Fuller Construction Products Brand; TEC 3N1 Performance Mortar: www.tecspecialty.com/#sle.
- d. Mapei; Ultralite Mortar Pro: www.mapei.com/US-EN/.

2.4. GROUTS

A. Manufacturers:

- 1) Custom Building Products; <>: www.custombuildingproducts.com.
- 2) LATICRETE International, Inc: www.laticrete.com/#sle.
- 3) TEC, an H.B. Fuller Construction Products Brand; <>: www.tecspecialty.com/#sle.
- 4) Mapei; www.mapei.com/US-EN/.

B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.

- 1) Applications: Use this type of grout where indicated and where no other type of grout is indicated.
- 2) Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for glass, glossy or metal tiles, or joints less than 1/8 inch wide.
- 3) Color(s): As selected by Architect from manufacturer's full line.
- 4) Products:
 - a. Custom Building Products; Fusion Pro Single Component Grout: www.custombuildingproducts.com/#sle.
 - b. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout: www.laticrete.com/#sle.
 - c. TEC, an H.B. Fuller Construction Products Brand; TEC AccuColor Plus Grout: www.tecspecialty.com/#sle.
 - d. Mapei; Flexcolor CQ, www.mapei.com/US-EN/.

2.5. Maintenance Materials

A. Grout Release: Temporary, water-soluble pre-grout coating.

- 1) Products:
 - a. Custom Building Products; Aqua Mix Grout Release: www.custombuildingproducts.com/#sle.
 - b. Mapei, UltraCare Grout Release: <http://www.mapei.com/US-EN/>.
 - c. LATICRETE International, Inc; Stonetech Grout Release: <https://laticrete.com/en>.

2.6. ACCESSORY MATERIALS

- A. Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
- 1) Thickness: 20 mils, maximum.
 - 2) Crack Resistance: No failure at 1/16 inch gap, minimum.
 - 3) Products:
 - a. LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane : www.laticrete.com/#sle.
 - b. Merkrete, by Parex USA, Inc; Merkrete Fracture Guard: www.merkrete.com/#sle.
 - c. Proflex Products, Inc; Maxxim Sim-40: www.proflex.us/#sle.
- B. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 5/8 inch thick; 2 inch wide coated glass fiber tape for joints and corners.
- 1) Products:
 - a. Custom Building Products; WonderBoard Lite Backerboard: www.custombuildingproducts.com/#sle.
 - b. USG Corporation; DUROCK Cement Board.
 - c. FinPan, Inc.; ProTEC Concrete Backer Board.
 - d. Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that 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 surfaces are dust-free and free of substances that could impair bonding of setting materials to surfaces.

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.

- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

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 neatly. Align wall 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 square.
- F. Install non-ceramic trim in accordance with manufacturer's instructions.
- G. Install thresholds where indicated.
- H. Sound tile after setting. Replace hollow sounding units.
- I. Keep control and expansion joints free of mortar, grout, and adhesive.
- J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- L. 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 - WALL TILE

- A. Over cementitious backer units on studs, install in accordance with TCNA (HB) Method W244 using membrane at beverage stations or any areas with a plumbing fixture.
- B. 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.

3.5. CLEANING

- A. Clean tile and grout surfaces.

3.6. 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. Suspended metal grid ceiling system (clean room gasketed)
- C. Acoustical units.

1.2. RELATED REQUIREMENTS

- A. Section 21 1300 - Fire-Suppression Sprinkler Systems: Sprinkler heads in ceiling system.
- B. Section 23 3700 - Air Outlets and Inlets: Air diffusion devices in ceiling.
- C. Section 26 5100 - Interior Lighting: Light fixtures in ceiling system.

1.3. 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 C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.
- C. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.
- D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- F. 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; 2017.
- G. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.
- H. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.
- I. UL (FRD) - Fire Resistance Directory; Current Edition.
- J. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.4. 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.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data on suspension system components.
- C. Samples: Submit two samples 6 inch in size illustrating material and finish of acoustical units.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- 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 Acoustical Units: Quantity equal to 5 percent of total installed.

1.6. QUALITY ASSURANCE

- A. Fire-Resistive Assemblies: Complete assembly listed and classified by {rs\#1} for the fire resistance indicated.
- B. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.7. 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/#sle.
 - 2) CertainTeed Corporation: www.certainteed.com/#sle.
 - 3) USG: www.usg.com/#sle.
- B. Suspension Systems:

- 1) Armstrong World Industries, Inc: www.armstrong.com/#sle.
- 2) CertainTeed Corporation: www.certainteed.com/#sle.
- 3) USG: www.usg.com/#sle.

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 D, E, or F and complying with the following:

- 1) Local authorities having jurisdiction.

2.3. ACOUSTICAL UNITS

- A. Acoustical Units - General: ASTM E1264, Class A.

- 1) Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly as part of suspension system.
- 2) VOC Content: Certified as Low Emission by one of the following:
 - a. Product listing in UL (GGG).

- B. Acoustical Tile Type ACT-1: Painted mineral fiber, ASTM E1264 Type III, with the following characteristics:

- 1) Size: 24 by 24 inches.
- 2) Thickness: 3/4 inches.
- 3) Composition: Water felted.
- 4) Light Reflectance: not less than 0.80 percent, determined in accordance with ASTM E1264.
- 5) NRC Range: 0.70 to 0.75, determined in accordance with ASTM E1264.
- 6) Articulation Class (AC): 190, determined in accordance with ASTM E1111.
- 7) Ceiling Attenuation Class (CAC): not less than 33, determined in accordance with ASTM E1264.
- 8) Edge: Beveled tegular.
- 9) Surface Color: White.
- 10) Surface Pattern: Fine textured visual.
- 11) Antimicrobial Treatment: Shield Manufacturer's standard anti mold / mildew.
- 12) Suspension System: Exposed grid Type SS-1.

- a. ACT-1 Products:
 - b. Basis-of-Design Product: Subject to compliance with requirements, provide Eclipse Clima Plus (Item No. 76775), SLT Lay-in as manufactured by USG Interiors, www.usg.com
- 13) Other Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong World Industries, Inc; www.armstrong.com
 - b. CertainTeed Corporation; www.certainteed.com
 - c. USG: www.usg.com/#sle.
- C. Acoustical Panels Type ACT-2: Painted mineral fiber, gasketed clean room with the following characteristics:
 - 1) Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - a. Type and Form: Type IV - Mineral-base panels with membrane faced overlay; Form 2, Water Felted; with washable, scrubbable finish, resistant to heat, moisture, soil and corrosive fumes.
 - b. Pattern: GH – Smooth, Clean Room Mylar
 - 2) Size: 24 by 24 inches.
 - 3) Thickness: 3/4 inches.
 - 4) Composition: Wet-formed mineral fiber.
 - 5) Surface Finish: Soil resistant polyester film.
 - 6) Light Reflectance: not less than 0.80 percent, determined in accordance with ASTM E1264.
 - 7) NRC: Not less than 0.50.
 - 8) Ceiling Attenuation Class (CAC): not less than 33, determined in accordance with ASTM E1264.
 - 9) Edge: Square.
 - 10) Surface Color: White.
 - 11) Surface Pattern: Non-directional fissured.
 - 12) Suspension System: Exposed grid gasketed.
 - 13) Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Clean Room FL #1715 or comparable product by one of the following:

- a. CertainTeed Corp.
- b. USG Interiors, Inc.; Subsidiary of USG Corporation.

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. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635 Heavy Duty.
 - 1) Components: Main beams and cross tees In accordance with the International Building Code, Section 1621 for Category D, E and F as described in ESR-1308.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. In accordance with the International Building Code, Section 1621 for Category D, E, and F.
- E. Wall Moldings: In accordance with the International Building Code, Section 1621 for Category D, E. and F or method as described in ESR-1308.
 - 1) Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
 - 2) Nominal 15/16 inch x 15/16 inch hemmed, pre-finished angle molding
- F. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1) Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2) Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- diameter wire.
- G. Seismic Accessories:
 - 1) Seismic Perimeter Clip - 2 inch Beam End Retaining Clip, 0.034 inch thick, hot-dipped galvanized cold-rolled steel per ASTM A568 - used to join main beam or cross tee to wall molding. The clip is compatible with 15/16 inch and 9/16 inch grid systems.
 - 2) SST Seismic Separation Tee - Seismic Joint Clip, 5 inches x 1-1/2 inch, hot-dipped galvanized cold-rolled steel per ASTM A568. The two piece unit is designed to accommodate a seismic separation joint. The clip is compatible with 15/16 inch and 9/16 inch grid systems.

- 3) Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
 - 4) Seismic Spacer Bar - Seismic, hot-dipped galvanized cold-rolled steel per ASTM A568. Manufacturer's standard spacer bar designed to accommodate seismic forces. The spacer bar is compatible with 15/16 inch and 15/16 inch grid systems.
- H. Exposed Steel Suspension System Type SS-1: Formed steel, commercial quality cold rolled; heavy-duty.
- 1) Profile: Tee; 15/16 inch wide face.
 - 2) Construction: Double web.
 - 3) Finish: White painted.
 - 4) SS-1 Products:
 - a. Basis-of-Design Product: Subject to compliance with requirements, provide USG Donn Brand DX/DXL Heavy Duty Acoustical Suspension System as manufactured by USG Interiors, www.usg.com
 - b. Other Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Armstrong World Industries, Inc; www.armstrong.com
 - 2) CertainTeed Corporation; www.certainteed.com
 - 3) USG: www.usg.com/#sle.
- I. (Metal Suspension System Gasketed) Exposed Steel Suspension System Type SS-2: Formed steel, commercial quality cold rolled; heavy-duty.
- 1) Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc.; Clean Room Steel (gasketed) or comparable product by one of the following:
 - a. CertainTeed Corp.
 - b. Chicago Metallic Corporation.
 - c. USG Interiors, Inc.; Subsidiary of USG Corporation.
 - 2) Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 15/16-inch- wide metal caps on flanges.
 - 3) Structural Classification: Heavy-duty system.
 - 4) End Condition of Cross Runners: Override (stepped) or butt-edge type.
 - 5) Face Design: Flat, flush.

- 6) Cap Material: Steel or aluminum cold-rolled sheet.
- 7) Cap Finish: Painted to match color of acoustical unit.
 - a. Coordinate colors of cap finish with color requirements of ACT-2 clean room tile.

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. Hanger Wire: 12-gage 0.08 inch galvanized steel wire.
- C. Hold-Down Clips: Manufacturer's standard clips to suit application.
- D. Seismic Clips: Manufacturer's standard clips for seismic conditions and to suit application.
- E. 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.
- 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. Comply with seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook." IBC Category D installation requirements.
- C. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- D. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- E. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- F. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.

- G. 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.
- H. Seismic Suspension System, Seismic Design Categories D, E, F: Hang suspension system with grid ends attached to the perimeter molding on two adjacent walls; on opposite walls, maintain a 3/4 inch clearance between grid ends and wall.
- I. 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.
- J. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- K. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- L. Do not eccentrically load system or induce rotation of runners.
- M. 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.
- N. Form expansion joints as detailed. Form to accommodate plus or minus 1 inch movement. Maintain visual closure.

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) Cut to fit irregular grid and perimeter edge trim.
 - 2) Make field cut edges of same profile as factory edges.
 - 3) Double cut and field paint exposed reveal edges.
- H. Where round obstructions occur, provide preformed closures to match perimeter molding.
- I. Install hold-down clips on panels within 20 ft of an exterior door.

J. Install safety clips on wood veneer panels 2 inches from outside edge of panel and at 24 inches on center.

1) Use wire ties to attach safety clips.

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 5423 - LINEAR METAL CEILINGS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Linear metal ceilings.
- B. Suspended metal support system and perimeter trim.

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 A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- F. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.
- G. 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; 2017.

1.3. DESIGN REQUIREMENTS

- A. Design components to ensure light fixtures will not induce eccentric loads. Where components may induce rotation of ceiling system components, provide stabilizing reinforcement.
- B. Seismic Performance: Ceiling systems designed to withstand the effects of earthquake motions determined according to ASCE 7 for Seismic Design Category D, E, or F and complying with the following:
 - 1) 2015 IBC and Local authorities having jurisdiction.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work of this section with installation of mechanical and electrical components and with other construction activities affected by work of this section.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Furnish for component profiles.

C. Shop Drawings: Indicate reflected ceiling plan.

1) Seismic Design: Include seal and signature of design professional on each drawing.

D. Samples: Submit two samples 6 by 6 inch in size illustrating color and finish of components exposed to view.

1.6. QUALITY ASSURANCE

A. Designer Qualifications for Seismic Design: Perform under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7. DELIVERY, STORAGE, AND HANDLING

A. See Section 01 7400 - Cleaning for packaging waste requirements.

B. Protect factory-finished products from damage to appearance by storing products in manufacturer's unopened factory packaging in dry storage area.

1.8. WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide 5-year manufacturer warranty; include coverage for corrosion resistance and discoloration of surface finish.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Linear Metal Ceilings:

1) Armstrong World Industries, Inc; Metal Works: Linear Classics
www.armstrongceilings.com/#sle.

2) Certainteed Architectural; Metal - Deep Box Series: www.certainteed.com/ceilings-and-walls/#sle.

3) Basis of Design; USG Corporation; USG Ceilings Plus Planx Universal Deep Box Panels: www.usg.com/ceilings/#sle.

4) Substitutions: See Section 01 6000 - Product Requirements.

2.2. LINEAR METAL CEILINGS

A. Linear Metal Ceiling System: Panels, suspension members, trim, and accessories as required to provide a complete system.

B. Performance Requirements:

- 1) Design to support imposed loads of indicated items without eccentric loading of supports.
- 2) Design for maximum deflection of 1/360 of span.
- 3) Design to resist seismic load by using practices specified in ASTM E580.

2.3. COMPONENTS

A. Linear Metal Baffles (LMB-1): Suspended horizontally and perpendicular from suspension members.

- 1) Profile: Deep Box shaped.
- 2) Deep Box Size: 3.0 in. wide and 4 in tall. in standard lengths of 12'-0".
- 3) Spacing: 3 inch reveal between baffles.
- 4) Material: Aluminum extrusions, ASTM B221 (ASTM B221M).
- 5) Material: Aluminum sheet, ASTM B209/B209M.
- 6) USG Basis of Design Finish: Timbre or Sarante; Wood grain look color from manufacturer's standard range.

2.4. SUSPENSION SYSTEM(S)

A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Heavy Duty Grid with Universal Carrier Assembly Suspension System as manufactured by USG Interiors, www.usg.com

- 1) Other Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Armstrong World Industries, Inc; www.armstrong.com
 - b. CertainTeed Corporation; www.certainteed.com

B. 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.

C. Semi-Exposed Steel Suspension System Type 15/16": Formed steel, commercial quality cold rolled; heavy-duty with special clip to accept linear metal panels.

D. Profile: Tee; 15/16 inch wide face.

E. Construction: Double web.

F. Finish: Black painted.

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. Perimeter Moldings: Same material and finish as baffles.

- C. Touch-up Paint: Type and color to match baffles and grid units.
- D. Edge Molding and Splices: Same material, thickness, and finish as linear baffles.
- E. End Caps: Formed metal; same color and finish as sight-exposed surfaces of linear panels.
- F. Accessories: Stabilizer bars as required for suspended grid system; sight-exposed surfaces same color and finish as sight-exposed surfaces of linear panels.
- G. Suspension Members: Formed steel sections, with integral attachment points; galvanized finish; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- H. Seismic Accessories
 - 1) Seismic Perimeter Clip - 2 inch Beam End Retaining Clip, 0.034 inch thick, hot-dipped galvanized cold-rolled steel per ASTM A568 - used to join main beam or cross tee to wall molding. The clip is compatible with 15/16 inch and 9/16 inch grid systems.
 - 2) SST Seismic Separation Tee - Seismic Joint Clip, 5 inches x 1-1/2 inch, hot-dipped galvanized cold-rolled steel per ASTM A568. The two piece unit is designed to accommodate a seismic separation joint. The clip is compatible with 15/16 inch and 9/16 inch grid systems.
 - 3) Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
 - 4) Seismic Spacer Bar - Seismic, hot-dipped galvanized cold-rolled steel per ASTM A568. Manufacturer's standard spacer bar designed to accommodate seismic forces. The spacer bar is compatible with 15/16 inch and 15/16 inch grid systems.
- I. Suspension Wire: Size and type as required for application, seismic requirements, and ceiling system flatness requirement specified.
- J. Subgirt Members: Hot-dip galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating; formed to resist imposed loads and to provide attachment for linear ceiling and accessories.
- K. Touch-up Paint For Concealed Items: Zinc rich type.

2.6. FABRICATION

- A. Shop cut linear panels to accommodate mechanical and electrical items.
- B. Factory-form internal and external corners of same material, thickness, finish, and profile to match exposed linear panels ; back brace internal corners.

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.
- C. Verify that required utilities are available, in proper location, and ready for use.

- D. Verify that field measurements are as indicated.

3.2. INSTALLATION

A. Suspension Components:

- 1) Install after above-ceiling work is complete in accordance with manufacturer's instructions, ASTM C636/C636M, and ASTM E580/E580M.
- 2) Hang carrying members independent of walls, columns, ducts, light fixtures, pipe, and conduit; where carrying members are spliced, avoid visible displacement of face panels with adjacent panels.
- 3) Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest adjacent hangers to span the required distance.
- 4) Locate suspension system for linear panel layout on room axis according to reflected plan.

B. Linear Metal Ceiling:

- 1) Install linear panels and other system components in accordance with manufacturer's instructions.
- 2) Align end joints.
- 3) Butt interior end joints tight.
- 4) Provide expansion and control joints to accommodate plus or minus 1/2 inch movement and maintain visual closure.
- 5) Install filler strips between linear panels at interior locations.
- 6) Install edge moldings at junctions with other finishes and at vertical surfaces; use maximum piece lengths.
- 7) Install end caps at sight-exposed ends of linear panels.
- 8) Exercise care when site cutting sight-exposed finished components to ensure surface finish is not defaced.

3.3. TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.
- C. Maximum Variation From Dimensioned Position: 1/4 inch.

3.4. CLEANING

- A. See Section 01 7400 - Cleaning for additional requirements.
- B. Clean surfaces.

- C. Replace damaged or abraded components.

END OF SECTION

SECTION 09 6500 - RESILIENT FLOORING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

1.2. RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.
- B. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.
- C. Section 09 6813 - Tile Carpeting.

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; 2017.
- C. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2017.
- D. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004, with Editorial Revision (2014).
- E. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing; 2004 (Reapproved 2014).
- F. ASTM F1344 - Standard Specification for Rubber Floor Tile; 2015.
- G. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile; 2013a.
- H. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.
- I. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2015.
- J. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.

- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Shop Drawings: Indicate seaming plans and floor patterns.
- D. Verification Samples: Submit two samples, 8 by 10 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: 5 percent or not less than one full carton of each type and color.
 - 3) Extra Wall Base: 5 percent or not less than 1 full carton of each type and color.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.6. 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. TILE FLOORING

A. Vinyl Tile (LVT-1, LVT-2, LVT-4): Printed film type, with transparent or translucent wear layer.

- 1) Acceptable Products:
 - a. Mannington Commercial: www.manningtoncommercial.com.
 - b. Tarkett Company: www.tarkett.com/#sle.
 - c. Shaw Contract: www.shawcontract.com.
- 2) Basis of Design: Tarkett; www.commercial.tarkett.com. Contour Series.
 - a. Substitutions: Not permitted.
- 3) Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
- 4) Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
- 5) Tile Size:
 - a. LVT-1: 6 by 36 inch.
 - b. LVT-2: 18 by 18 inch.
 - c. LVT-4: To be determined.
- 6) Wear Layer Thickness: No less than .028 inch.
- 7) Total Thickness: .0120 inch.
- 8) Patterns: As indicated on drawings..
- 9) Colors: As indicated on drawings.

B. Vinyl Tile (LVT-3): Printed film type, with transparent or translucent wear layer.

- 1) Acceptable Products:
 - a. Mannington Commercial; www.manningtoncommercial.com.
 - b. Tarkett Company; www.commercial.tarkett.com.
 - c. Shaw Contract; www.shawcontract.com.; Abide.
- 2) Basis of Design: Shaw Contract; www.shawcontract.com: Abide 4107V.
- 3) Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.

- 4) Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
- 5) Plank Tile Size: 7 by 47 inch.
- 6) Wear Layer Thickness: .020 inch.
- 7) Total Thickness: 0.098 inch.
- 8) Color: As indicated on drawings.

C. Rubber Tile - Type RUB-1: Homogeneous, color and pattern throughout thickness.

- 1) Manufacturers:
 - a. Burke Flooring: www.burkeflooring.com/#sle.
 - b. Flexco, Inc: www.flexcofloors.com/#sle.
 - c. Tarkett Company: www.commercial.tarkett.com.
- 2) Minimum Requirements: Comply with ASTM F1344, 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) Size: 24 by 24 inch nominal.
- 5) Total Thickness: .25 inch.
- 6) Texture: Hammered.
- 7) Pattern: Basis of Design: Tarkett, Inertia Square Edge Tile #NRH.
- 8) Color: As indicated on drawings.

2.2. RESILIENT BASE

A. Resilient Base (RB-1): ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove.

- 1) Manufacturers:
 - a. Burke Flooring: www.burkeflooring.com/#sle.
 - b. Basis of Design: Tarkett Company; Baseworks Rubber Cove Base: www.commercial.tarkett.com.
 - c. Roppe Corp; <>: www.roppe.com.
 - d. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.

- 2) Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
- 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.

B. Molded Wall Base (MB-1, MB-3): ASTM F 1861, Type TP rubber, thermoplastic.

- 1) Manufacturers:
 - a. Basis of Design: Tarkett; Millwork Wall Base, www.commerical.tarkett.com.; Profile: Reveal.
 - b. Roppe Corp.; www.roppe.com.
 - c. Burke Flooring: www.burkeflooring.com/#sle.
 - d. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.
- 2) Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
- 3) Height: 6 inch.
- 4) Length: 8 feet.
- 5) Thickness: 3/8 inch.
- 6) Color: As indicated on drawings.
- 7) Corners: Mitered, field cut.

C. Molded Wall Base (MB-2): ASTM F 1861, Type TP rubber, thermoplastic.

- 1) Manufacturers:
 - a. Basis of Design: Tarkett; Millwork Wall Base, www.commercial.tarkett.com.; Profile: Mandalay.
 - b. Roppe Corp.; www.roppe.com.
 - c. Burke Flooring: www.burkeflooring.com/#sle.

- d. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.
- 2) Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E648.
- 3) Height: 4.5 inch.
- 4) Length: 8 feet.
- 5) Thickness: 3/8 inch.
- 6) Color: As indicated on drawings.
- 7) Corners: Mitered, field cut.

2.3. ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- C. Moldings, Transition and Edge Strips: Same material as flooring.
 - 1) Manufacturers:
 - a. Burke Flooring: www.burkeflooring.com/#sle.
 - b. Basis of Design Tarkett; www.commercial.tarkett.com.
 - c. Roppe Corp; [\diamond]: www.roppe.com.
 - d. Substitutions: See Section 007213 General Conditions, Section 002113 Instruction to Bidders article 4.0-D and Section 006325 product substitution form.
 - 2) Colors: As selected by Architect from manufacturer's full range of colors.

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 Section 09 0561.

- 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. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).
- B. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.
- C. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- D. 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.
- E. Prohibit traffic until filler is fully cured.
- F. 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. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- D. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

- 1) Resilient Strips: Attach to substrate using adhesive.

- E. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- F. Install flooring in recessed floor access covers, maintaining floor pattern.
- G. At movable partitions, install flooring under partitions without interrupting floor pattern.
- H. Spread only enough adhesive to permit installation of materials before initial set.
- I. Fit joints and butt seams tightly.
- J. Set flooring in place, press with heavy roller to attain full adhesion.
- K. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- L. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

- 1) Resilient Strips: Attach to substrate using adhesive.

- M. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.4. 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 tiles and planks in pattern as indicated on drawings.
- D. Install square tile to monolithic grid, random pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

3.5. Installation - Resilient Base

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Miter internal corners of cove wall base. At external corners, use premolded units. At exposed ends, use premolded units.
- C. Miter internal and external corners of molded wall base.
- D. Install base on solid backing. Bond tightly to wall and floor surfaces.
- E. Scribe and fit to door frames and other interruptions.

3.6. CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.7. PROTECTION

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

3.8. SCHEDULE

END OF SECTION

SECTION 09 6700 - FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Fluid-applied flooring and base.

1.2. RELATED REQUIREMENTS

- A. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.3. REFERENCE STANDARDS

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available; and textures.
- C. Samples: Submit two samples, 6" by 6" inch in size illustrating color and pattern for each floor material for each color specified.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.
- E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section.
 - 1) Minimum 5 years of documented experience.
 - 2) Approved by manufacturer.
- C. Supervisor Qualifications: Trained by product manufacturer , under direct full time supervision of manufacturer's own foreman.

1.6. MOCK-UPS

- A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
 - 1) Number of Mock-Ups to be Prepared: Two.
 - 2) Use same materials and methods for use in the work.

- 3) Include integral wall base condition as part of mock-up.
- 4) Use approved design samples as basis for mock-ups.
- 5) Locate where directed.
- 6) Minimum Size: 48 inches by 48 inches.

B. Obtain approval of mock-up by Architect before proceeding with work.

C. Approved mock-up may remain as part of the work.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.8. FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.1. Fluid-Applied Flooring SYSTEMS

A. Fluid-Applied Flooring Type RES-1 and RES-2: Epoxy base coat(s), with broadcast aggregate.

- 1) Aggregate: Quartz granules.
 - a. Grain Size 40 Mesh.
 - b. Grain Shape: Spherical
 - c. Typical Application Broadcast.
 - d. Premix color granules to produce system color as selected.
- 2) Top Coat: Clear Urethane. Water-based, breathable, aliphatic urethane.
 - a. Provide two coats at minimum 4 Wet mils (microns)
- 3) System Thickness: 1/8 inch, nominal, dry film thickness (DFT).
- 4) Texture: Slip resistant.
- 5) Sheen: Gloss.
- 6) System Color: As selected by Architect. Field verify existing color with new to match.

- a. Existing facility color to match is TNEMEC Q212 Light Brown

7) Products:

- a. Key Resin Company; Key Mortar SLT System: www.keyresin.com/#sle.
- b. Sherwin-Williams High-Performance Flooring; Resufloor 3569: www.sherwin-williams.com/resin-flooring/#sle.
- c. Stonhard; Stonshield SLT: www.stonhard.com/#sle.
- d. TNEMEC; 1/8" Deco-Tread Quartz System: www.tnemec.com/#sle.

2.2. ACCESSORIES

- A. Base Caps: Extruded anodized aluminum with projecting base of 1/8 inch; color as selected.
- B. Cant Strips: Molded of flooring resin material.
- C. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.
- D. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
- 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 flooring.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.
- D. Verify that wood subfloors have 12 percent maximum moisture content.
- E. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
 - 1) Test in accordance with Section 09 0561.
 - 2) Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.
- F. Verify that required floor-mounted utilities are in correct location.

3.2. PREPARATION

- A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

- B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.
- C. Vacuum clean substrate.
- D. Apply primer to surfaces required by flooring manufacturer.

3.3. INSTALLATION - Accessories

- A. Install access panel recess frames.
- B. Install cant strips at base of walls where flooring is to be extended up wall as base.
- C. Install terminating cap strip at top of base; attach securely to wall substrate.

3.4. INSTALLATION - FLOORING

- A. Apply in accordance with manufacturer's instructions.
- B. Apply each coat to minimum thickness required by manufacturer.
- C. Finish to smooth level surface.
- D. Cove at vertical surfaces.

3.5. PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.
- B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 09 6813 - TILE CARPETING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Carpet tile<>.
- B. Removal of existing carpet tile.

1.2. RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.
- B. Section 09 0561 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.
- C. Section 09 6500 - Resilient Flooring.

1.3. REFERENCE STANDARDS

- A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016.
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.
- C. CRI 104 - Standard for Installation of Commercial Carpet; 2015.
- D. 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 3300 - Submittals 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.
- D. Samples: Submit one carpet tiles illustrating color and pattern design for each carpet color selected.
- E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- 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 of each color and pattern installed.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience.

1.6. 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: Tarkett, Assertive Stria.
 - 2) Other Acceptable Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Patcraft; www.patcraft.com.
 - b. Mannington Commercial; www.manningtoncommercial.com

2.2. MATERIALS

- A. Tile Carpeting (CPT-1); Types specified on interior drawings flooring finish schedule: Tufted, Manufactured in one color dye lot.
 - 1) Product: Basis of Design, Assertive Stria manufactured by Mannington Commercial.
 - 2) Tile Size: 18 by 36 inch, nominal.
 - 3) Color: As indicated on drawings.
 - 4) Yarn System: 100% solution dyed, Econyl Type 6 Nylon.
 - 5) Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
 - 6) Gage: 5/64 inch.
 - 7) Stitches: 9 per inch.
 - 8) Pile Weight: 28 oz/sq yd.

- 9) Secondary Backing Material: ethos Modular with Omnicoat Technology.
- 10) Installation Method: Vertical Ashlar.

2.3. ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by flooring material manufacturer.
- B. Edge Strips: Rubber, color as selected by Architect.
- C. Adhesives:
 - 1) Compatible with materials being adhered; maximum VOC content of 50 g/L; CRI (GLP) certified; in lieu of labeled product, independent test report showing compliance is acceptable.
- D. 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 Section 09 0561.
 - 2) Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. (18.6 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - 3) "Anhydrous Calcium Chloride Test" Subparagraph below is based on CRI's "CRI Carpet Installation Standard" and on floor-covering industry practices for adhered floor coverings to avoid adhesive failures.
 - a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

- 4) 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. Remove existing carpet and resilient flooring.
- B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- C. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
- D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- E. Vacuum clean substrate.

3.3. INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- C. Installation Method: As recommended in writing by carpet tile manufacturer:
- D. Install carpet tile in accordance with manufacturer's instructions.
- E. Blend carpet from different cartons to ensure minimal variation in color match.
- F. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- G. Lay carpet tile in square pattern, with pile direction parallel to next unit, set parallel to building lines.
- H. Locate change of color or pattern between rooms under door centerline.
- I. Trim carpet tile neatly at walls and around interruptions.
- J. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- K. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- L. Complete installation of edge strips, concealing exposed edges.
- M. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

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) Exposed surfaces of steel lintels and ledge angles.
 - 2) Mechanical and Electrical:
 - a. On the roof and outdoors, paint equipment exposed to weather or to view, not 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) Non-metallic roofing and flashing.
 - 6) Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, zinc, and lead.
 - 7) Marble, granite, slate, and other natural stones.
 - 8) Floors, unless specifically indicated.
 - 9) Glass.
 - 10) Concealed pipes, ducts, and conduits.

1.2. RELATED REQUIREMENTS

- A. Section 05 5000 - Metal Fabrications: Shop-primed items.
- B. 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; 2016.
- C. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating; 2005 (Reapproved 2017).
- D. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.
- E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- F. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; 2016.
- G. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; 2015.
- H. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- I. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).
- J. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004).
- K. SSPC-SP 6 - Commercial Blast Cleaning; 2007.
- L. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003).

1.5. SUBMITTALS

- A. See Section 013300 Submittal Procedures, 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.
 - 4) Manufacturer's installation instructions.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
 - 1) Where sheen is specified, submit samples in only that sheen.
 - 2) Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens 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 paint product manufacturer's temperature ranges.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- 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. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:

- 1) Basis of Design Manufacturer: Sherwin-Williams Company: www.sherwin-williams.com or system matching performance and product information for the basis of design product identified below.
 - a. Benjamin Moore & Co: www.benjaminmoore.com.
 - b. PPG Paints: www.ppgpaints.com/#sle.
 - c. Behr Process Corporation: www.behr.com/#sle.
- C. Primer Sealers: Same manufacturer as top coats.
- D. 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) For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 - 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 described explicitly 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 in Color Schedule.

- 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, 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, , 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, 3 Coat:

- 1) One coat glavanize 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.
- F. 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) Fiber Cement Siding: 12 percent.
 - 2) Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 3) Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

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. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
- I. 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.
- J. Galvanized Surfaces:
 - 1) Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

- 2) Prepare surface according to SSPC-SP 2.

K. Ferrous Metal:

- 1) Solvent clean according to SSPC-SP 1.
- 2) Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
- 3) Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

L. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

M. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

N. 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. 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. Sand wood and metal surfaces lightly between coats to achieve required finish.
- I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- J. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection.
- B. Owner will provide field inspection.

3.5. CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6. 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) Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 2) Mechanical and Electrical:
 - a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - 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 05 5000 - Metal Fabrications: Shop-primed items.

B. 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. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.
- C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- E. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; 2016.
- F. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; 2015.
- G. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- H. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).
- I. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004).
- J. SSPC-SP 6 - Commercial Blast Cleaning; 2007.
- K. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003).

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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) Allow 30 days for approval process, after receipt of complete samples by Architect.

- 4) Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, 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 in addition to the manufacturer's label.

1.5. QUALITY ASSURANCE

- A. 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: Sherwin-Williams Company: www.sherwin-williams.com or system matching performance and product information for the basis of design product identified below.
- 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 Illinois.
 - 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) Extend colors to surface edges; colors may change at any edge as directed by Architect.
 - 2) In finished areas, finish pipes, ducts, conduit, 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, wood, uncoated steel, shop primed steel, galvanized steel, and exterior pvc trim and siding materials used in streetscape theme.
 - 1) Two top coats and one coat primer.
 - 2) Top Coat(s): Interior Latex; MPI #43, 44, 52, 53, 54, or 114.
 - a. Products:
 - 1) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Flat.
 - 2) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Semi-Gloss. (MPI #43)
 - 3) Sherwin-Williams ProMar 200 Zero VOC Interior Latex, Eg-Shel. (MPI #52)
 - 4) Sherwin-Williams, Duration Exterior Acrylic Latex, Satin Finish, VinylSafe.
 - 3) Top Coat Sheen:
 - a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
 - b. Eggshell: MPI gloss level 3; use this sheen at all locations.
 - c. Satin: MPI gloss level 4; use this sheen at PVC siding and/or trim scheduled to receive painted finish.
 - d. Semi-Gloss: MPI gloss level 5; use this sheen for items subject to frequent touching such as metal substrates including doors, door frames and railings, and in resident toilet rooms and serving areas.
 - 4) Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
 - 1) Two top coats and one coat primer.
 - 2) Top Coat(s): Interior Alkyd, Water Based; MPI #157, 167, 168, or 169.

a. Products:

1) Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane, Semi-Gloss .

3) Top Coat Sheen:

a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

4) Primer: As recommended by top coat manufacturer for specific substrate.

C. Ferrous Metals, Unprimed, Alkyd, 3 Coat:

1) One coat of alkyd primer.

2) Semi-gloss: Two coats of alkyd enamel; B53W01151 Pro Industrial Water-Based Alkyd Urethane Semi-Gloss.

D. Galvanized Metals, Alkyd, 3 Coat:

1) One coat galvanize primer.

2) Semi-gloss: Two coats of alkyd enamel; B53W01151 Pro Industrial Water-Based Alkyd Urethane Semi-Gloss.

2.4. PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

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. 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.

- F. 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) Interior Wood: 15 percent, measured in accordance with ASTM D4442.
- 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. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
- 1) Notify Architect about anticipated problems when using the materials specified over substrates primed by others.
 - 2) At interior areas to be painted with Dry Fall Acrylic Latex, touch up factory primed surfaces as required.
- H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Galvanized Surfaces:
- 1) Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- 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 using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

- K. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
- 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 wood and 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, MPI #50.
 - 2) Sherwin Williams, ProMar 200 Zero VOC Interior Latex Primer.
 - a. Intermediate Coat: Latex, Interior matching topcoat.

- b. Top Coat: Latex, Interior Eggshell, (Gloss Level 3).
 - c. Top Coat: Latex, Interior Semi-Gloss, (Gloss Level 5).
 - 3) Sherwin Williams, ProMar 200 Zero VOC Interior Latex Eg-Shel.
 - a. Locations: General use, U.N.O.
 - 4) Sherwin Williams, ProMar 200 Zero VOC Interior Latex Semi-Gloss.
 - a. Locations: Resident Toilet Rooms.
 - 5) Interior Ceilings and Underside of Soffits:
 - a. Prime Coat(s): Primer Sealer, Latex, MPI #50.
 - 6) Sherwin Williams, ProMar 200 Zero VOC Interior Latex Primer.
 - a. Intermediate Coat: Latex, Interior matching topcoat.
 - b. Top Coat: Latex, Interior Flat, (Gloss Level 1).
 - 7) Sherwin Williams, ProMar 200 Zero VOC Interior Latex Flat.
- B. PVC Siding and Trim: Finish surfaces exposed to view as indicated in drawings.
 - 1) Top Coat:
 - a. Sherwin Williams, Duration Exterior Acrylic Latex, Satin Finish.
- C. Steel Doors and Frames: Finish surfaces exposed to view.
 - 1) Prime Coat:
 - a. Sherwin Williams, Pro Industrial Pro-Cryl Universal Metal Primer, B66-310 Series.
 - 2) Intermediate Coat: Latex interior, institutional low-odor/VOC, matching topcoat.
 - 3) Top Coat:
 - a. Sherwin Williams, B53W01151 Pro Industrial Water-Based Alkyd Urethane, Semi-Gloss.

END OF SECTION

SECTION 10 1200 - DISPLAY CASES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Recessed display cases.
- B. Free-standing display cases.

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Blocking and supports.
- B. Section 09 2116 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

1.3. REFERENCE STANDARDS

- A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- C. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

1.4. SUBMITTALS

- A. See Section 01 3300 Submittals for submittal procedures.
- B. Product Data: Submit complete printed data and installation details indicating products to be provided as specified.
 - 1) Submit color charts for selection by the Architect.
- C. Shop Drawings: Submit complete installation details. Include dimensioned elevations.
- D. Samples: Submit samples of material and trim to illustrate finish, color, and texture.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
- B. Regulatory Requirements: Products shall meet requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) and local amendments and modifications.
- C. Installer: Installer specialized and experienced in work similar to that required for this project shall perform Installation.

1.6. DELIVERY, STORAGE AND HANDLING

- A. Deliver display cases and materials to the Project site with manufacturer's protective crate covering and do not open until ready for use.
- B. Protect display cases before, during, and after installation. In case of damage, immediately provide necessary repairs and replacements.

1.7. FIELD CONDITIONS

- A. Field Measurements: Verify field measurements for recessed application for display cases before preparation of shop drawings and before fabrication to ensure proper installation.

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.
- C. Provide five year manufacturer warranty against defects and in materials, finish product and workmanship.

PART 2 PRODUCTS

2.1. DISPLAY CASES

- A. Manufacturers:
 - 1) Peter Pepper Products Model PMC-B 724224 Free-standing.
 - 2) Claridge Products and Equipment, Inc: www.claridgeproducts.com/#sle.
 - 3) Nelson Adams NACO: www.nelsonadamsnaco.com/#sle.
 - 4) The Tablet & Ticket Co.: <https://www.tabletandticket.com/custom-display-cases/school/>
 - 5) Blankenship Associates Inc.: <https://blankenshipassociates.com/products/display-cases>
- B. Recessed Display Case: Factory-fabricated wood-framed display case with adjustable glass shelves, finished interior, and aluminum trim on face to cover edge of recessed opening.
 - 1) Width: 3 feet.
 - 2) Height: As indicated on drawings.
 - 3) Depth: As indicated on drawings.
 - 4) Components:
 - a. Glazed Doors: Hinged.
 - 1) Number of Doors: Two pair.
 - b. Side Panels: Laminate-faced substrate.

- c. Back Panel: Laminate-faced.
 - d. Top Panel: Laminate-faced substrate.
 - e. Bottom Panel: Laminate-faced substrate.
- C. Free-Standing Display Case: Factory-fabricated aluminum-framed display case with adjustable glass shelves, finished interior.
 - 1) Width: 6 feet.
 - 2) Height: 42 inches.
 - 3) Depth: 24 inches.
 - 4) Components:
 - a. Glazed Doors: Sliding.
 - 1) Number of Doors: Two pair.
 - b. Side Panels: Tempered clear glass.
 - c. Back Panel: Tempered clear glass.
 - d. Top Panel: Tempered clear glass.
 - e. Bottom Panel: Laminate-faced substrate.
 - 5) Free-Standing Display Case Base: Veneer plywood base to match display case interior.
 - 6) Basis of Design Peter Pepper Products Model PMC-B 724224.

2.2. FABRICATION

- A. Comply with requirements indicated for materials, thickness, finishes, colors, designs, shapes, sizes, and details of construction.
- B. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress on exposed and contact surfaces.
- C. Mill joints to a tight, hairline fit.
- D. Pre-assemble signs in the shop. No visible fasteners.
- E. Form panels to required size and shape. Comply with requirements indicated for design, dimensions, finish, color, and details of construction.
- F. Coordinate dimensions and attachment methods to produce message panels with closely fitting joints. Align edges and surfaces with one another in the relationship indicated.
- G. Increase metal thickness or reinforce with concealed stiffeners or backing materials as required to produce surfaces without distortion, buckles, warp, or other surface deformations.

- 1) Fabricate frame from extruded aluminum. Corners to have hairline miters and be braced by means of internal aluminum angels. If welding is necessary, none should be visible. Frames shall have a continuous back-up member behind the door.

2.3. COMPONENTS

- A. Wood Case Construction: 3/4 inch 7-ply maple veneer plywood with manufacturer's standard stain.
- B. Aluminum Framed Case Construction: 1-1/2 inch by 2 inch extruded aluminum tube frame with tempered glass and laminate-faced infill panels.
- C. Aluminum Case Construction: Aluminum side, bottom, and top panels fabricated from extruded aluminum shapes.
- D. Face Frame Trim for Recessed Installation: 2 inch flat face dimension extruded aluminum trim mitered with corner clips and mechanical fasteners.
- E. Glazed Sliding Doors: (Free standing display case)
 - 1) 1/4 inch clear tempered glass with plastic finger pulls.
 - 2) Door track: Extruded aluminum glass shoe with bottom rollers and top plastic guide.
 - 3) Lock: Glass door cylinder lock.
- F. Glazed Hinged Doors: (Recess mounted display cases)
 - 1) 1/4 inch clear tempered glass with polished edges.
 - 2) Frameless Pivot Hinges: Satin Chrome Flush Mount Cabinet Pivot Hinges.
 - 3) Lock: Glass door cylinder lock. Chrome Single Glass Door Lock - Randomly Keyed
- G. Glass Shelves:
 - 1) 1/4 inch clear tempered glass with flat-polished edges.
 - 2) Shelf Depth: As indicated on drawings.
 - 3) Shelves per Unit: As indicated on drawings.
- H. Recessed Display Case Glass Shelf Support : adjustable in 1 inch increments along entire length of standard, drilled and countersunk for screws.
 - 1) Shelf Support, For glass shelves, for screw fixing into drill hole Ø 5 mm
 - 2) Steel, load-bearing capacity 80 kg (in compliance with DIN EN 1727:1998-06), with lip, Nickel plated.
- I. Free-standing Display Case Shelf Standards and Brackets: Integral to case frame single-slotted channel standards for brackets adjustable in 1 inch increments along entire length of standard frame slot.
- J. Laminate Back Panel: Low-pressure laminate on one face of plywood substrate.

- 1) Laminate Color and Texture: As selected from manufacturer's full range.

2.4. MATERIALS

- A. Aluminum Extrusions for Framing and Trim: Alloy as recommended by manufacturer for construction and specified finish; nominal 1/8-inch wall thickness.
- B. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper.
 - 1) Finish: Factory anodized; AAMA 611: Color as selected from manufacturers standard line.
- C. Plywood: Softwood plywood with veneer core, waterproof glue, 3/4 inch thick.
- D. Heat-Strengthened and Fully Tempered Glass: ASTM C1048, Kind FT.

PART 3 EXECUTION

3.1. PREPARATION

- A. Rough openings, electrical pre-wiring, and final finishing are by other trades.

3.2. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Locate fastening devices to secure cases securely to back and sides of rough opening.
- C. Install recessed display cases plumb and level in wall openings.
- D. Refer to drawings for display case mounting heights.
- E. Clean case and glass using manufacturers recommended procedures.
- F. Provide mitered and wrapped hairline joints for all trims.

3.3. ADJUSTING AND CLEANING

- A. Verify that all accessories are installed as detailed for each unit.
- B. At completion of work, clean glass surfaces, back panels and trim in accordance with manufacturer's recommendations leaving units ready for use.

3.4. CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

END OF SECTION

SECTION 10 1400 - SIGNAGE

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Emergency evacuation maps.
- D. Plaque.

1.2. 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.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals 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) All message and sign copy to be reviewed and approved by Owner and Architect prior to fabrication and installation.
 - 2) When room numbers to appear on signs differ from those on drawings, confirm proper numbering with Owner prior to fabrication and installation.
 - 3) When content of signs is indicated to be determined later, request such information from Owner through Architect at least 4 months prior to beginning fabrication; upon request, submit preliminary schedule.
 - 4) Submit for approval by Owner through Architect prior to fabrication.
- D. Samples: Submit one sample 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. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

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. 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.

1.6. 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. MANUFACTURERS

- A. All interior sign types to be provided by one single vendor.
- B. Basis of Design manufacturer: ASI Signage, www.asisignage.com.
- C. Other acceptable manufacturers:
 - 1) Cosco Industries; www.coscoarchitecturalsigns.com/#sle.
 - 2) Apco Signs; <http://www.apcosigns.com/>.
 - 3) Substitutions: See Section 01 6000 - Product Requirements.

2.2. SIGNAGE APPLICATIONS

- A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 , unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. Room and Door Signs: Provide a sign in locations as indicated on drawings.
 - 1) Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
 - 2) Character Height: Minimum 5/8 inch.
 - 3) Sign Height: As indicated on drawings.
 - 4) Office Doors: Identify with room numbers to be determined later, not the numbers indicated on drawings; in addition, provide "window" section for replaceable occupant name.

- 5) Conference and Meeting Rooms: Identify with room names to be determined later, not the numbers indicated on drawings; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
- 6) Service Rooms: Identify with room names to be determined later, not those indicated on drawings.
- 7) Rest Rooms: Identify with pictograms, the names "MEN", "WOMEN", or "RESTROOM" and braille. Copy to be reviewed and approved by Owner and Architect prior to fabrication.

C. Interior Directional and Informational Signs:

- 1) Sign Type: Same as room and door signs.
- 2) Sizes: As indicated on drawings.
- 3) Wording of signs to be verified by Owner and Architect prior to order and fabrication.

D. Specialty Signage:

- 1) Provide all signage for "Mainstreet" business as indicated on drawings. Secure specialty (non-standard sign) materials as labeled and fabricate off site. Sign to arrive on site as one unit and shall be installed complete.
- 2) Sizes: As indicated on drawings.

E. Emergency Evacuation Maps:

- 1) Allow for one map per unit (A100, A200, A300, and so on) and as indicated on drawing.
- 2) Map content to be provided by Owner.
- 3) Sizes: As indicated on drawings.

F. Other Dimensional Letter Signs: Wall and specialty panel mounted.

- 1) Interior: Provide dimensional letters, cut plastic laminate with metal finish.
- 2) Sizes: As indicated drawings.

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.
- 4) Wall Mounting of Two-Sided Signs (on glass): Tape adhesive; provide solid back panel matching same face color and panel size to conceal adhesive.

- 5) Suspended Mounting: Stainless steel suspension cables, cable clamps, and hardware fastener suitable for attachment to decorative wall mounted bracket as indicated.

B. Color and Font: Unless otherwise indicated:

- 1) Character Font: Helvetica, Arial, or other sans serif font.
 - a. Tactile Signs: Helvetica, Arial or other sans serif font.
 - b. Non-Tactile/Specialty Signs: Decorative serif font, as indicated on drawings, or similar as approved by Architect.
- 2) ADA Sign Character Case: Upper case only.
- 3) Decorative Sign Character Case: Upper and lower case, as indicated on drawings.
- 4) Background Color: To be selected by Architect from manufacturer's full range of colors and finishes.
- 5) Character Color: Contrasting color, to be selected by Architect from manufacturer's full range of colors and finishes.

2.4. TACTILE SIGNAGE MEDIA

- A. Injection Molded Panels (S-1): One-piece acrylic plastic, with custom graphic/logo, raised letters and braille.
 - 1) Product: ASI Signage, 'InTouch'; Room ID Sign.
 - 2) Total Thickness: 1/8 inch.
- B. Injection Molded Panels (S-2, S-18): One-piece acrylic plastic, with raised pictogram, letters and braille.
 - 1) Product: ASI Signage, 'InTouch'; Restroom Sign.
 - 2) Total Thickness: 1/8 inch.
- C. Injection Molded Panels (S-3): Layered acrylic plastic, with custom graphic/logo, raised letters and braille, Visible Window(s) for Insert(s).
 - 1) Product: ASI Signage, 'InTouch'; Restroom Sign.
 - 2) Total Thickness: 3/8 inch.
 - 3) Provide (1) one window at all Private Rooms.
 - 4) Provide (2) two windows at all Semi-Private Rooms.
- D. Injection Molded Panels (S-6): Layered acrylic plastic, with custom graphic/logo, raised letters and braille.
 - 1) Product: ASI Signage, 'InTouch'; Conference Room Sign with Centered Opening for 'Vacant/In Use' Slide.

- 2) Total Thickness: 3/8 inch.

E. Injection Molded Panels (S-7): One-piece acrylic plastic, with raised letters and braille.

- 1) Product: ASI Signage, 'InTouch'; Room ID Sign for back of house areas.
- 2) Total Thickness: 1/8 inch.

F. Injection Molded Panels (S-14): One-piece acrylic plastic, with vinyl copy/graphics, raised letters and braille.

- 1) Product: ASI Signage, 'InTouch'; Room ID Sign.
- 2) Total Thickness: 1/8 inch.

2.5. NON-TACTILE SIGNAGE MEDIA

A. Injection Molded Panels (S-9): Two-piece acrylic plastic frame with vinyl letters, directional arrow and raised border.

- 1) Product: ASI Signage, 'InTouch'; Wayfinding Sign.
- 2) Total Thickness: 1/4 inch.

B. Injection Molded Panels (S-10): Two-piece acrylic plastic.

- 1) Product: ASI Signage, 'InTouch'; Room Evacuation Sign, with frame, large visible window and thumb notch for 8-1/2 x 11-inch paper insertion/removal in landscape orientation.
- 2) Total Thickness: 1/4 inch.

2.6. SPECIALTY SIGNAGE

A. Cut Out Letters and Panels (S-12 Cape Dining):

- 1) Product: ASI Signage, Custom SignEtch; Wood backer board with brushed aluminum panel, dimensional letters and metal standoffs.
 - a. Wood: 1/4 inch thick, 2 feet diameter; painted finish: Black.
 - b. Brushed Aluminum Panel: Alloy 3003, 1 foot 11 inch diameter, 1/8 inch thick, brushed finish, smooth edges.
 - c. Letters: Cut out from aluminum face panel to expose backer panel behind; "Cape" (12 inches high); "Dining" (4 inches high).
 - d. Hardware: 1 inch round, 7/16 inch deep metal standoff, black finish. Basis of design Grainger Standoff Caps, Round, #ZA0252-ALBLK.

B. Dimensional Letters and Wood Panel (S-16 Library and S-17 Physical Therapy):

- 1) Product: ASI Signage, Custom Sign; Decorative painted tube steel bracket with suspended wood panel with raised border and dimensional letters.

- a. Wood: 1/2 inch thick, two-sided oval shape 1'-10" wide by 1'-2" high; 1" wide x 1/4" H raised border. Maple species, stained and varnished to match Architect's sample.
- b. Letters: ASI Signage; Metal Laminate Cut Letters.
- c. Stains: One color for background, one color for border and copy; to be selected by Architect.
- d. Hardware: 1-inch square decorative wall mounted metal bracket with round finial for suspended panel, painted.

C. Dimensional Letters and Metal Panel (S-11 Bistro):

- 1) Product: ASI Signage, Custom Sign; Metal panel with dimensional letters and metal standoffs.
 - a. Metal Panel: 6 foot 4 inch by 1 foot 8 inch, CorTen weathering steel, smooth edges.
 - b. Letters: ASI Signage; Metal Laminate Cut Letters.
 - c. Hardware: 1-1/2 inch round, 1/2 inch deep metal standoff, brushed aluminum or stainless finish. Basis of design Grainger Standoff Caps, Round, #ZA0261-SS32D.

D. Dimensional Letters and Wood Panel (S-4 Bank):

- 1) Product: ASI Signage, Custom Sign; Wood panel with dimensional letters.
 - a. Wood: 1/2 inch thick, 6 feet by 1 foot 6 inch with painted offset 1/2" wide raised border; Oak species, stained finish to be selected by Architect.
 - b. Letters: ASI Signage; Metal Laminate Cut Letters.
 - c. Hardware: Concealed.

E. Dimensional Letters and Panel (S-13 Canteen):

- 1) Product: ASI Signage, Custom Sign; Metal panel with wood frame and dimensional letters.
 - a. S-14 Panel #1 (Est. Date): 1 inch overall thick reclaimed wood frame, varnished; 5 feet by 1 foot 8 inch.
 - b. S-13 Panel #2 (Name): 1 inch overall thick reclaimed wood frame, varnished; 16 feet 3 inch by 1 foot 8 inch.
 - c. Corrugated Metal Panel: Reclaimed and weathered; staggered seams as required for desired length.
 - d. Letters: ASI Signage; Metal Laminate Cut Letters.
 - e. Hardware: Concealed.

2.7. DIMENSIONAL LETTERS

A. Laminate Letters (S-8 Country Kitchen):

- 1) Materials: Copper Laminate.
- 2) Product: ASI Signage; Metal Laminate Cut Letters.
- 3) Mounting: Tape adhesive.
- 4) Sizes: As indicated on drawings.
- 5) All exposed sides of letters to be finished with face laminate.

B. Vinyl Cut Lettering (S-15 Barber):

- 1) Materials: Vinyl letters and graphic symbols.
- 2) Product: ASI Signage, Dimensional Cut Vinyl Letters.
- 3) Sizes: As indicated on drawings.
- 4) Provide graphic "Barber Pole" symbol with red, blue, white and black coloring, as shown.
- 5) Provide graphic "Moustache" symbol as shown.

C. Laminate Letters (S-5 Resident Wings):

- 1) Materials: Aluminum Laminate.
- 2) Product: ASI Signage; Metal Laminate Cut Letters.
- 3) Mounting: Tape adhesive.
- 4) Sizes: As indicated on drawings.

2.8. ACCESSORIES

- A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
- B. Exposed Screws: As indicated.
- C. Tape Adhesive: Double sided tape, permanent adhesive.

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 2239 - FOLDING PANEL PARTITIONS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Top-supported folding panel partitions, horizontal opening.

1.2. 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 C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- E. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- F. ASTM E413 - Classification for Rating Sound Insulation; 2016.
- G. ASTM E557 - Standard Guide for Architectural Design and Installation Practices for Sound Isolation between Spaces Separated by Operable Partitions; 2012.
- H. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

1.3. ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene at project site seven calendar days prior to scheduled beginning of construction activities of this section to review section requirements.
 - 1) Require attendance by representatives of installer.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data on partition materials, operation, hardware and accessories, electric operating components, track switching components, and colors and finishes available.
- C. Design Data: Design calculations, bearing seal and signature of structural engineer licensed to practice in the State in which the Project is located, showing loads at points of attachment to the building structure.
- D. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.
- E. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

- F. Samples for Review: Submit two samples of surface finish, 12 by 12 inches size, illustrating quality, colors selected, texture, and weight.
- G. Manufacturer's Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- H. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.5. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- C. Fire-Test-Response Characteristics: Provide panels with finishes meeting one of the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1) Surface-Burning Characteristics: As determined by testing per ASTM E 84.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2) Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265.

D.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until installation.

1.7. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within five year period after Date of Substantial Completion.
- C. Provide two year manufacturer warranty against defects in material and workmanship, excluding abuse.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Folding Panel Partitions - Horizontal Opening:
 - 1) Basis of Design Hufcor, Inc; Series 632: www.hufcor.com/#sle.
- B. Other Acceptable Manufacturers:

- 1) Kwik-Wall Company; <>: www.kwik-wall.com/#sle.
- 2) Moderco, Inc: www.moderco.com/#sle.
- 3) Modernfold, a DORMA Group Company: www.modernfold.com/#sle.
- 4) Panelfold, Inc; <>: www.panelfold.com/#sle.

2.2. FOLDING PANEL PARTITIONS - HORIZONTAL OPENING

A. Folding Panel Partitions: Side opening; paired panels; side stacking; manually operated.

B. Panel Construction:

- 1) Frame: 16 gage, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
- 2) Substrate: Gypsum board.
- 3) Panel Substrate Facing: Steel sheet, manufacturer's standard thickness.
- 4) Low profile hinges on basic panels shall be of steel and project no more than 1/4" beyond panel faces. Each pair of panels to have a minimum of three hinges.
- 5) Hardware: Latching door handles of cast steel, satin chrome finish; pull bars.
- 6) Panel Properties:
 - a. Thickness With Finish: 3 inches.
 - b. Width: Equal widths.
 - c. Weight: 10 lb/sq ft.

C. Panel Finishes:

- 1) Facing: 20 oz Vinyl coated fabric.
- 2) Exposed Metal Trim: Custom powder coated paint finish.

D. Panel Seals:

- 1) Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
- 2) Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.

E. Suspension System:

- 1) Suspension Tracks: Steel or aluminum mounted directly to overhead structural support, with adjustable steel hanger rods for overhead support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions,

or adjacent construction. Limit track deflection to no more than 0.10 inch (2.54 mm) between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

- 2) Carriers: Steel, ball bearing wheels on trolley carrier at top of every \diamond panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.

F. Performance:

- 1) Acoustic Performance:
 - a. Sound Transmission Class (STC): 38 to 42 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
- 2) Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

G. Accessories:

- 1) Ceiling Closure: White enameled ceiling closure; aluminum jamb and head molding, fittings and attachments, and intermediate meeting posts.
- 2) Pocket Enclosures: Door, frame, and trim to match adjacent panels.
- 3) Acoustic Sealant: As recommended by partition manufacturer.

2.3. MATERIALS

- A. Aluminum Extrusions: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
- B. Standard Gypsum Board: ASTM C1396/C1396M, 3/8 inch thick, maximum permissible length; ends square cut, square edges.
- C. Vinyl Coated Fabric: ASTM F793 Category VI, polyvinyl fluoride (PVC) finish for washability and improved flame retardance; color as selected by Architect from manufacturer's standard range.
- D. Acoustic Insulation:
 - 1) Type: As required for acoustic performance indicated.
 - 2) Thickness: As required for acoustic performance indicated.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.
- C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

- D. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.2. INSTALLATION

- A. Install partition in accordance with manufacturer's instructions and ASTM E557.
- B. Fit and align partition assembly level and plumb.
- C. Lubricate moving components.
- D. Install acoustic sealant to achieve required acoustic performance.
- E. Coordinate electrical connections.

3.3. ADJUSTING

- A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.
- B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.
- C. Adjust partition assembly to achieve lightproof seal.

3.4. CLEANING

- A. Clean finish surfaces and partition accessories.

3.5. CLOSEOUT ACTIVITIES

- A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

SECTION 10 2600 - WALL AND DOOR PROTECTION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Bumper rails.
- B. Protective corridor handrails.
- C. Corner guards.
- D. Protective wall covering.
- E. Door frame protection.
- F. Dimensional mouldings.

1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Blocking for wall and corner guard anchors.
- B. Section 09 2116 - Gypsum Board Assemblies: Placement of supports in stud wall construction.

1.3. REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM D256 - Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics; 2010, with Editorial Revision (2015).
- C. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents; 2014.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- E. ASTM F476 - Standard Test Methods for Security of Swinging Door Assemblies; 2014.
- F. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.
- C. Shop Drawings: Include plans, elevation, sections, and attachment details. Show design and spacing of supports for protective corridor handrails, required to withstand structural loads.
- D. Samples: Submit samples illustrating component design, configurations, joinery, color and finish.

- 1) Submit two sections of corner guards, bumper rails, and protective corridor handrails, 24 inches long.
 - 2) Submit two samples of protective wall covering and door surface protection, 6 by 6 inches square.
 - 3) Submit two full-size samples of door edge protectors.
- E. Manufacturer's Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. 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 Stock Materials: Three units minimum 96 inches long unit of each kind of covers for corner guards, bumper rails, and protective corridor handrails from same production run as installed materials.
 - 3) Extra Stock Materials: 5 percent extra of each kind of protective wall covering from same production run as installed materials.
- H. Maintenance Data: For each type of product . Include information regarding recommended and potentially detrimental cleaning materials and methods.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Deliver wall and door protection items in original, undamaged protective packaging. Label items to designate installation locations.
- B. Protect work from moisture damage.
- C. Do not deliver products to project site until areas for storage and installation are fully enclosed, and interior temperature and humidity are in conformance with manufacturer's recommendations for each type of item.
- D. Store products in either horizontal or vertical position, in conformance with manufacturer's instructions.

1.6. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer and installer warranty for metal crash rails.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Bumper Rails, Protective Corridor Handrails, and Corner Guards:
 - 1) Construction Specialties, Inc: www.c-sgroup.com/#sle.

- 2) Inpro; <>: www.inprocorp.com/#sle.
- 3) Koroseal Interior Products; <>: www.koroseal.com/#sle.

B. Protective Wall Covering and Dimensional Trims:

- 1) Construction Specialties, Inc; <>: www.c-sgroup.com/#sle.
- 2) Inpro; <>: www.inprocorp.com/#sle.
- 3) Koroseal Interior Products; www.koroseal.com/#sle.

2.2. PERFORMANCE CRITERIA

- A. Impact Strength: Unless otherwise noted, provide protection products and assemblies that have been successfully tested for conformance to applicable provisions of ASTM D256 and/or ASTM F476.
- B. Chemical and Stain Resistance: Unless otherwise noted, provide protection products and assemblies with chemical and stain resistance conforming to applicable provisions of ASTM D543.
- C. Fungal Resistance: Unless otherwise noted, provide protection products and assemblies which pass ASTM G21 testing.

2.3. PRODUCT TYPES

- A. Bumper Guard (BG-1): Factory- or shop-fabricated, with continuous aluminum retainer, preformed end caps and internal and external corners:
 - 1) Basis of Design: CS Acrovyn, SCR-64MN Surface Mount Crash Rail.
 - 2) Performance of Installed Assembly:
 - a. Support vertical live load of 100 lb/lineal ft with deflection not to exceed 1/50 of span between supports.
 - b. Resist lateral force of 250 lbs at any point without damage or permanent set.
 - 3) Material: Polyethylene terephthalate (PET or PETG); PVC-free, color solid, as indicated on drawings.
 - 4) Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - 5) Mounting: Surface.
 - 6) Projection From Wall to Outside of Rail: 1-1/4 inch.
 - 7) Return rail to wall.
- B. Protective Corridor Handrails (HR-1): Factory- or shop-fabricated, with preformed end caps and internal and external corners:

- 1) Basis of Design: CS Acrovyn, P-OAN Single Line Oval with Stainless Steel Brackets, 1-1/2 inch grip.
- 2) Comply with accessibility requirements of ICC A117.1 and ADA Standards.
- 3) Performance of Installed Assembly:
 - a. Support vertical live load of 100 lb/lineal ft with deflection not to exceed 1/50 of span between supports.
 - b. Resist lateral force of 250 lbs at any point without damage or permanent set.
- 4) Material: Polyethylene terephthalate (PET or PETG); PVC-free, color wood grain, as indicated on drawings.
- 5) Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- 6) Mounting: Surface.
- 7) Projection From Wall to Outside of Rail: 3 inch.
- 8) Clear Space From Wall: 1-1/2 inch.
- 9) Return rail to wall.

C. High Impact Corner Guards - Surface Mounted (CG-3):

- 1) Basis of Design: CS Acrovyn, SM-20AN/SM-20MN.
- 2) Material: Polyethylene terephthalate (PET or PETG); PVC-free with full height extruded aluminum retainer.
- 3) Performance: Resist lateral impact force of 100 lbs at any point without damage or permanent set.
- 4) Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- 5) Width of Wings: 3 inches.
- 6) Corner: Square.
- 7) Color: As indicated on drawings.
- 8) Length: One piece.
- 9) Height: As indicated on drawings.
- 10) Preformed end caps.

D. Corner Guards - Surface Mounted, Three Dimensional (CG-1,2):

- 1) Basis of Design: CS Acrovyn, Dimensional Moldings, Outside Corner.
- 2) Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
- 3) Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- 4) Width of Wings CG-1: 2 inches.
- 5) Width of Wings CG-2: 4 inches.
- 6) Corner: Square.
- 7) Color: As indicated on drawings.
- 8) Projection From Wall to Outside of Guard: 1/2 inch.
- 9) Height: As indicated on drawings.

E. Three Dimensional Trim - Surface Mounted, Molded (CR-1)

- 1) Basis of Design: CS Acrovyn, Dimensional Moldings, Notched Wainscot Horizontal Trim.
- 2) Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
- 3) Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- 4) Projection From Wall to Outside of Guard: 1/2 inch.
- 5) Color: As indicated on drawings.
- 6) Height: 2 inches.

F. Three Dimensional Trim - Surface Mounted, Molded (TR-1)

- 1) Basis of Design: CS Acrovyn, Dimensional Molding, Horizontal Trim.
- 2) Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
- 3) Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- 4) Projection From Wall to Outside of Guard: 5/8 inch.
- 5) Color: As indicated on drawings.

- 6) Height: 6 inches.

G. Three Dimensional Trim - Surface Mounted, Molded (TR-2):

- 1) Basis of Design: CS Acrovyn, Feature Rail, Colonial Profile.
- 2) Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
- 3) Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- 4) Projection From Wall to Outside of Guard: 1/2 inch.
- 5) Color: As indicated on drawings.
- 6) Height: 2-1/2 inches.

H. Three Dimensional Trim - Surface Mounted, Molded (DWB-1, DWB-2):

- 1) Basis of Design: CS Acrovyn, Dimensional Moldings, Wall Base Trim.
- 2) Material: Polyethylene terephthalate (PET or PETG); PVC-free; consists of rigid sheet formed over shaped MDF board supplied in 9 foot 6 inch lengths and field mitered.
- 3) Surface Burning Characteristics: Provide assemblies with flame spread index of 75 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- 4) Projection From Wall to Outside of Guard: 1/2 inch.
- 5) Color: As indicated on drawings.
- 6) DWB-1 Height: 6 inches.
- 7) DWB-2 Height: 8 inches.

I. Protective Wall Covering (WP-1, WP-3, WP-4):

- 1) Basis of Design: CS Acrovyn, Acrovyn By Design
- 2) Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free; with high definition graphic file reverse printed on clear sheet and sealed with protective backer.
- 3) Thickness: 0.040 inch.
- 4) Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- 5) Colors: As indicated on drawings.
- 6) Patterns: As indicated on drawings.

- 7) Texture: Suede.
- 8) Mounting: Adhesive.
- 9) Caulk joints with color-matched caulk, by manufacturer.

J. Protective Wall Covering (WP-2):

- 1) Basis of Design: CS Acrovyn, Rigid Sheet Wall Protection.
- 2) Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free; with high definition graphic file reverse printed on clear sheet and sealed with protective backer.
- 3) Thickness: 0.040 inch.
- 4) Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- 5) Color: As indicated on drawings.
- 6) Pattern: Simulated wood, as indicated on drawings.
- 7) Texture: Suede.
- 8) Mounting: Adhesive.
- 9) Caulk joints with color-matched caulk, by manufacturer.

K. Protective Wall Covering (WP-5 and WP-6):

- 1) Basis of Design: CS Acrovyn, Rigid Sheet Wall Protection.
- 2) Material: Polyethylene terephthalate (PET or PETG); PVC and PBTs-free; with high definition graphic file reverse printed on clear sheet and sealed with protective backer.
- 3) Thickness: 0.040 inch.
- 4) Surface Burning Characteristics: Provide assemblies with flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
- 5) Colors: As indicated on drawings.
- 6) Pattern: Solid Colors, as indicated on drawings.
- 7) Texture: Suede.
- 8) Mounting: Adhesive.
- 9) Caulk joints with color-matched caulk, by manufacturer.

L. Doorway Protection:

2.4. FABRICATION

- A. Fabricate components with tight joints, corners and seams.
- B. Pre-drill holes for attachment.
- C. Form end trim closure by capping and finishing smooth.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.
- B. Verify that field measurements are as indicated on drawings.
- C. Verify that substrate surfaces for adhered items are clean and smooth.
 - 1) Test painted or wall covering surfaces for adhesion in inconspicuous area, as recommended by manufacturer. Follow adhesive manufacturer's recommendations for remedial measures at locations and/or application conditions where adhesion test's results are unsatisfactory.
- D. Start of installation constitutes acceptance of project conditions.

3.2. INSTALLATION

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.
- B. Position top of bumper rail at 1 inches above wall base.
- C. Position top of corridor hand rail at 34 inches from finished floor.
- D. Position corner guard above wall base to height as indicated on drawings.
- E. Terminate handrails 1 inch short of door openings and intersecting walls.
- F. Position protective wall covering no less than 1 inch above finished floor to allow for floor level variation.
 - 1) Full-Height Installation: Establish a plumb line located at edge of starting point of first sheet to ensure following sheets will be installed plumb.
 - 2) Wainscot Installation: Establish a level line at the specified height for entire length of run. Install by aligning top of edge of covering with this line.
 - 3) Install trim pieces as required for a complete installation. Allow tolerance for thermal movement.
 - 4) At joints indicated to be caulked, allow for a minimum 1/16 inch wide gap between edges of sheets. Gaps are required to be of consistent width throughout the project.
 - 5) Use a roller to ensure maximum contact with adhesive.

- 6) At inside and outside corners cut covering sheets to facilitate installation of trim pieces or corner guards as indicated in drawings.

3.3. TOLERANCES

- A. Maximum Variation From Required Height: 1/4 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

3.4. CLEANING

- A. Clean wall and door protection items of excess adhesive, dust, dirt, and other contaminants.

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. Utility room accessories.

1.2. 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. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- D. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- F. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- G. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings; 2013.
- H. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2017.
- I. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- J. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- K. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008 (Reapproved 2013).
- L. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.
- M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- N. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- O. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

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1.3. ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1) AJW Architectural Products; <>: www.ajw.com.
 - 2) American Specialties, Inc; <>: www.americanspecialties.com.
 - 3) Bradley Corporation; <>: www.bradleycorp.com.
 - 4) Georgia-Pacific Professional; <>: www.blue-connect.com.
- B. Under-Lavatory Pipe Supply Covers:
 - 1) Plumberex Specialty Products, Inc; Pro-Extreme: www.plumberex.com/#sle.
 - 2) IPS Corporation; Trubro Lav Guard 2 Undersink Pipe Covers:
www.ipscorp.com/plumbing/truebro
 - 3) Keeney Manufacturing Company; www.keeneymfg.com ADA Compliant Undersink Rubber Pipe Trap Wrap

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.
 - 1) Grind welded joints smooth.
 - 2) Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

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- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Zinc Alloy: Die cast, ASTM B86.
- G. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.
- H. Adhesive: Two component epoxy type, waterproof.
- I. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.
- J. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3. FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.
- B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.
- C. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.
- D. Galvanizing for Items Other than Sheet: Comply with ASTM A123/A123M; galvanize ferrous metal and fastening devices.
- E. Shop Primed Ferrous Metals: Pretreat and clean, spray apply one coat primer and bake.
- F. Back paint components where contact is made with building finishes to prevent electrolysis.

2.4. Commercial Toilet Accessories

- A. Toilet Paper Dispenser: single roll, surface mounted, Unit shall accommodate one standard-core toilet paper roll up to 5-1/2" (140mm) diameter (1800 sheets). support arms shall be 22- gauge (0.8mm) and equipped with concealed, 16-gauge (1.6mm) mounting brackets that are secured to concealed, 16-gauge (1.6mm) wall plates with stainless steel setscrews. *Spindle shall be chrome-plated plastic with a heavy duty internal spring.

1) Products:

- a. Bobrick; Model B-6857. www.bobrick.com
 - b. American Specialties, Inc. Model 7305-S.
 - c. Bradley Corporation; Model 5084: www.bradleycorp.com.
 - d. Substitutions: Section 01 6000 - Product Requirements.
- B. Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock. Satin-finish stainless steel. Dispenses 400 C-fold or 525 multifold towels. Door has tumbler lock and piano-hinge. Hemmed towel tray opening. Unit 10 3/4" W, 14" H, 4" D (275 x 355 x 100mm).

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- 1) Capacity: 400 multifold minimum.
- 2) Products:
 - a. Bobrick; Model B-262. www.bobrick.com.
 - b. American Specialties, Inc. Model 0210.
 - c. Bradley Corporation; Model 250-15: www.bradleycorp.com.
- C. Soap Dispenser: Bag-In-Box Liquid soap dispenser, wall-mounted, surface, with impact resistant polymer cover and Valve dispenses all-purpose hand soaps, removable for easy maintenance. Lid has concealed locking device. Concealed wall/mirror mounting. ; wall to push-button, 4" (100mm). Design intent is for new to match existing.
 - 1) Minimum Capacity: 28 ounces.
 - 2) Products:
 - a. Georgia-Pacific Professional; GP PRO MANUAL UNIVERSAL DISPENSER, GRAY www.blue-connect.com/#sle.
 - b. GOJO® 5150-06 FMX-12 1250 mL Dove Gray Manual Hand Soap Dispenser
 - c. DIAL® DISPENSER - FOR 800ML BAG-IN-BOX
 - d. American Specialties, Inc. Model 0347.
 - e. Bradley Corporation; www.bradleycorp.com.
- D. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036. One-piece, 1/2" x 1/2" x 3/8" (13 x 13 x 9.5mm) channel-frame. Type 430 stainless steel with bright-polished finish. Mitered corners. Frame screw permits easy replacement of glass. No. 1 quality, 1/4" (6mm) glass mirror; warranted against silver spoilage for 15 years. Galvanized steel back. Secured to concealed wall hanger with theft-resistant mounting.
 - 1) Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
 - 2) Size: 24"x36".
 - 3) Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
 - 4) Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
 - 5) Products:
 - a. Bobrick; Model B-165-2436; www.bobrick.com.
 - b. American Specialties, Inc.; Model 0620-2436.
 - c. Bradley Corporation; Model 781-2436: www.bradleycorp.com.

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- E. Grab Bars: Stainless steel, smooth surface. 1-1/4" (32mm) dia. tubing. Constructed of 18-gauge (1.2mm), type 304 satin-finish stainless steel tubing. Concealed mounting flange 1/8" (3mm) thick, type 304 stainless steel plate, 2" W x 3 1/8" H (50 x 80mm), with screw holes for concealed anchors. Cover is 22-gauge (0.8mm), type 304 stainless steel with satin finish, 3 1/4" (85mm) diameter. Cover snaps over mounting flange to conceal screws

1) 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, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
- c. Finish: Satin.
- d. Length and Configuration: As indicated on drawings.

2) Products:

- a. Bobrick; Series B-5806 www.bobrick.com.
- b. American Specialties, Inc.; Series 3700
- c. Bradley Corporation; Model 832: www.bradleycorp.com.

2.5. UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. 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: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
 - b. Comply with ASTM C1822, type indicated.
 - c. Comply with ASME A112.18.9.
 - d. Comply with ICC A117.1.
 - e. 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:

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- a. Plumberex Specialty Products, Inc; Plumberex Pro-Extreme: www.plumberex.com/#sle.
- b. IPS Corporation; Trubro Lav Guard 2 Undersink Pipe Covers: www.ipscorp.com/plumbing/truebro
- c. Keeney Manufacturing Company; www.keeneymfg.com ADA Compliant Undersink Rubber Pipe Trap Wrap

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. For electrically-operated accessories, verify that electrical power connections are ready and in the correct locations.
- D. Verify that field measurements are as indicated on drawings.
- E. See Section Rough Carpentry for installation of blocking, reinforcing plates, and concealed anchors in walls and ceilings.

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. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

- 1) Grab Bars: As indicated on drawings.

3.4. PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

Toilet, Bath, and Laundry Accessories		10 2800-6
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SECTION 10 3100 - MANUFACTURED FIREPLACES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Manufactured steel box gas insert fireplace.
- B. Insulated chimney flue and associated roof flashings.

1.2. RELATED REQUIREMENTS

- A. Section 23 1123 - Facility Natural-Gas Piping: Gas piping to fire box.

1.3. REFERENCE STANDARDS

- A. UL (DIR) - Online Certifications Directory; Current Edition.
- B. UL 127 - Standard for Factory-Built Fireplaces; Current Edition, Including All Revisions.

1.4. SYSTEM DESCRIPTION

- A. Built-in firebox with concealed flue; rectangular shape; gas starter and circulating fan.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide fire box cabinet dimensions, clearances required from adjacent dissimilar construction, applicable regulatory agency approvals, electrical characteristics of fan.
- C. Shop Drawings: Indicate fire box rough opening dimensions, rough opening sizes for chimney flue, and fan size.
- D. Manufacturer's Certificate: Certify that fireplace components meet or exceed UL (DIR) requirements.
- E. Manufacturer's Instructions: Indicate installation procedures and component installation sequence, clearances and tolerances from adjacent construction.

1.6. REGULATORY REQUIREMENTS

- A. Conform to applicable code for clearances from adjacent materials, chimney height above roof line requirements, and unit UL approval.
- B. Listed by Underwriters Laboratories Inc. (UL) as complying with UL 127.
- C. Products Requiring Electrical Connection: Listed and labeled by {rs#1} or testing firm acceptable to authorities having jurisdiction, as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Manufactured Fireplaces:

- 1) Basis of Design Heat & Glo Escape See-Through Fireplace; Model ESC-42ST: Direct Vent See-Through gas fireplace www.heatnglo.com/#sle.

B. Other Acceptable Manufacturers:

- 1) Lennox Hearth Products; <>: www.ihp.us.com/#sle.
- 2) Vermont Castings; <>: www.vermontcastings.com/#sle.
- 3) Substitutions: See Section 01 6000 - Product Requirements.

2.2. COMPONENTS

A. Fire Box: Formed insulated steel cabinet, rectangular shaped interior, configured to include chimney outlet and cleanout, refractory brick lining.

- 1) Hearth Opening: 42 inches wide by 23 inches high by 28 inches deep.
- 2) Flue Diameter: 8 inches.
- 3) Combustion Air Source: Ducted outside air with screened grilles and ducts.
- 4) Air Jacket: Steel enclosure surrounding fire box, air inlets and outlets, electrical fan with rheostat switch.
- 5) BTU input Rating: 57,500.
- 6) Efficiency: Steady State 75%, AFUE 62%, Canada EnerGuide 60%.

B. Exposed Cladding: Prepainted steel.

C. Fire Box Closure: Clear, tempered glass doors in black steel frame, butt hinged, with friction catch.

D. Flue Construction: Insulated stainless steel sandwich construction, modular sized sections with elbows and spacing collars to permit site assembly, air and fire stop collars, elbows, elbow offsets, tees, supports, roofing storm collar, roof flashing; nominal inside diameter of 8 inches.

E. Roof Terminations: Round terminal cap.

2.3. ACCESSORIES

A. Fronts-Doors: Black Frame Non-Operable Tempered Glass Front.

B. Gas Log Set: included with fireplace insert.

C. Control: Basis of Design Heat & Glo IntelliFire Touch Wireless Wall Switch. IFT-RC150

- D. Roof Flashing: Pre-finished sheet metal, configured to fit tightly to chimney riser and seal to shingle roofing system.

2.4. FACTORY FINISHING

- A. Exposed to View Surfaces: Baked enamel, Black color.

PART 3 EXECUTION

3.1. VERIFICATION OF CONDITIONS

- A. Verify that prepared openings are ready to receive work and opening dimensions are as indicated on drawings.
- B. Verify that proper power supply and fuel source are available.

3.2. INSTALLATION

- A. Install unit assembly in accordance with manufacturer's instructions.
- B. Install chimney plumb through prepared openings using fire stop spacers.
- C. Secure chimney in opening framing with appropriate fasteners.
- D. Carefully cut holes for fan wall switch and grilles.
- E. Install roof flashings to ensure moisture is shed from chimney flue.

3.3. TOLERANCES

- A. Maximum Variation of Chimney From Plumb: 1/2 inch.

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. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.3. REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- B. FM (AG) - FM Approval Guide; current edition.
- C. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures
- B. Product Data: Provide extinguisher operational features.
- C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.
- D. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.5. FIELD CONDITIONS

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Fire Extinguishers:
 - 1) Ansul, a Tyco Business; <>: www.ansul.com/#sle.
 - 2) Amerex

- 3) Kidde, a unit of United Technologies Corp; <>: www.kidde.com/#sle.
- 4) Nystrom, Inc; <>: www.nystrom.com/#sle.

B. Fire Extinguisher Cabinets and Accessories:

- 1) Activar Construction Products Group - JL Industries; <>: www.activarcpg.com/#sle.
- 2) Ansul, a Tyco Business; <>: www.ansul.com/#sle.
- 3) Kidde, a unit of United Technologies Corp; <>: www.kidde.com/#sle.
- 4) Larsen's Manufacturing Co; <>: www.larsensmfg.com/#sle.

2.2. 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) Finish: Baked polyester powder coat, red color.
- 4) Temperature range: Minus 40 degrees F to 120 degrees F.

2.3. FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.

C. Cabinet Configuration: Semi-recessed type.

- 1) Size to accommodate accessories.
- 2) Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim and door stiles.

D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with two butt hinge.

E. Door Glazing: Acrylic plastic, clear, 1/8 inch thick, flat shape and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

G. Weld, fill, and grind components smooth.

H. Finish of Cabinet Exterior Trim and Door: No. 4 - Brushed stainless steel.

I. Finish of Cabinet Interior: White colored enamel.

2.4. ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Cabinet Signage: Fire Extinguisher.

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, 48 inches from finished floor to door handle to ensure ADA requirements.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

E. Position cabinet signage above cabinet.

END OF SECTION

SECTION 10 7313 - AWNINGS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Aluminum framing and fittings.
- B. Covering material.

1.2. REFERENCE STANDARDS

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data on awning covering, color fastness, stitching and seaming methods, attachment devices to framing system.
- C. Shop Drawings: Indicate awning profiles, sizes, connection attachments, anchorage, size and type of fasteners, graphic images, patterns, and accessories.
- D. Samples, Covering: Submit 12 by 12 inch sample of covering with representative hem stitch detail, seam with reinforcement, and attachment devices to framing system.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Awnings:
 - 1) Lawrence Fabric and Metal.
 - 2) Traube Canvas Products.
 - 3) Jefferson Tent and Awning Company.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.

2.2. REGULATORY REQUIREMENTS

- A. Comply with applicable code for fire resistance ratings for awning covering.
- B. Fire-Test-Response Characteristics: Provide awning fabrics with the fire-test-response characteristics indicated, as determined by testing identical products according to test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1) Flame-Resistance Ratings: Passes NFPA 701.
 - 2) Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency for Flame-Spread Index of 25 or less.

- 3) Permanently attach label to each awning fabric indicating whether fabric is inherently and permanently flame resistant or is treated with flame-retardant chemicals, and whether it requires retreatment after designated time period or cleaning.

2.3. ALUMINUM FRAMING SYSTEM

- A. Framing: 2 inchsquare, tubing, complying with ASTM B241/B241M.
- B. Fittings: Elbows, T-shapes, wall brackets; cast aluminum.
- C. Mounting: Brackets and flanges, with aluminum inserts for mounting in wood frame wall construction.
- D. Splice Connectors: Concealed spigot; cast aluminum.
- E. Exposed Fasteners: Flush countersunk stainless steel screws or bolts; consistent with design of system.
- F. Finish Exposed Components: Baked enamel to <> color as selected.
- G. Anchors, Fasteners, Fittings, Hardware, and Installation Accessories: Complying with performance requirements indicated and suitable for exposure conditions, supporting structure, anchoring substrates, and installation methods indicated. Corrosion-resistant or noncorrodible units; weather-resistant, compatible, nonstaining materials. Provide as required for awning assembly, mounting, and secure attachment. Number as needed to comply with performance requirements and to maintain uniform appearance; evenly spaced.
 - 1) Wood Screws: ASME B18.6.1.
 - 2) Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).
 - 3) Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.
 - 4) Grommets: Stainless steel, No. 2.
 - 5) Lacing: 100 percent polyester, braided No. 4.

2.4. COVERING MATERIALS

- A. Fiber Content: Acrylic-coated polyester/cotton blend.
- B. Shrinkage: Not greater than 0.1 percent according to ASTM D 1204.
- C. Stretch Factor: Not less than 1 percent according to ASTM D 4851.
- D. Applied Treatment: Mildew resistant.
- E. Pattern and Color: To be selected from manufacturers full range. Assume different color for each awning.

2.5. FABRICATION - FRAMING

- A. Fit and shop assemble components in largest practical sizes, for delivery to site. Fabricate awning frames from aluminum. Preassemble in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces.

Clearly mark units for reassembly and coordinated installation. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- B. Fabricate components with joints tightly fitted and secured.
- C. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Fabricate slip-fit connections exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- E. Weld corners and connections continuously. Obtain fusion without undercut or overlap. Remove welding flux immediately. At exposed corners and connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Exposed Fastenings: Unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- G. Supply components required for anchorage of framing. Fabricate anchors and related components of same material and finish as framing, except where specifically noted otherwise.
- H. Continuously seal joined pieces by intermittent welds and plastic filler.
- I. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- J. Accurately form components to suit each other and to building structure.

2.6. FABRICATION - COVERING

- A. Manufacture covering in one piece wherever possible, sized and configured to suit framing.
- B. Form covering heading of triple thickness 2 inches wide, double fold bottom hem 2 inches wide.
- C. Prepare covering with grommets for attachment to framing 6 inches on center.
- D. Turn seam edges and lock stitch.
- E. Apply patterns to design and colors indicated.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that wall substrate anchors are acceptable and are ready to receive work.

3.2. INSTALLATION - FRAMING

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects.

- C. Provide anchors required for connecting framing to structure. Anchor framing to structure. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing awnings to structural support and for properly transferring load to in-place construction.
- D. Conceal bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.3. INSTALLATION - COVERING

- A. Install covering over framing members, stretched taut without creases or folds.
- B. Attach covering and fasten securely.

3.4. TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Misalignment From True Position: 1/4 inch.

END OF SECTION

SECTION 10 7516 - GROUND SET FLAGPOLES

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 ground-set flagpoles made from aluminum.
- B. Owner-Furnished Material: Flags.

1.3. ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1) Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Shop Drawings: For flagpoles.
 - 1) Include plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
 - 2) Include section and details of foundations system.
- C. Samples and Verification: For each type of exposed finish, in manufacturer's standard sizes.
- D. Delegated - Design Submittal: For flagpoles.

1.4. CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Spiral wrap flagpoles with heavy paper and enclose in a hard fiber tube or other protective container.

1.6. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide manufacturer's printed product data sheets and installation instructions.
- C. Warranty Documentation: 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. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

2.2. PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified Professional Engineer, as defined in Section 01 4000 "Quality Requirements," to design flagpole assemblies.
- B. Seismic Performance: Flagpole assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- C. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
 - 1) Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is 90 MPH.
 - 2) Base flagpole design on the polyester flags of maximum standard size suitable for use with flagpole or flag size indicated, whichever is more stringent.

2.3. ALUMINUM FLAGPOLES

- A. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch.
 - 1) Acme/Lingo Flagpoles, LLC
 - 2) Eder Flag Manufacturing Company.
 - 3) Ewing Flagpoles.
 - 4) Morgan-Francis Flagpoles.
- B. Exposed Height: 20, 25 feet and 30 feet, as indicated on plans.
- C. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:
 - 1) Fabricate shop and field joints without using fasteners, screw collars, or lead caulking.
 - 2) Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.
- D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch wall thickness with 3/16 inch steel bottom plate and support plate; 3/4 diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.
 - 1) Flashing Collar: Same material and finish as flagpole.

- E. Sleeve for Aluminum Flagpole: Fiberglass or PVC pipe foundation sleeve, made to fit flagpole, for casting into concrete foundation.
 - 1) Flashing Collar: Same material and finish as flagpole.
- F. Cast-Metal Shoe Base: Made from aluminum with same finish and color as flagpoles for anchor-bolt mounting; furnish with anchor bolts.
 - 1) Furnish ground spike.

2.4. FITTINGS

- A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.
 - 1) 0.063-inch spun aluminum with gold anodic finish.
- B. Internal Halyard, Cam Clean System: 5/16 inch diameter, braided polypropylene halyard; cam cleat; and concealed revolving truck assembly with plastic-coated counterweight and sling. Furnish flush access door secured with cylinder lock. Finish truck assembly to match flagpole.
 - 1) Halyard Flag Snaps: Stainless-steel swivel snap hooks with neoprene or vinyl covers. Furnish two per halyard.

2.5. MISCELLANEOUS MATERIALS

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M.
- B. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.
- C. Sand: ASTM C33/C 33M, fine aggregate.
- D. Elastomeric Joint Sealant: Multicomponent non-sag urethane joint sealant complying with requirements in Section 07 9200 "Joint Sealants."
- E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

2.6. ALUMINUM FINISHED

- A. Natural Satin Finish: AA-M32, fine directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear hard-coat wax.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22QA41.
- C. Gold Anodic Finish: AAMA 611, AA-M32C22A43; gold color.

2.7. ACCESSORIES

- A. Lighting: All flagpoles shall include hardwired, LED downlighting provided by the flagpole manufacturer.
 - 1) Lighting fixture shall include dusk to dawn photo eye

- 2) Lighting output shall be, at minimum, 500 lux / 1300 lumens
- 3) Contractor shall furnish and place all necessary wiring and transformers per manufacturer's specifications

PART 3 EXECUTION

3.1. PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Excavation: Excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete. Place and compact drainage material at excavation bottom.
- C. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure and brace forms to prevent displacement during concreting.
- D. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.
- E. Sleeves: Locate and secure sleeves informs by bracing to reinforcement and forms.
- F. Place concrete, as specified in Section 03 3000 "Cast-in Place Concrete." Compact concrete in place by using vibrators. Moist-cure exposed concrete for no fewer than seven days or use non-staining curing compound.
- G. Trowel exposed concrete surface to a smooth, dense finish, free of trowel marks, and uniform in texture and appearance. Provide positive slope for water runoff to perimeter of concrete base.

3.2. FLAGPOLE INSTALLATION

- A. General: Install flagpoles where indicated and according to Shop Drawings and manufacturer's written instructions.
- B. Foundation Tube: Place Flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastomeric joint sealant and cover with flashing collar.
- C. Coordinate all electrical connections with electrical drawings and electrical contractor.

END OF SECTION

SECTION 10 8113 - BIRD CONTROL DEVICES

PART 1 – GENERAL

1.1.SUMMARY

- A. Design Requirements: Select appropriate size as determined by site conditions to prevent birds from landing and roosting on specified surfaces.

1.2. QUALITY ASSURANCE

- A. Single Source Responsibility: Furnish products from one manufacturer for entire project.
- B. Country of Origin: Country of Origin shall be designated at U.S.A.
- C. Obtain all technical information from the manufacturer.
- D. Utilize labor Authorized Installers who are knowledgeable in Bird Control Devices product installations.
- E. Installer shall visit the site to gather all information of existing site conditions.

1.3. SUBMITTALS

- A. Product Data: Submit manufacturer's descriptive literature and product specifications for each product including catalogs, installation instructions and other descriptive material.
- B. Provide Samples: Each type of spike excluding proposed fastening methods.

1.4. PRODUCT HANDLING

- A. Protect Bird Control Device products from damage before, during and after the installation.

1.5. PROJECT CONDITIONS

- A. Coordination: Furnish samples of system(s) so installation can be coordinated with existing conditions and within on-site conditions.
- B. Visit site and field measure prior to fabrication and delivery of materials.

1.6. WARRANTY

- A. Product shall carry a minimum 5-year guarantee against manufacturer's defect and U.V. breakdown.

PART 2 – PRODUCTS

2.1. ACCEPTABLE MANUFACTURER

- A. Manufacturers:
 - 1) Basis of Design Nixalite Premium Spike
 - 2) Bird·B·Gone LLC Stainless Steel Bird Spike.
 - 3) HB Jinshi Industrial Metal Co. Ltd

2.2. PRODUCT DESCRIPTION

2.3. MATERIALS

A. Material: stainless steel wire and base strip spikes.

- 1) Wires: Stainless steel, 0.041" (1 mm) diameter, full-hard spring temper.
- 2) Base Strips: Stainless steel, 0.25" wide x 0.02" thick (6.3 mm x 0.5 mm), full anneal for flexibility, easy strip cutting and surface shape memory. available in 24" (61.0 cm) and 48" (122.0 cm) strip lengths.
- 3) Finish Natural stainless-steel finish or manufacturers Color Coat finish.

2.4. MOUNTING SYSTEMS

- A. To be made of stainless steel or non-corrosive materials. Standard mounting hardware is supplied with Bird Barrier Spike Models in set quantities. Mounting Hardware must allow for bird spike strip installation, removal and reinstallation without damaging the installation surface, the spike strips or the mounting system.
- B. Use the Bird Spike Mounting Hardware that best suits the installation surface. All hardware is made of either stainless steel or non-corrosive materials.

1) Installation Surface	Bird Spike Mounting Hardware
2) Masonry, stone, concrete;	Mounting clip, sheet metal screw, masonry anchor
3) Wood, plywood, shingles;	Mounting clip, sheet metal screw, washer
4) Sheet metal, plastic, PVC;	Mounting clip, sheet metal screw, washer
5) Steel, cast iron, brass, bronze;	Mounting clip, drive screw, washer
6) Pipes, cables, conduit, grates;	Wire tie, wire tying tool, adhesive

- C. **Apply adhesive or sealant in all holes that penetrate the installation surface.** After mounting hardware is installed, apply additional adhesive or sealant over the heads of the sheet metal screws and/or the drive screws. Do not get adhesive or sealant in the hook end of the mounting clips.

D. **Optional Fastening:**

- 1) **Glue Clips & Adhesive:** If surface conditions do not allow for the use of the supplied Bird Spike Mounting Hardware, use the Glue Clip and Adhesive installation method. Follow the Glue Clip installation instructions available from the manufacturer.
- 2) Custom made stainless steel mounting brackets, straps or clamps to hold the Bird Spikes to installation surfaces with limited or zero surface penetration requirements.

- E. Steel, Brick, Stone or Concrete: Use an outdoor construction adhesive that is non-silicone based. Purchase from the manufacturer or call for recommended adhesives. If mounting surface warrants, screw or bolt down Bird Spike in conjunction with using the adhesive.

PART 3 – EXECUTION

3.1. EXAMINATION

- A. Examine the installation area and note any detrimental or hazardous work conditions. Notify contracting officer or inspector of the detrimental work conditions.
- B. Do not proceed with installation until conditions are corrected.

3.2. INSPECTION

- A. Visually inspect Bird Spike for any signs of poor installation, including loose screws, fasteners and un-removed debris. Visually inspect all installation surfaces. Make sure all surfaces are clean, dry and free from debris or other conditions that could impede the workflow of this section. All surfaces must be sanitized and deodorized before Bird Spike installation.
- B. Immediately correct and repair as necessary.

3.3. PREPARATION

- A. Surface should be thoroughly cleaned and free of bird droppings, nesting materials, rust, peeling paint or other debris.
- B. **Field Measurements:** Verify the dimensions for each surface specified for Bird Spike installation. Use manufacturers Planning Guides and Estimate Worksheets to verify that sufficient quantities of bird spike strips will be installed on EACH surface specified for bird control.
- C. Make sure all installation surface finishing requirements have been accomplished before installing Bird Spike Models. They are to be the last items installed on each specified surface. DO NOT apply any surface coating or treatment (paint, sealer, etc.) over the installed Premium Nixalite Bird Spike Models or the mounting hardware.

3.4. INSTALLATION

- A. Install Bird Spike as recommended by the manufacturer.
- B. Bird Spike should be installed correctly, covering the entire depth of the surface, not just the perimeter.
 - 1) Follow the contours and angles closely: cut or break away to fit properly.
 - 2) Space materials in accordance with manufacturer's recommendations.

END OF SPECIFICATONS

END OF SECTION

SECTION 12 3600 - COUNTERTOPS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Countertops for architectural cabinet work.
- B. Solid surface wall panels.

1.2. RELATED REQUIREMENTS

- A. Section 06 4100 - Architectural Wood Casework.

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. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2014.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- F. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- G. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.
- H. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- I. PS 1 - Structural Plywood; 2009.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

- E. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.
- F. Test Reports: Chemical resistance testing, showing compliance with specified requirements.
- G. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- H. Installation Instructions: Manufacturer's installation instructions and recommendations.
- I. 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) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
 - 1) Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.

- a. Manufacturers:
 - 1) Formica Corporation; <>: www.formica.com/#sle.
 - 2) Panolam Industries International, Inc. Nevamar; <>: www.nevamar.com.
 - 3) Panolam Industries International, Inc. Pionite; <>: www.pionitelaminates.com.
 - 4) Wilsonart; <>: www.wilsonart.com/#sle.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Wear Resistance: In addition to specified grade, comply with NEMA LD 3 High Wear Grade requirements for wear resistance.
 - d. Finish: Matte or suede, gloss rating of 5 to 20.
 - e. Surface Color and Pattern: As selected by Architect from the manufacturer's full line.
 - 2) Exposed Edge Treatment: Postformed laminate; front edge substrate built up to minimum 1-1/2 inch thick with radiused edge, integral coved backsplash with radiused top edge.
 - 3) Back Splashes: Same material, integral to counters, same construction.
- C. 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) Basis of Design: Avonite Surfaces; <>: www.avonitesurfaces.com/#sle. "Right Size".
 - 2) Dupont; <>: www.corian.com/#sle.
 - 3) Formica Corporation; <>: www.formica.com/#sle.
 - 4) Wilsonart: www.wilsonart.com/#sle.
 - b. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - d. Color and Pattern: As selected by Architect from manufacturer's Grade 4 line.
 - 3) Other Components Thickness: 1/2 inch, minimum.

- 4) Exposed Edge Treatment: Built up to minimum 1-1/2 inch thick; eased edge.
- 5) Back Splashes: Same sheet material, eased edge top; minimum 4 inches high. Backsplashes to be integral to countertop.

D. Solid Surfacing Wall Panels: Solid surfacing sheet or plastic resin casting over continuous substrate.

- 1) Flat Sheet Thickness: 1/4 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.
- 3) Manufacturers:
 - a. Meganite, Inc: www.meganite.com.
 - b. Corian: www.corian.com
 - c. Wilsonart: www.wilsonart.com.
- 4) Substitutions: See Section 01 6000 - Product Requirements.
 - a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.
 - b. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
 - c. Color and Pattern: As indicated on drawings.
- 5) Fabricate in accordance with manufacturer's standard requirements.

2.2. MATERIALS

- A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.
- B. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.
- C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- D. Joint Sealant: Mildew-resistant silicone sealant, white.

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, integral to counter, unless otherwise indicated.
- C. Solid Surfacing: Fabricate wall panels up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

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. Seal 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 0548 - VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Seismic control requirements.
 - 1) Includes requirements for seismic qualification of equipment not specified in this section.
- B. Seismic restraint systems

1.2. RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 05 5000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment
- D. Section 23 0548 - Vibration and Seismic Controls for HVAC

1.3. DEFINITIONS

- A. Fire Suppression Component: Where referenced in this section in regards to seismic controls, applies to any portion of the fire suppression system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g. piping).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.4. REFERENCE STANDARDS

- A. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.
- B. ASHRAE (HVAC) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.
- D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.
- F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- G. FM 1950 - Seismic Sway Braces for Automatic Sprinkler Systems; 2010.

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- H. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2015).
- J. MFMA-4 - Metal Framing Standards Publication; 2004.
- K. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.
- M. UL 203A - Standard for Sway Brace Devices for Sprinkler System Piping; Current Edition, Including All Revisions.

1.5. ADMINISTRATIVE REQUIREMENTS

A. Coordination:

- 1) Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment 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) Seismic Controls:
 - a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
 - b. Coordinate the work with other trades to accommodate relative positioning of essential and non-essential components in consideration of seismic interaction.
- 5) Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.6. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
 - 1) Seismic Controls: Include seismic load capacities.
- D. Shop Drawings - Seismic Controls:

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- 1) Include dimensioned plan views and sections indicating proposed fire suppression component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
 - 2) Identify mounting conditions required for equipment seismic qualification.
 - 3) Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
 - 4) Indicate proposed arrangement of distributed system trapeze support groupings.
 - 5) Indicate proposed locations for distributed system flexible fittings and/or connections.
 - 6) Indicate locations of seismic separations where applicable.
- 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.
- F. Field quality control test reports.

1.7. QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.

1.8. DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1. SEISMIC CONTROL REQUIREMENTS

- A. Design and provide fire suppression component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor fire suppression components.
- B. Seismic Design Criteria: As indicated on drawings.
- C. Seismic Restraints:
- 1) Provide seismic restraints for fire suppression components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
 - 2) Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:

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- a. ASHRAE (HVACA).
- b. FEMA 412.
- c. FEMA 413.
- d. FEMA 414.
- e. FEMA E-74.
- f. SMACNA (SRM).

3) Seismic Restraint Systems:

- a. Arrange restraint elements to avoid obstruction of sprinklers in accordance with NFPA 13.
- b. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
- c. Use only cable restraints to restrain vibration-isolated fire suppression components.
- d. Use only one restraint system type for a given fire suppression component or distributed system (e.g. piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
- e. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain fire suppression component in all lateral directions; consider bracket geometry in anchor load calculations.
- f. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported fire suppression component weight.
- g. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported fire suppression component weight.
- h. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
- i. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
- j. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

D. Seismic Attachments:

- 1) Comply with support and attachment requirements of NFPA 13.

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- 2) Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
- 3) Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
- 4) Do not use power-actuated fasteners.
- 5) Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps, but not for sway bracing attachments as prohibited by NFPA 13.
- 6) Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
- 7) Concrete Housekeeping Pads:
 - a. Increase size of pad as required to comply with anchor requirements.
 - b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

E. Seismic Interactions:

- 1) Include provisions to prevent seismic impact between fire suppression components and other structural or nonstructural components.
- 2) Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
- 3) Comply with minimum clearance requirements between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

F. Seismic Relative Displacement Provisions:

- 1) Use suitable fittings or flexible connections, in accordance with NFPA 13, to accommodate:
 - a. Relative displacements at connections between components, including distributed systems (e.g. piping); do not exceed load limits for equipment utility connections.
 - b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
 - c. Design displacements at seismic separations.
- 2) Provide clearance around fire suppression system piping extending through walls, floors, platforms, and foundations in accordance with NFPA 13.

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2.2. SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:

- 1) Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Where required by NFPA 13, provide products listed as complying with UL 203A or FM 1950.

D. Cable Restraints:

- 1) Comply with ASCE 19.
- 2) Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
- 3) Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
- 4) Use protective thimbles for cable loops where potential for cable damage exists.

E. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.2. CODE-REQUIRED SPECIAL INSPECTIONS

- A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in statement of special inspections.

3.3. INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Field-Welding (where approved by Architect): Comply with Section 05 5000.
- E. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

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F. Seismic Controls:

- 1) Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
- 2) Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
- 3) Equipment with Sheet Metal Housings:
 - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
 - b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
 - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
- 4) Concrete Housekeeping Pads:
 - a. Size in accordance with seismic design to meet anchor requirements.
 - b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
- 5) Seismic Restraint Systems:
 - a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
 - b. Install restraints within permissible angles in accordance with seismic design.
 - c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
 - d. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.4. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect vibration isolation and/or seismic control components for damage and defects.
- C. Provide manufacturer representative or authorized technician services to assist with inspection and testing of vibration isolation systems and seismic controls. Submit a detailed copy of manufacturer recommended inspection, testing, and field report procedures.
- D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

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- E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

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SECTION 21 1300 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Wet-pipe sprinkler system.
- B. Dry-pipe sprinkler system.
- C. System design, installation, and certification.

1.2. REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; current edition.
- B. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3. SUBMITTALS

- A. See Section 013300 - Submittals, 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.
- 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 Sprinklers: Type and size matching those installed, in quantity required by referenced NFPA design and installation standard.
 - 3) Sprinkler Wrenches: For each sprinkler type.
- E. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.4. QUALITY ASSURANCE

- A. Conform to FM (AG) requirements.
- B. Designer Qualifications: Design system under direct supervision of a Professional Engineer, or an individual having NICET Level III, or IV certification, and experienced in design of this type of work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.1. SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Majority light hazard..
- C. Water Supply: Utilize existing water flow test data.
- D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to existing cabinets, and only where additional head types are installed..

2.2. SPRINKLERS

- A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
 - 1) Response Type: Quick.
 - 2) Coverage Type: Standard.
 - 3) Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- B. Exposed Area Type: Upright type.
 - 1) Response Type: Quick.
 - 2) Coverage Type: Standard.
 - 3) Finish: Chrome plated.
 - 4) Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
 - 1) Response Type: Quick.
 - 2) Coverage Type: Standard.
 - 3) Finish: Chrome plated.
 - 4) Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- D. Dry Sprinklers: Recessed pendant type with matching push on escutcheon plate.
 - 1) Response Type: Quick.
 - 2) Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- E. 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.

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. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings.
- E. 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.
- F. Flush entire piping system of foreign matter.
- G. Hydrostatically test entire system.
- H. Require test be witnessed by Authority Having Jurisdiction.

END OF SECTION

SECTION 22 0517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Pipe sleeves.
- B. Pipe sleeve-seals.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 09 9113 - Exterior Painting: Preparation and painting of exterior piping systems.
- C. Section 09 9123 - Interior Painting: Preparation and painting of interior piping systems.
- D. Section 22 0719 - Plumbing Piping Insulation.

1.3. REFERENCE STANDARDS

- A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- B. FM (AG) - FM Approval Guide; current edition.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.

1.5. QUALITY ASSURANCE

- A. 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. Vertical Piping:
 - 1) Sleeve Length: 1 inch above finished floor.
 - 2) Provide sealant for watertight joint.
 - 3) Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.

- 4) Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Pipe Passing Through Concrete Slabs On Grade:

- 1) Zinc coated or cast iron pipe.
 - a. Cast-iron pipe sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.
- 2) Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

C. Pipe Passing Through Interior Walls and Partitions:

- 1) Plastic or sheet metal.

D. Pipe Passing Through Above Grade Exterior Walls:

- 1) Steel pipe sleeves.
 - a. ASTM A53, Type E, Grade B, Schedule 40, galvanized, with plain ends and integral welded waterstop collar.

E. Clearances:

- 1) Provide allowance for insulated piping.
- 2) Walls, Floors, and Partitions: 1 inch 1 inch greater than external pipe diameter.
- 3) All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

2.2. PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:

- 1) Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
- 2) Watertight seal between pipe and wall-sleeve, wall or casing opening.
- 3) Size and select seal component materials in accordance with service requirements and manufacturer's recommendations.
- 4) Stainless steel pressure end plates.

B. Sealing Compounds:

- 1) Provide packing and sealing compound to fill pipe to sleeve thickness.
- 2) Combined packing and sealing compounding to match partition fire-resistance hourly rating.

Sleeves and Sleeve Seals for Plumbing Piping		22 0517-2
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PART 3 EXECUTION

3.1. 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. Inserts:
 - 1) Provide inserts for placement in concrete formwork.
 - 2) Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - 3) Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 - 4) Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Structural Considerations: Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
 - 1) Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
 - 2) 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.
 - 3) All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
 - 4) Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- G. 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.

Sleeves and Sleeve Seals for Plumbing Piping		22 0517-3
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- 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.
- H. 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.

3.2. 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 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. Globe/balancing valves.

1.2. ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. PTFE: Polytetrafluoroethylene.
- E. TFE: Tetrafluoroethylene.

1.3. REFERENCE STANDARDS

- A. ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- C. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- D. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- E. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.
- F. NSF 61 - Drinking Water System Components - Health Effects; 2017.

1.4. SUBMITTALS

- A. See Section 13300 - Submittals, 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.

PART 2 PRODUCTS

2.1. APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:

General-Duty Valves for Plumbing Piping		22 0523-1
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- 1) Shutoff: Ball, valves.
- 2) Throttling: Provide Taco AccuFlo balance valves..

B. Domestic, Hot and Cold Water Valves:

- 1) 2 NPS and Smaller:
 - a. Bronze: 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 except plug valves.
- D. Valve-End Connections:
 - 1) Threaded End Valves: ASME B1.20.1.
 - 2) Solder Joint Connections: ASME B16.18.

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) Ball: Chrome plated brass.

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.

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. Related Requirements

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 5000 - Metal Fabrications.
- C. Section 22 0548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.

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 (Reapproved 2014).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2015.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- H. MFMA-4 - Metal Framing Standards Publication; 2004.
- I. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- J. NFPA 101 - Life Safety Code; 2015.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; 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.

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- 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) Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.5. Submittals

- A. See Section 01 3300 - Submittals for submittal procedures.

1.6. Quality Assurance

- A. Comply with applicable building code.
- B. Installer Qualifications for Field-Welding: As specified in Section 05 5000.

PART 2 PRODUCTS

2.1. SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

- 1) Comply with MSS SP-58.
- 2) Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
- 3) Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
- 4) 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.
- 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.

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- 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:
 - 1) Manufacturers:
 - a. 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.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 - 5) Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
 - D. 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.
 - E. Pipe Supports:
 - 1) Manufacturers:
 - a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
 - 2) 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.

- 3) Operating Temperatures from 122 to 446 degrees F:
 - a. Overhead Support: MSS SP-58 Type 1 or 3 through 12, with appropriate saddle of MSS SP-58 Type 40 for insulated pipe.
 - b. Roller Support: MSS SP-58 Types 41 or 43 through 46, with appropriate saddle of MSS SP-58 Type 39 for insulated pipe.
 - c. Sliding Support: MSS SP-58 Types 35 through 38.
- F. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
 - 1) Manufacturers:
 - a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
 - 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.
- G. Riser Clamps:
 - 1) Manufacturers:
 - a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
 - 2) Provide copper plated clamps for copper tubing support.
 - a. Shall be used for all copper tubing support.
 - 3) For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
- H. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.
 - 1) Manufacturers:
 - a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- I. Strut Clamps: Two-piece pipe clamp.
 - 1) Manufacturers:
 - a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- J. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.
 - 1) Manufacturers:

- a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- K. Pipe Hangers: For a given pipe run use hangers of the same type and material.
 - 1) Manufacturers:
 - a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
 - 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.
- L. Intermediate Pipe Guides: Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
 - 1) Manufacturers:
 - a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
 - 2) Pipe Diameter 6 inches and Smaller: Provide minimum clearance of 0.16 inch.
- M. Pipe Alignment Guides: Galvanized steel.
 - 1) Manufacturers:
 - a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
 - 2) Pipe Diameter 8 inches and Smaller: Spider or sleeve type.
- N. 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.
 - 1) Manufacturers:
 - a. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- O. 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) 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.
- 9) Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

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. Field-Welding (where approved by Architect): Comply with Section 05 5000.
- 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.
- 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.

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

SECTION 22 0548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Seismic control requirements.
 - 1) Includes requirements for seismic qualification of equipment not specified in this section.
- B. Seismic restraint systems.

1.2. RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 05 5000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 21 0548 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.
- D. Section 22 0529 - Hangers and Supports for Plumbing Piping and Equipment.
- E. Section 23 0548 - Vibration and Seismic Controls for HVAC.

1.3. DEFINITIONS

- A. Plumbing Component: Where referenced in this section in regards to seismic controls, applies to any portion of the plumbing system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g. piping).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.4. REFERENCE STANDARDS

- A. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.
- B. ASHRAE (HVAC) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.
- D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.
- F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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- H. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2015).
- I. MFMA-4 - Metal Framing Standards Publication; 2004.
- J. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.5. ADMINISTRATIVE REQUIREMENTS

A. Coordination:

- 1) Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment 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) Seismic Controls:
 - a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
 - b. Coordinate the work with other trades to accommodate relative positioning of essential and non-essential components in consideration of seismic interaction.
- 5) Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.6. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
 - 1) Seismic Controls: Include seismic load capacities.
- D. Shop Drawings - Seismic Controls:
 - 1) Include dimensioned plan views and sections indicating proposed plumbing component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
 - 2) Identify mounting conditions required for equipment seismic qualification.
 - 3) Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.

- 4) Indicate proposed arrangement of distributed system trapeze support groupings.
- 5) Indicate proposed locations for distributed system flexible fittings and/or connections.
- 6) Indicate locations of seismic separations where applicable.

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.

1.7. QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.

1.8. DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1. SEISMIC CONTROL REQUIREMENTS

- A. Design and provide plumbing component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor plumbing components.
- B. Seismic Design Criteria: As indicated on drawings.
- C. Seismic Restraints:
 - 1) Provide seismic restraints for plumbing components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
 - 2) Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
 - a. FEMA 412.
 - b. FEMA 413.
 - c. FEMA 414.
 - d. FEMA E-74.
 - e. SMACNA (SRM).
 - 3) Seismic Restraint Systems:

- a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
- b. Use only cable restraints to restrain vibration-isolated plumbing components, including distributed systems.
- c. Use only one restraint system type for a given plumbing component or distributed system (e.g. piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
- d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain plumbing component in all lateral directions; consider bracket geometry in anchor load calculations.
- e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported plumbing component weight.
- f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported plumbing component weight.
- g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
- h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
- i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

D. Seismic Attachments:

- 1) Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
- 2) Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
- 3) Do not use power-actuated fasteners.
- 4) Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
- 5) Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.

- 6) Concrete Housekeeping Pads:
 - a. Increase size of pad as required to comply with anchor requirements.
 - b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

E. Seismic Interactions:

- 1) Include provisions to prevent seismic impact between plumbing components and other structural or nonstructural components.
- 2) Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
- 3) Comply with minimum clearance requirements between plumbing equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

F. Seismic Relative Displacement Provisions:

- 1) Use suitable fittings or flexible connections to accommodate:
 - a. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
 - b. Design displacements at seismic separations.

2.2. SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:

- 1) Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Cable Restraints:

- 1) Comply with ASCE 19.
- 2) Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
- 3) Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
- 4) Use protective thimbles for cable loops where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- 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. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Secure fasteners according to manufacturer's recommended torque settings.
- D. Field-Welding (where approved by Architect): Comply with Section 05 5000.
- E. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- F. Seismic Controls:
 - 1) Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
 - 2) Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
 - 3) Equipment with Sheet Metal Housings:
 - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
 - b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
 - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
 - 4) Concrete Housekeeping Pads:
 - a. Size in accordance with seismic design to meet anchor requirements.
 - b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
 - 5) Seismic Restraint Systems:
 - a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.

- b. Install restraints within permissible angles in accordance with seismic design.
- c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
- d. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.3. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect vibration isolation and/or seismic control components for damage and defects.
- C. Provide manufacturer representative or authorized technician services to assist with inspection and testing of vibration isolation systems and seismic controls. Submit a detailed copy of manufacturer recommended inspection, testing, and field report procedures.
- D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.
- E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 22 0553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Pipe markers.

1.2. SUBMITTALS

- A. See Section 013300 - Submittals, for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.1. IDENTIFICATION APPLICATIONS

- A. Piping: Pipe markers.

2.2. PIPE MARKERS

- A. 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.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

END OF SECTION

Identification for Plumbing Piping and Equipment		22 0553-1
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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 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; 2018.
- C. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- D. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4. SUBMITTALS

- A. See Section 013300 - Submittals, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

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. 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.
- B. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- C. Vapor Barrier Lap Adhesive: Compatible with insulation.

2.3. FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. 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: 220 degrees F.
- 3) Connection: Waterproof vapor barrier adhesive.

PART 3 EXECUTION

3.1. 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. 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.

3.2. SCHEDULES

- A. Plumbing Systems:
 - 1) Domestic Hot Water Supply and Recirculation:
 - a. Glass Fiber Insulation:
 - 1) Pipe Size Range: 1 to 2 1/2 inch.
 - (a) Thickness: 1 inch.
 - 2) Pipe Size Range: 3/4 inch and under.
 - (a) Thickness: 1/2 inch.
 - 2) Domestic Cold Water:

a. Glass Fiber Insulation:

1) Pipe Size Range: 1 1/2 inch and larger.

(a) Thickness: 1 inch.

2) Pipe Size Range: 1 inch and under.

(a) Thickness: 1/2 inch.

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) Natural Gas.
 - 4) Flanges, unions, and couplings.
 - 5) Pipe hangers and supports.
 - 6) Strainers.

1.2. REFERENCE STANDARDS

- A. ANSI Z223.1 - National Fuel Gas Code; 2016.
- B. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- E. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 2016.
- F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012.
- G. ASME B31.1 - Power Piping; 2016.
- H. ASME B31.9 - Building Services Piping; 2014.
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2017.
- K. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2017.
- L. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- M. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- N. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.
- O. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.

- P. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- Q. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- R. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.
- S. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 2012a.
- T. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.
- U. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2015.
- V. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
- W. 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.
- X. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.
- Y. 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).
- Z. 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).
- AA. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- BB. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- CC. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.3. SUBMITTALS

- A. See Section 013300 - Submittals, 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.

1.4. QUALITY ASSURANCE

- A. 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 service 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 heavy-duty stainless steel clamp-and-shield assemblies.
- B. Copper Tube: ASTM B306, DWV.
 - 1) Fittings: ASME B16.29, wrought copper, or ASME B16.23, solvent.
 - 2) Joints: ASTM B32, alloy Sn50 solder.
- C. PVC Pipe: ASTM D2665.
 - 1) Fittings: PVC.
 - 2) Joints: Solvent welded, with ASTM D2564 solvent cement.
 - 3) All PVC exposed in return air plenums must be wrapped with a fire-resistant wrap per ASTM E84 equal to 3M Fire Barrier Plenum Wrap 5A+. Wrap must be installed per manufacturer's guidelines.

2.4. DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. PE Pipe: ASTM D2239.
 - 1) Fittings: ASTM D2609, PE.
 - 2) Joints: Mechanical with stainless steel clamp.

2.5. 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: Double pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, non toxic synthetic rubber sealing elements.
 - a. Manufacturers:
 - 1) Viega Press-Fitt system (no substitutions).

2.6. NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M Schedule 40 black.

- 1) Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
- 2) Joints: Threaded or welded to ASME B31.1.

2.7. FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:

- 1) Ferrous pipe: Class 150 malleable iron threaded unions.
- 2) Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Flanges for Pipe Size Over 1 Inch:

- 1) Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
- 2) Copper Tube and Pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.8. PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

- 1) If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
- 2) Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
- 3) Trapeze Hangers: Welded steel channel frames attached to structure.

- 4) Vertical Pipe Support: Steel riser clamp.

B. Plumbing Piping - Drain, Waste, and Vent:

- 1) Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
- 2) Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- 3) Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.

C. Plumbing Piping - Water:

- 1) Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
- 2) Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- 3) Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.

2.9. STRAINERS

A. 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. 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.

3.2. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- C. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover.
- D. 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.
- E. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

F. Pipe Hangers and Supports:

- 1) Install in accordance with ASME B31.9.
- 2) Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- 3) Place hangers within 12 inches of each horizontal elbow.
- 4) Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- 5) Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

3.3. SCHEDULES

A. Pipe Hanger Spacing:

- 1) Metal Piping:
 - a. Pipe Size: 1/2 inches to 1-1/4 inches:
 - 1) Maximum Hanger Spacing: 6.5 ft.
 - 2) Hanger Rod Diameter: 3/8 inches.
 - b. Pipe Size: 1-1/2 inches to 2 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.
 - c. Pipe Size: 2-1/2 inches to 3 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 1/2 inch.
 - d. Pipe Size: 4 inches to 6 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 5/8 inch.
- 2) Plastic Piping:
 - a. All Sizes:
 - 1) Maximum Hanger Spacing: 6 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION

SECTION 22 1006 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Hydrants.
- D. Backflow preventers.
- E. Mixing valves.

1.2. REFERENCE STANDARDS

- A. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- B. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.3. SUBMITTALS

- A. See Section 013300 - Submittals for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

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. Refer to plan schedules for all drains associated with this project.

2.3. CLEANOUTS

- A. Refer to plan cleanout schedules for all cleanouts associated with this project.

2.4. HYDRANTS

- A. Refer to plan schedules for sill cocks to be used for this project.

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. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

END OF SECTION

SECTION 22 3000 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

A. Water Heaters:

- 1) Commercial electric.

B. Domestic Water Filters and Treatment equipment.

1.2. REFERENCE STANDARDS

- A. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

1.3. SUBMITTALS

- A. See Section 013300 - Submittals, for submittals procedures.

B. Product Data:

- 1) Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
- 2) Provide electrical characteristics and connection requirements.

1.4. QUALITY ASSURANCE

A. Certifications:

- 1) Water Heaters: NSF approved.
- 2) Electric Water Heaters: UL listed and labeled to UL 174.
- 3) Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1. WATER HEATERS

- A. Refer to plan schedules for water heaters to be utilized for this project.

2.2. DOMESTIC WATER FILTERS AND TREATMENT EQUIPMENT

- A. Reference plan schedules for domestic water filters and treatment equipment.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

- B. Coordinate with plumbing piping and related electrical work to achieve operating system.
- C. Install water filters allowing adequate room for filter cartridge change out.
- D. Route equipment drains full size to floor drain terminating with air gap.

END OF SECTION

SECTION 22 4000 - PLUMBING FIXTURES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Water closets.
- B. Lavatories.
- C. Sinks.
- D. Electric water coolers.

1.2. REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- C. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.3. SUBMITTALS

- A. See Section 013300 - Submittals, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

PART 2 PRODUCTS

2.1. GENERAL

- 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.

2.2. FLUSH VALVE WATER CLOSETS

- A. Refer to plan schedules for flush valve water closets to be used for this project.

2.3. TANK TYPE WATER CLOSETS

- A. Refer to plan schedules for tank type water closets to be used for this project.

2.4. LAVATORIES

- A. Refer to plan schedules for lavatories to be used for this project.

2.5. SINKS

- A. Refer to plan schedules for sinks to be used for this project.

2.6. ELECTRIC WATER COOLERS

- A. Refer to plan schedules for electric water coolers to be used for this project.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and 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. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 0513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. General construction and requirements.
- B. Applications.
- C. Single phase electric motors.
- D. Three phase electric motors.
- E. Electronically Commutated Motors (ECM).

1.2. REFERENCE STANDARDS

- A. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; 2004.
- B. NEMA MG 1 - Motors and Generators; 2017.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.

PART 2 PRODUCTS

2.1. GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Electrical Service:
 - 1) Motors 1/2 HP and Smaller: 115 volts, single phase, 60 Hz.
 - 2) Motors Larger than 1/2 Horsepower: 208 volts, three phase, 60 Hz.
- B. Nominal Efficiency:
 - 1) Open Motor with Two Poles: 82.5.
 - 2) Open Motor with Four Poles: 82.5.
 - 3) Open Motor with Six Poles: 50.0.
 - 4) Enclosed Motor with Two Poles: 75.5.
 - 5) Enclosed Motor with Four Poles: 82.5.
 - 6) Enclosed Motor with Six Poles: 50.0.
- C. Construction:

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- 1) Open drip-proof type except where specifically noted otherwise.
 - 2) Design for continuous operation in 104 degrees F environment.
 - 3) Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- E. Wiring Terminations:
- 1) Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 - 2) For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.2. APPLICATIONS

- A. Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not conform to these specifications.
- B. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.
- C. Motors located in direct drive axial fans: Totally enclosed type.

2.3. SINGLE PHASE POWER - SPLIT PHASE MOTORS

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.
- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

2.4. SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.
- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A (50 degrees C temperature rise) insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.5. 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.

2.6. THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Starting Torque: Between 1 and 1-1/2 times full load torque.
- B. Starting Current: Six times full load current.
- C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.
- E. Insulation System: NEMA Class B or better.
- F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.

2.7. ELECTRONICALLY COMMUTATED MOTORS (ECM)

- A. Applications:
 - 1) Commercial:
 - a. Packaged Air Handling Unit:
 - 1) Operating Mode: Constant speed.
 - 2) Input: Motor manufacturer to coordinate control requirements with the control board of the roof top unit and/or specified sequence of operation.
 - 3) RPM: 300 through 1200.
 - b. Hydronic Fan Coil Unit:
 - 1) Operating Mode: Constant cfm.

- 2) Input: Motor manufacturer to coordinate control requirements with the control board of the fan coil unit and/or specified sequence of operation.
 - 3) Options: Remote mount control.
 - 4) RPM: 300 through 1250.
- c. Power Roof Ventilator (PRV):
- 1) Operating Mode: Constant cfm.
 - 2) Input: Motor manufacturer to coordinate control requirements with the control board of the PRV and/or specified sequence of operation.
 - 3) Options: Remote mount control/User-interface box.

PART 3 EXECUTION

3.1. 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 23 0516 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.

1.2. RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping.

1.3. SUBMITTALS

- A. See Section 01 330 - Submittals for submittal procedures.
- B. Product Data:
 - 1) Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
 - 2) Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

PART 2 PRODUCTS

2.1. FLEXIBLE PIPE CONNECTORS - STEEL PIPING

- A. Inner Hose: Bronze.
- B. Pressure Rating: 125 psi and 450 degrees F.
- C. Joint: Flanged.
- D. Size: Use pipe sized units.
- E. Maximum offset: 3/4 inch on each side of installed center line.

2.2. FLEXIBLE PIPE CONNECTORS - COPPER PIPING

- A. Inner Hose: Bronze.
- B. Exterior Sleeve: Braided bronze.
- C. Pressure Rating: 125 psi and 450 degrees F.
- D. Joint: Flanged.
- E. Size: Use pipe sized units.

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- F. Maximum offset: 3/4 inch on each side of installed center line.
- G. Application: Copper piping.

2.3. EXPANSION JOINTS - TWO-PLY BRONZE BELLOWS TYPE

- A. Construction: Bronze with anti-torque device, limit stops, internal guides.
- B. Pressure Rating: 125 psi and 400 degrees F.
- C. Maximum Compression: 1-3/4 inches.
- D. Maximum Extension: 1/4 inch.
- E. Joint: Soldered.
- F. Size: Use pipe sized units.
- G. Application: Copper piping.

2.4. EXPANSION LOOPS - HOSE AND BRAID

- A. Provide flexible loops with two flexible sections of hose and braid, two 90 degree elbows, and 180 degree return with support bracket and air release or drain plug.
- B. Provide flexible loops capable of movement in the x, y, and z planes. Flexible loops to impart no thrust loads to the building structure.
- C. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
 - 1) Maximum Allowable Working Pressure: 150 psig at 120 degrees F.
 - 2) Accommodate the Following:
 - a. Axial Deflection in Compression and Expansion: one inch.
 - b. Lateral Movement: one inch.
 - c. Angular Rotation: 15 degrees.
 - d. Force developed by 1.5 times specified maximum allowable operating pressure.
 - 3) End Connections: Same as specified for pipe jointing.
 - 4) Provide necessary accessories including, but not limited to, swivel joints.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

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- C. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- D. Anchor pipe to building structure. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- E. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.

END OF SECTION

Expansion Fittings and Loops for HVAC Piping		23 0516-3
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SECTION 23 0517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Pipe sleeves.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 23 0523 - General-Duty Valves for HVAC Piping.
- C. Section 23 0719 - HVAC Piping Insulation.

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 3300 - Submittals for submittal procedures.

1.5. QUALITY ASSURANCE

PART 2 PRODUCTS

2.1. PIPE SLEEVES

- A. Vertical Piping:
 - 1) Sleeve Length: 1 inch above finished floor.
 - 2) Provide sealant for watertight joint.
- 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 conforming to ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.

Sleeves and Sleeve Seals for HVAC Piping		23 0517-1
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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. Inserts:
 - 1) Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- E. Structural Considerations:
 - 1) Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating footings, floors, 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 conforming to 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 conforming to ASTM E814 in accordance with Section 07 8400 to prevent the spread of fire, smoke, and gases.
 - 3) Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- 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

Sleeves and Sleeve Seals for HVAC Piping		23 0517-2
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SECTION 23 0519 - METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Flow meters.
- B. Pressure gauges and pressure gauge taps.
- C. Thermometers and thermometer wells.
- D. Static pressure gauges.
- E. Filter gauges.

1.2. RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping.

1.3. REFERENCE STANDARDS

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.
- B. ASME MFC-3M - Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi; 2004.
- C. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.
- D. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014, with Editorial Revision (2017).
- E. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

PART 2 PRODUCTS

2.1. LIQUID FLOW METERS

- A. Manufacturers:
 - 1) Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2) McCrometer: www.mccrometer.com.

- 3) Venture Measurement, a Danaher Company: www.venturemeasurement.com.
- B. Calibrated ASME MFC-3M Venturi orifice plate and flanges with valved taps, chart for conversion of differential pressure readings to flow rate, with pressure gauge in case.
- C. Annular element flow stations with meter set.
 - 1) Measuring Station: Type 316 stainless steel pitot type flow element inserted through welded threaded couplet, with safety shut-off valves and quick coupling connections, and permanent metal tag indicating design flow rate, reading for design flow rate, metered fluid, line size, station or location number.
 - a. Pressure rating: 275 psi.
 - b. Maximum temperature: 400 degrees F.
 - c. Accuracy: Plus 0.55 percent to minus 2.30 percent.
 - 2) Portable Meter Set: Dry single diaphragm type pressure gauge with 6 inch dial pointer, stainless steel wetted metal parts, variable pulsation damper, equalizing valve, two bleed valves, and master chart for direct conversion of meter readings to flow rate, mounted in rust-proof carrying case with two ten foot long rubber test hoses with brass valves or quick connections for measuring stations.

2.2. PRESSURE GAUGES

- A. Manufacturers:
 - 1) Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2) Moeller Instrument Company, Inc: www.moellerinstrument.com.
 - 3) Omega Engineering, Inc: www.omega.com.
- B. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
 - 1) Case: Steel with brass bourdon tube.
 - 2) Size: 4-1/2 inch diameter.
 - 3) Mid-Scale Accuracy: One percent.
 - 4) Scale: Psi and KPa.

2.3. PRESSURE GAUGE TAPPINGS

- A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.
- B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.
- C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.
- D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

2.4. 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.

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) Stem: 0.25 inch brass.
- 4) Accuracy: 2 percent, per ASTM E77.
- 5) Calibration: Degrees F.

C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.

- 1) Size: 9 inch scale.
- 2) Window: Clear Lexan.
- 3) Stem: 3/4 inch NPT brass.
- 4) Accuracy: 2 percent, per ASTM E77.
- 5) Calibration: Degrees F.

2.5. DIAL 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.

B. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.

- 1) Size: 5 inch diameter dial.
- 2) Lens: Clear glass.

- 3) Accuracy: 1 percent.
- 4) Calibration: Degrees F.
- C. Thermometer: ASTM E1, stainless steel case, adjustable angle with front recalibration, bimetallic helix actuated with silicone fluid damping, white with black markings and black pointer hermetically sealed lens, stainless steel stem.
 - 1) Size: 3 inch diameter dial.
 - 2) Lens: Clear glass.
 - 3) Accuracy: 1 percent.
 - 4) Calibration: Degrees F.
- D. Thermometers: Dial type vapor or liquid actuated; ASTM E1; stainless steel case, with brass or copper bulb, copper or bronze braided capillary, white with black markings and black pointer, glass lens.
 - 1) Size: 4-1/2 inch diameter dial.
 - 2) Lens: Clear glass.
 - 3) Length of Capillary: Minimum 5 feet.
 - 4) Accuracy: 2 percent.
 - 5) Calibration: Degrees F.

2.6. THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.
- B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.7. TEST PLUGS

- A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel core for temperatures up to 350 degrees F.
- B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gauges, one gauge adapters with 1/8 inch probes, two 1 inch dial thermometers.

2.8. STATIC PRESSURE GAUGES

- A. Manufacturers:
 - 1) Dwyer Instruments, Inc: www.dwyer-inst.com.
 - 2) Omega Engineering, Inc: www.omega.com.
 - 3) Veris Industries: www.veris.com.

- B. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.
- C. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.
- D. Accessories: Static pressure taps with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.
- C. Install pressure gauges with pulsation dampers. Provide gauge cock to isolate each gauge. Provide siphon on gauges in steam systems. Extend nipples and siphons to allow clearance from insulation.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- E. Install thermometers in air duct systems on flanges.
- F. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.
- G. Coil and conceal excess capillary on remote element instruments.
- H. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- I. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- J. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- K. Locate test plugs adjacent thermometers and thermometer sockets.

END OF SECTION

SECTION 23 0523 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Globe valves.
- D. Ball valves.
- E. Check valves.

1.2. 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: Nonrising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. SWP: Steam working pressure.
- I. TFE: Tetrafluoroethylene.

1.3. REFERENCE STANDARDS

- A. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard; 2017.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- C. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.
- D. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- E. AWWA C606 - Grooved and Shouldered Joints; 2015.
- F. MSS SP-45 - Bypass and Drain Connections; 2003 (Reaffirmed 2008).
- G. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; 2013.
- H. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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.

1.5. QUALITY ASSURANCE

- A. Manufacturer:
 - 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 documented experience.
- B. Welding Materials and Procedures: Conform to ASME BPVC-IX.

PART 2 PRODUCTS

2.1. APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:
 - 1) Throttling (Hydronic): Butterfly, Ball, and Globe.
 - 2) Isolation (Shutoff): Butterfly, Gate, Ball, Plug, and _____.
 - 3) Dead-End: Butterfly, single-flange (lug) type.
- B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.
- C. Required Valve End Connections for Non-Wafer Types:
 - 1) Copper Tube:
 - a. 2 NPS and Smaller: Solder-joint valve-ends or brazed.
- D. Chilled Water Valves:
 - 1) 2 NPS and Smaller, Bronze Valves:
 - a. Solder-joint ends.
 - b. Ball: Full port, one piece, bronze trim.
 - c. Swing Check: Bronze disc, Class.
 - d. Gate: NRS, Class 125.
 - e. Globe: Bronze disc, Class 125.
- E. Heating Hot Water Valves:

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- 1) 2 NPS and Smaller, Bronze Valves:
 - a. Flanged ends.
 - b. Ball: Full port, one piece, bronze trim.
 - c. Swing Check: Bronze disc, Class 125.
 - d. Gate: NRS, Class 125.
 - e. Globe: Bronze disc, Class 125.

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) Gear Actuator: Quarter-turn valves 8 NPS and larger.
- D. Valves in Insulated Piping: Provide 2 NPS stem extensions and the following features:
 - 1) Gate Valves: Rising stem.
 - 2) 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.
 - 3) Butterfly Valves: Extended neck.
 - 4) Memory Stops: Fully adjustable after insulation is installed.
- E. Memory Stops: Fully adjustable after insulation is installed.
- F. Valve-End Connections:
 - 1) Pipe Flanges and Flanged Fittings 1/2 NPS through 24 NPS: ASME B16.5.
 - 2) Solder Joint Connections: ASME B16.18.
 - 3) Grooved End Connections: AWWA C606.
- G. Bronze Valves:
 - 1) Fabricate from dezincification resistant material.
 - 2) Copper alloys containing more than 15 percent zinc are not permitted.
- H. Valve Bypass and Drain Connections: MSS SP-45.

2.3. BRONZE GLOBE VALVES

A. Class 125: CWP Rating: 200 psig:.

- 1) Comply with MSS SP-80, Type 1.
- 2) Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
- 3) Ends: Solder joint.
- 4) Stem and Disc: Bronze or PTFE.
- 5) Packing: Asbestos free.
 - a. Handwheel: Malleable iron.

2.4. BRONZE BALL VALVES

A. One Piece, Reduced Port with Bronze Trim:

- 1) Comply with MSS SP-110.
- 2) CWP Rating: 400 psig.
- 3) Body: Bronze.
- 4) Ends: Solder-joint.
- 5) Seats: PTFE.
- 6) Stem: Bronze.
- 7) Ball: Chrome plated brass.

2.5. 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) Body Design: Horizontal flow.
- 3) Body Material: Bronze, ASTM B62.
- 4) Ends: Solder-joint or brazed.
- 5) Disc: Bronze.

2.6. BRONZE GATE VALVES

A. Non-Rising Stem (NRS) or Rising Stem (RS):

- 1) Comply with MSS SP-80, Type I.
- 2) Class125: CWP Rating: 200 psig.

- 3) Class 150: CWP Rating: 300 psig.
- 4) Body Material: Bronze with integral seat and union-ring bonnet.
- 5) Ends: Brazed or solder joint.
- 6) Stem: Bronze.
- 7) Disc: Solid wedge; bronze.
- 8) Packing: Asbestos free.
- 9) Handwheel: Malleable iron, bronze, or aluminum.

PART 3 EXECUTION

3.1. 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.

END OF SECTION

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. 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. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- F. MFMA-4 - Metal Framing Standards Publication; 2004.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3. 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 the contract documents. Obtain direction before proceeding with work.

B. Sequencing:

- 1) Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.

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- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

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: 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. Thomas & Betts Corporation: www.tnb.com.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com.
- 2) Comply with MFMA-4.

C. 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.

D. Thermal Insulated Pipe Supports:

- 1) 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 polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
- 2) PVC Jacket:
 - a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
 - b. Minimum Service Temperature: Minus 40 degrees F.
 - c. Maximum Service Temperature: 180 degrees F.
 - d. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
 - e. Thickness: 60 mil.
 - f. Connections: Brush on welding adhesive.
- 3) Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

E. Anchors and Fasteners:

- 1) Manufacturers - Mechanical Anchors and Powder-Actuated Fastening Systems:
 - 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.
- 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) Powder-actuated fasteners are permitted only as follows:
 - a. Where approved by Architect.
 - b. Use only threaded studs; do not use pins.
- 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. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.1. 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.

- 4) Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- 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.

END OF SECTION

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SECTION 23 0548 - VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Equipment support bases.
- B. Vibration isolators.
- C. Seismic snubber assemblies.
- D. Seismic restraints for suspended components and equipment.

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. ASHRAE (HVAC) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.
- D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.
- F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- G. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.3. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1) Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment 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) Seismic Controls:
 - a. Coordinate the arrangement of seismic restraints with piping, conduit, 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.

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1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
 - 1) Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification method for spring element load capacities.
 - 2) Seismic Controls: Include seismic load capacities.
- D. Shop Drawings - Vibration Isolation Systems:
 - 1) Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
 - 2) Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.
- E. Shop Drawings - Seismic Controls:
 - 1) Include dimensioned plan views and sections indicating proposed HVAC component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
 - 2) Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
 - 3) Indicate proposed arrangement of distributed system trapeze support groupings.
 - 4) Indicate proposed locations for distributed system flexible fittings and/or connections.
 - 5) Indicate locations of seismic separations where applicable.
- F. Seismic Design Data:
 - 1) Compile information on project-specific characteristics of actual installed HVAC components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
- G. Shop Drawings:
 - 1) Provide schedule of vibration isolator type with location and load on each.
 - 2) Fully dimensioned fabrication drawings and installation details for vibration isolation bases, member sizes, attachments to isolators, and supported equipment.
 - 3) Include auxiliary motor slide bases and rails, base weights, inertia bases, concrete weights, equipment static loads, support points, vibration isolators, and detailed layout of isolator location and orientation with static and dynamic load on each isolator.

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- 4) Include the seal of the Professional Structural Engineer registered in the State of Missouri in which the Project is located, on drawings and calculations which at a minimum include the following:
 - a. Seismic Restraint Details: Detailed drawings of seismic restraints and snubbers including anchorage details that indicate quantity, diameter, and depth of penetration, edge distance, and spacing of anchors.
 - b. Equipment Seismic Qualification Certification: Certification by the manufacturer or responsible party that each piece of equipment provided will withstand seismic force levels as specified in the applicable building code for seismic controls.

H. Manufacturer's Instructions: Indicate installation instructions with special procedures and setting dimensions.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Kinetics Noise Control, Inc: www.kineticsnoise.com.
- B. Mason Industries: www.mason-ind.com/#sle.
- C. Vibration Eliminator Company, Inc: www.veco-nyc.com.

2.2. PERFORMANCE REQUIREMENTS

- A. General:
 - 1) All vibration isolators, base frames and inertia bases to conform to all uniform deflection and stability requirements under all operating loads.
 - 2) Steel springs to function without undue stress or overloading.

2.3. EQUIPMENT SUPPORT BASES

- A. Structural Bases:
 - 1) Construction: Engineered, structural steel frames with welded brackets for side mounting of the isolators.
 - 2) Frames: Square, rectangular or T-shaped.
 - 3) Design: Sufficiently rigid to prevent misalignment or undue stress on machine, and to transmit design loads to isolators and snubbers.

2.4. VIBRATION ISOLATORS

- A. Non-Seismic Type:
 - 1) All Elastomeric-Fiber Glass Pads:
 - a. Configuration: Flat or molded.

- b. Thickness: 0.25 inch minimum.
 - c. Assembly: Single or multiple layers using bonded, galvanized sheet metal separation plate between each layer with load plate providing evenly distributed load over pad surface.
- 2) Elastomeric Mounts:
- a. Material: Oil, ozone, and oxidant resistant compounds.
 - b. Assembly: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
- 3) Steel Springs:
- a. Assembly: Freestanding, laterally stable without housing.
 - b. Leveling Device: Rigidly connected to equipment or frame.
- 4) Restrained Steel Springs:
- a. Housing: Rigid blocking during rigging prevents equipment installed and operating height from changing during temporary weight reduction.
 - b. Equipment Wind Loading: Adequate means for fastening isolator top to equipment and isolator base plate to supporting structure.
- 5) Elastomeric Hangers:
- a. Housing: Steel construction containing elastomeric isolation element to prevent rod contact with housing and short-circuiting of isolating function.
 - b. Incorporate steel load distribution plate sandwiching elastomeric element to housing.
- 6) Spring Hanger:
- a. Housing: Steel construction containing stable steel spring and integral elastomeric element preventing metal to metal contact.
 - b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.
- 7) Combination Elastomeric-Spring Hanger:
- a. Housing: Steel construction containing stable steel spring with elastomeric element in series isolating upper connection of hanger box to building structure.
 - b. Bottom Opening: Sized to allow plus/minus 15 degrees rod misalignment.

B. Seismic Type:

- 1) Coil Springs Consisting of Single Elements:
- a. Housing: Manufactured from cast iron material.

- b. Ductile Material: Designed and rated for seismic applications.
 - c. Spring: Restrained by housing without significant degradation of vibration isolation capabilities during normal equipment operating conditions.
 - d. Resilient Snubbing Grommet System: Incorporated and designed with clearances of no more than 0.25 inch in any direction preventing direct metal-to-metal contact between supported member and fixed restraint housing.
 - e. Resilient Pad: Located in series with spring.
 - f. Coil Springs: Color coded elements to have a lateral stiffness greater than 0.8 times the rated vertical stiffness with 50 percent overload capacity.
 - g. Finish: Suitable for the application.
- 2) All Directional Elastomeric:
- a. Material: Molded from oil, ozone, and oxidant resistant compounds.
 - b. Operating Parameters: Designed to operate within the isolator strain limits providing maximum performance and service life.
 - c. Attachment Method: Encapsulated load transfer plate bolted to equipment and base plate with anchor hole bolted to supporting structure.
 - d. Rating: Cast iron and aluminum housings rated for seismic restraint applications.
 - e. Minimum Operating Static Deflections: Deflections indicated in project documents are not to exceed published load capacities.

2.5. SEISMIC SNUBBER ASSEMBLIES

A. Comply with:

- 1) ASHRAE (HVACA) Handbook - HVAC Applications.
- 2) FEMA 412.
- 3) FEMA 413.
- 4) FEMA 414.
- 5) FEMA E-74.
- 6) SMACNA (SRM).

B. Lateral External:

- 1) Application: Minimum three (3) snubbers are required for each stable equipment installation, oriented properly to restrain isolated equipment in all lateral directions where uplift forces are zero or addressed by other restraints.

- 2) Construction: Steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
- 3) Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
- 4) Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

C. Omni Directional External:

- 1) Application: Minimum four (4) snubbers are required for each stable equipment installation, oriented properly to restrain isolated equipment in all lateral directions.
- 2) Construction: Steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
- 3) Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
- 4) Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

D. Horizontal Single Axis External:

- 1) Application: Minimum four (4) snubbers are required for each stable equipment installation, oriented properly to restrain isolated equipment in all lateral directions where uplift forces are zero or addressed by other restraints.
- 2) Construction: Steel construction attached to the building structure and equipment in a manner consistent with anticipated design loads.
- 3) Performance: Equipment movement at each snubber location limited to a maximum of 0.25 inches in any direction without significantly degrading the vibration isolation capability of the isolator during normal operating conditions.
- 4) Resilient Pad: Minimum 0.25 inch thick cushions any impact and prevents metal-to-metal contact.

2.6. SEISMIC RESTRAINTS FOR SUSPENDED COMPONENTS AND EQUIPMENT

A. Comply with:

- 1) ASHRAE (HVACA) Handbook - HVAC Applications.
- 2) FEMA 412.
- 3) FEMA 413.
- 4) FEMA 414.

- 5) FEMA E-74.
- 6) SMACNA (SRM).

B. Cable Restraints:

- 1) Wire Rope: Steel wire strand cables sized to resist seismic loads in all lateral directions.
- 2) Protective Thimbles: Eliminates potential for dynamic cable wear and strand breakage.
- 3) Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
- 4) Connections:
 - a. Use overlapping wire rope U clips, cable clamping bolts, swaged sleeves or seismically rated tool-less wedge insert lock connectors.
 - b. Internally brace clevis hanger bracket cross bolt to prevent deformation.
- 5) Vertical Suspension Rods: Attach required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

C. Rigid Restraints:

- 1) Structural Element: Sized to resist seismic loads in all lateral directions and carry both compressive and tensile loading.
- 2) Size: Based on the lesser of cable capacity or anchor load taking into account bracket geometry.
- 3) Connections: Internally brace clevis hanger bracket cross bolt to prevent deformation.
- 4) Static Support System: Anchorage capable of carrying additional tension loads generated by the vertical component of the rigid brace compression which is additive to any static load requirements on the system.
- 5) Vertical Suspension Rods: Attached required bracing of sufficient strength to prevent rod buckling from vertical compression forces utilizing series of attachment clips.

2.7. ROOF CURBS

A. Vibration Isolation Curbs:

- 1) Seismic Curb:
 - a. Location: Between structure and rooftop equipment.
 - b. Construction: Steel.
 - c. Integral vibration isolation to conform to requirements of this section.
 - d. Snubbers consist of minimum 0.25 inch thick resilient pads to avoid metal-to-metal contact without compromising vibration isolating capabilities.

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- e. Weather exposed components consist of corrosion resistant materials.

PART 3 EXECUTION

3.1. INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. Bases:
- 1) Set steel bases for one inch clearance between housekeeping pad and base.
 - 2) Adjust equipment level.
- C. On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- D. Support piping connections to equipment mounted on isolators using isolators or resilient hangers for scheduled distance.
- 1) Up to 4 Inches Pipe Size: First three points of support.
 - 2) Select three hangers closest to vibration source for minimum 1.0 inch static deflection or static deflection of isolated equipment. Select remaining isolators for minimum 1.0 inch static deflection or 1/2 static deflection of isolated equipment.

3.2. INSTALLATION - SEISMIC

- A. Seismic Snubbers:
- 1) Provide on all isolated equipment, piping and ductwork.
 - 2) Provide minimum of four seismic snubbers located close to isolators.
 - 3) Snub equipment designated for post-disaster use to 0.05 inch maximum clearance.
 - 4) Snub all other equipment between 0.15 inch and 0.25 inch clearance.
- B. Floor and Base-Mounted Equipment, Vibration Isolated Equipment and associated Vibration and Seismic Controls for Connections:
- 1) Install equipment anchorage items designed to resist seismic design force in any direction.
 - 2) Install vibration and seismic controls designed to include base and isolator requirements.
 - 3) Provide flexible connections between equipment and interconnected piping.
 - 4) Provide isolators and restraints designed for amplified code forces per ASCE 7 and with demonstrated ability to resist required forces including gravity, operational and seismic forces.
 - 5) Where equipment is not designed to be point loaded, provide base capable of transferring gravity and seismic demands from equipment to isolator base plate anchorage.

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- 6) Where concrete floor thickness is less than required for expansion anchor installation, install through bolt in lieu of expansion anchor.
- 7) Where timber/wood floor or other substrate is inadequate for installation of lag bolts, screws or other mechanical fasteners, install supplemental framing or blocking to transfer loads to structural elements.

C. Suspended Mechanical Equipment:

- 1) Provide supports and bracing to resist seismic design force in any direction.
- 2) Provide flexible connections between equipment and interconnected piping.
- 3) Brace equipment hung from spring mounts using cable or other bracing that will not transmit vibration to the structure.
- 4) Use of proprietary restraint systems with a certificate of compliance, verified and listed by an accredited inspection body is acceptable (pending shop drawing approval), as an alternative to project specific seismic bracing design.

D. Wall mounted Mechanical Equipment:

- 1) Provide support and bracing to resist seismic design force in any direction.
- 2) Install backing plates or blocking as required to deliver load to primary wall framing members.

E. Piping:

- 1) Provide seismic bracing in accordance ASCE 7.
- 2) Provide supports, braces, and anchors to resist gravity and seismic design forces.
- 3) Provide flexible connections between floor mounted equipment and suspended piping; between unbraced piping and restrained suspended items; as required for thermal movement; at building separations and seismic joints; and wherever relative differential movements could damage pipe in an earthquake.
- 4) Brace resiliently supported pipe with cable bracing or alternate means designed to prevent transmission of vibrations and noise to the structure.
- 5) Brace every run 5.0 feet or more in length with two transverse and one longitudinal bracing locations.
- 6) Piping Explicitly Exempt from Seismic Bracing Requirements:
 - a. Provide flexible connections between piping and connected equipment, including in-line devices such as VAV boxes and reheat coils.
 - b. Install piping consistent with ASCE 7, such that swinging of the pipes will not cause damaging impact with adjacent components, finishes, or structural framing while maintaining clear horizontal distance of 67 percent of the hanger length between subject components.

- c. Provide swing restraints as required to control potential impact due to limited space between subject components.

F. Ductwork:

- 1) Provide seismic bracing for ducts with cross sectional area greater than 6 sq ft (independent of duct contents).
- 2) Provide seismic bracing for all ducts containing hazardous materials.
- 3) Provide supports, braces, and anchors to resist gravity and seismic design forces.
- 4) Install ducts and duct risers designed to accommodate interstory drift.
- 5) Independently support in-line devices weighing more than 20 pounds.
- 6) Independently support and brace all in-line devices weighing more than 75 pounds.
- 7) Provide unbraced piping attached to braced in-line equipment with adequate flexibility to accommodate differential displacements.
- 8) Positively attach dampers, louvers, diffusers and similar appurtenances to ductwork with mechanical fasteners.
- 9) Install duct supports designed to resist not less than 150 percent of the duct weight.
- 10) The use of power driven fasteners is prohibited in the hanging of ducts weighing over 10 pounds per lineal foot for seismic design categories D, E, and F.

END OF SECTION

SECTION 23 0553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Adhesive-backed duct markers.
- D. Stencils.
- E. Pipe markers.
- F. Ceiling tacks.

1.2. RELATED REQUIREMENTS

- A. Section 09 9123 - Interior Painting: Identification painting.

1.3. REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2015.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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.

PART 2 PRODUCTS

2.1. IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Automatic Controls: Tags. Key to control schematic.
- C. Control Panels: Nameplates.
- D. Dampers: Ceiling tacks, where located above lay-in ceiling.
- E. Ductwork: Stencilled painting.
- F. Major Control Components: Nameplates.
- G. Piping: Pipe markers.

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- H. Small-sized Equipment: Tags.
- I. Thermostats: Nameplates.
- J. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2. NAMEPLATES

A. Manufacturers:

- 1) Advanced Graphic Engraving, LLC: www.advancedgraphicengraving.com.
- 2) Brimar Industries, Inc: www.pipemarker.com.
- 3) Kolbi Pipe Marker Co: www.kolbipipemarkers.com/.
- 4) Seton Identification Products, a Tricor Direct Company: www.seton.com.

- B. Letter Color: White.
- C. Letter Height: 1/4 inch.
- D. Background Color: Black.
- E. Plastic: Conform to ASTM D709.

2.3. TAGS

A. Manufacturers:

- 1) Advanced Graphic Engraving: www.advancedgraphicengraving.com.
- 2) Brady Corporation: www.bradycorp.com.
- 3) Brimar Industries, Inc: www.pipemarker.com.
- 4) Kolbi Pipe Marker Co: www.kolbipipemarkers.com.
- 5) Seton Identification Products, a Tricor Company: www.seton.com.

- 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. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
- D. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4. ADHESIVE-BACKED DUCT MARKERS

- A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.
- B. Style: Individual Label.
- C. Color: Yellow/Black.

2.5. STENCILS

A. Stencils: With clean cut symbols and letters of following size:

- 1) 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
- 2) 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
- 3) 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
- 4) Ductwork and Equipment: 2-1/2 inch high letters.

B. Stencil Paint: As specified in Section 09 9123, semi-gloss enamel, colors conforming to ASME A13.1.

2.6. PIPE MARKERS

A. Color: Conform to ASME A13.1.

B. 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.

C. Color code as follows:

- 1) Heating, Cooling, and Boiler Feedwater: Green with white letters.

2.7. CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:

- 1) HVAC Equipment: Yellow.
- 2) Fire Dampers and Smoke Dampers: Red.
- 3) Heating/Cooling Valves: Blue.

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.

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- C. Apply stencil painting in accordance with Section 09 9123.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- F. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
- G. 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.
- H. Install ductwork with plastic nameplates. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- I. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

Identification for HVAC Piping and Equipment		23 0553-4
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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. REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. 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 both I-P (inch-pound) and SI (metric) units.

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) AABC (NSTSB), AABC National Standards for Total System Balance.
 - 2) ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
 - 3) SMACNA (TAB).
 - 4) Maintain at least one copy of the standard to be used at project site at all times.

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- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D. TAB Agency Qualifications:
 - 1) Company specializing in the testing, adjusting, and balancing of systems specified in this section.
- E. TAB Supervisor Qualifications: Professional Engineer licensed in the State in which the Project is located.

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.
 - 11) Hydronic systems are flushed, filled, and vented.
 - 12) Pumps are rotating correctly.
 - 13) Proper strainer baskets are clean and in place.
 - 14) Service and balance valves are open.
- B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

3.3. 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.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

3.4. RECORDING AND ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- 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.

3.5. 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. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

- K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

3.6. WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.7. SCOPE

- A. Test, adjust, and balance the following:
 - 1) Packaged Roof Top Heating/Cooling Units.
 - 2) Packaged Makeup Air Units.
 - 3) Unit Air Conditioners.
 - 4) Fan Coil Units.
 - 5) Induction Units.
 - 6) Air Handling Units.
 - 7) Fans.
 - 8) Air Filters.
 - 9) Air Terminal Units.
 - 10) Air Inlets and Outlets.

3.8. MINIMUM DATA TO BE REPORTED

A. Electric Motors:

- 1) Model/Frame.
- 2) HP/BHP.
- 3) Phase, voltage, amperage; nameplate, actual, no load.
- 4) RPM.
- 5) Service factor.

B. Cooling Coils:

- 1) Identification/number.
- 2) Location.
- 3) Service.
- 4) Manufacturer.
- 5) Air flow, design and actual.
- 6) Entering air DB temperature, design and actual.
- 7) Entering air WB temperature, design and actual.
- 8) Leaving air DB temperature, design and actual.
- 9) Leaving air WB temperature, design and actual.
- 10) Water flow, design and actual.
- 11) Water pressure drop, design and actual.
- 12) Entering water temperature, design and actual.
- 13) Leaving water temperature, design and actual.
- 14) Saturated suction temperature, design and actual.
- 15) Air pressure drop, design and actual.

C. Heating Coils:

- 1) Identification/number.
- 2) Location.
- 3) Service.
- 4) Manufacturer.

- 5) Air flow, design and actual.
- 6) Water flow, design and actual.
- 7) Water pressure drop, design and actual.
- 8) Entering water temperature, design and actual.
- 9) Leaving water temperature, design and actual.
- 10) Entering air temperature, design and actual.
- 11) Leaving air temperature, design and actual.
- 12) Air pressure drop, design and actual.

D. Induction Units:

- 1) Manufacturer.
- 2) Identification/number.
- 3) Location.
- 4) Model number.
- 5) Size.
- 6) Design air flow.
- 7) Design nozzle pressure drop.
- 8) Final nozzle pressure drop.
- 9) Final air flow.

E. Air Moving Equipment:

- 1) Location.
- 2) Manufacturer.
- 3) Model number.
- 4) Serial number.
- 5) Arrangement/Class/Discharge.
- 6) Air flow, specified and actual.
- 7) Return air flow, specified and actual.
- 8) Outside air flow, specified and actual.
- 9) Total static pressure (total external), specified and actual.

- 10) Inlet pressure.
- 11) Discharge pressure.
- 12) Sheave Make/Size/Bore.
- 13) Number of Belts/Make/Size.
- 14) Fan RPM.

F. Return Air/Outside Air:

- 1) Identification/location.
- 2) Design air flow.
- 3) Actual air flow.
- 4) Design return air flow.
- 5) Actual return air flow.
- 6) Design outside air flow.
- 7) Actual outside air flow.
- 8) Return air temperature.
- 9) Outside air temperature.
- 10) Required mixed air temperature.
- 11) Actual mixed air temperature.
- 12) Design outside/return air ratio.
- 13) Actual outside/return air ratio.

G. Exhaust Fans:

- 1) Location.
- 2) Manufacturer.
- 3) Model number.
- 4) Serial number.
- 5) Air flow, specified and actual.
- 6) Total static pressure (total external), specified and actual.
- 7) Inlet pressure.
- 8) Discharge pressure.

- 9) Sheave Make/Size/Bore.
- 10) Number of Belts/Make/Size.
- 11) Fan RPM.

H. Duct Traverses:

- 1) System zone/branch.
- 2) Duct size.
- 3) Area.
- 4) Design velocity.
- 5) Design air flow.
- 6) Test velocity.
- 7) Test air flow.
- 8) Duct static pressure.
- 9) Air temperature.
- 10) Air correction factor.

I. Terminal Unit Data:

- 1) Manufacturer.
- 2) Type, constant, variable, single, dual duct.
- 3) Identification/number.
- 4) Location.
- 5) Model number.
- 6) Size.
- 7) Minimum static pressure.
- 8) Minimum design air flow.
- 9) Maximum design air flow.
- 10) Maximum actual air flow.
- 11) Inlet static pressure.

END OF SECTION

SECTION 23 0713 - DUCT INSULATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Duct insulation.

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 C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.
- B. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.
- C. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013.
- D. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.

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.

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) Knauf Insulation; Atmosphere Duct Wrap: www.knaufinsulation.com.
 - 3) Owens Corning Corporation: www.ocbuildingspec.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: 1200 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. Vapor Barrier Tape:

- 1) Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

- E. Outdoor Vapor Barrier Mastic:

- 1) Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

- F. Tie Wire: Annealed steel, 16 gage, 0.0508 inch diameter.

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.

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.

E. Indoor Vapor Barrier Finish:

- 1) Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
- 2) Vinyl emulsion type acrylic, compatible with insulation, black color.

2.4. FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

- 1) Aeroflex USA, Inc; Aerocel Sheet & Roll with PSA: www.aeroflexusa.com/#sle.
- 2) Armacell LLC: www.armacell.us.com.
- 3) K-Flex USA LLC; Insul-Sheet: www.kflexusa.com.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.

- 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.

D. Weather Barrier Coating: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.

2.5. JACKETS

A. Aluminum Jacket: ASTM B209 (ASTM B209M).

- 1) Thickness: 0.016 inch 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. INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:

- 1) Provide insulation with vapor barrier jackets.
- 2) Finish with tape and vapor barrier jacket.
- 3) Continue insulation through walls, sleeves, hangers, and other duct penetrations.
- 4) Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. 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.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with aluminum jacket.

F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section.

3.2. SCHEDULES

3.3.

A. Concealed Indoor Ducts:

- 1) Exhaust Ducts Within 10 ft of Exterior Openings: R-10

2) Exhaust Ducts Exposed to Outdoor Air: R-10

- B. Outside Air Intake Ducts: R-10
- C. Supply Ducts: R-8
- D. Return and Relief Ducts in Mechanical Rooms: R-10
- E. Ducts Exposed to Outdoors: R-10

END OF SECTION

SECTION 23 0719 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Piping insulation.
- B. Jackets and accessories.
- C. Engineered wall outlet seals and refrigerant piping insulation protection.

1.2. 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 C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.
- D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2016.
- E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2017.
- F. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2016a.
- G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- I. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- J. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

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.

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. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.

- 1) 'K' Value: ASTM C177, 0.23 at 75 degrees F.
- 2) Maximum Service Temperature: 220 degrees F.
- 3) Maximum Moisture Absorption: 0.2 percent by volume.

D. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.

- 1) 'K' Value: ASTM C177, 0.24 at 75 degrees F.
- 2) Maximum Service Temperature: 650 degrees F.
- 3) Maximum Moisture Absorption: 0.2 percent by volume.

E. 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.

F. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

2.3. CELLULAR GLASS

A. Insulation: ASTM C552, Type II.

- 1) 'K' Value: Grade 6, 0.35 at 100 degrees F.
- 2) Service Temperature: Up to 800 degrees F.
- 3) Water Vapor Permeability: 0.005 perm inch.
- 4) Water Absorption: 0.5 percent by volume, maximum.

2.4. FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:

- 1) Aeroflex USA, Inc: 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.

2.5. JACKETS

A. PVC Plastic.

- 1) Jacket: One piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum Service Temperature: 0 degrees F.
 - b. Maximum Service Temperature: 150 degrees F.
 - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
 - d. Thickness: 10 mil.
 - e. Connections: Brush on welding adhesive.
- 2) Covering Adhesive Mastic: Compatible with insulation.

B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.

- 1) Thickness: 0.016 inch 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.

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. Insulated pipes conveying fluids below ambient temperature; insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- 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. 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.
- E. 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.
- F. 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.
- G. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with aluminum jacket.

3.3. SCHEDULE

- A. Condensate and Equipment Drain Water below 60 Deg. F (16 Deg. C):
 - 1) All pipe sizes: Insulation shall be the following:
 - a. Flexible elastomeric: 3/4 inch (19 mm) thick.

B. Chilled Water:

- 1) 6" and smaller: Insulation shall be one of the following:
 - a. Cellular glass: 1 inch thick.
 - b. Mineral-fiber, preformed pipe, Type I: 1 inch thick.
 - c. Flexible elastomeric: 1-inch thick.

C. Heating Water Supply and Return:

- 1) NPS 1-1/4 and smaller: Insulation shall be the following:
 - a. Mineral-fiber, preformed pipe, Type I: 1-1/2 inch thick.
- 2) NPS 1-1/2 and larger: Insulation shall be one of the following:
 - a. Mineral-fiber, preformed pipe, Type I: 2 inches thick.

D. Refrigerant Suction, Liquid, and Hot-Gas Piping and Tubing:

- 1) NPS 1-1/2 and smaller: Insulation shall be the following:
 - a. Cellular glass: 1 inch (25 mm) thick.
 - b. Flexible elastomeric: 1 inch (25 mm) thick.
- 2) NPS 1-5/8 and larger:
 - a. Cellular glass: 1-1/2 inches thick.
 - b. Flexible elastomeric: 1-1/2 inches thick.

END OF SECTION

SECTION 23 0913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC - SCHNEIDER ELECTRIC

PART 1 GENERAL

1.1. Section Includes

- A. Room controllers/thermostats.
- B. Temperature sensors.
- C. Humidity transmitters.
- D. Differential pressure transmitters for airside applications.
- E. Differential pressure transmitters for waterside applications.
- F. Current sensors.
- G. Current status switches.
- H. Liquid flowmeters.
- I. Analog electric-pneumatic transducers.
- J. Pressure-independent control valves.
- K. Control valve actuators.
- L. Control and smoke dampers.
- M. Damper actuators.
- N. Airflow measuring stations.
- O. Door Switches

1.2. Products Supplied but not Installed Under This Section

- A. Control valves.
- B. Control dampers.
- C. Electrical power meters.
- D. Room-mounted pressure sensors.
- E. Pipe-mounted temperature sensor wells.
- F. Fluid-side-mounted flow meters; water flow stations, switches, and probes.
- G. Airside-mounted flow meters; airflow measuring stations, switches, and probes.

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1.3. Reference Standards

- A. ANSI C12.20 - American National Standard for Electricity Meters - 0.2 and 0.5 Accuracy Classes; 2015.
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2015.
- C. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2014).
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- E. UL (DIR) - Online Certifications Directory; Current Edition.
- F. UL 268A - Standard for Smoke Detectors for Duct Application; Current Edition, Including All Revisions.
- G. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.4. Submittals

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Coordinate the following items for inclusion in Section submittal:
 - 1) Product data.
 - 2) Shop drawings.
 - 3) Manufacturer's instructions.
 - 4) Manufacturer's qualification statement.
 - 5) Installer's qualification statement.
 - 6) Operation and maintenance data.
 - 7) Project Record Documents: Floor plan(s) with red-marked locations of installed products.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 - 1) See Section 01 6000 - Product Requirements for additional provisions.
 - 2) Tools: One each of special tool required for maintenance of installed products.

1.5. Quality Assurance

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

- C. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.

1.6. Delivery, Storage, and Handling

- A. See Section 01 7400 - Cleaning for packaging waste requirements.

1.7. Warranty

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for supplied or furnished products. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1. Manufacturers

- A. Schneider Electric: _____: www.se.com/#sle.
- B. Substitutions: Not permitted.
- C. Source Limitations: Furnish products produced by same manufacturer as other controls systems, produced by single manufacturer, and obtained from single supplier.

2.2. Room Controllers/Thermostats

- A. Controller communicates via user-selectable protocol choices that includes BACnet MS/TP, Modbus RTU, or BACnet IP over WiFi using optional WIFI module.
- B. Controller includes TFT transmissive LED backlit LCD touchscreen (HMI) with at least 12 user-selectable color options, 12 user-selectable HMI button displays, and multiple options for casings and fascia's.
- C. Controller capable of displaying custom messages using minimum of 2 formats that can be statically defined within controller or dynamically defined via BACnet commands.
 - 1) Format 1: Displays minimum of 24 character message on default HMI screen which can be scrolled.
 - 2) Format 2: Displays up to 480 characters with ability to scroll multiple messages. This format allows HMI screen to use up to 12 different colors at any given time per message.
- D. Controller capable of automating the following equipment applications using simple user selectable configuration menus displayed on built-in HMI:
 - 1) 2/4-Pipe Fan Coil applications:
 - a. Analog or 1-speed, 2-speed or 3-speed fan control.
 - b. Control valves via analog, 2-position, or floating signal.
 - 2) RTU, AHU, MAU, Split System or Heat-Pump:

- a. 2-stage or modulating heating or cooling.
 - b. Analog heating.
 - c. Dehumidification output.
 - d. Analog economizer output.
 - e. Demand-based ventilation.
- 3) Pressure Dependent and Pressure Independent VAVs or VVTs:
- a. Single zone; parallel or series fan powered with analog or binary fan speed control.
 - b. Damper and reheat control via analog, 2-position, or floating control.
- 4) Other mechanical system applications utilizing similar I/O and strategies mentioned above.

E. The controller provides the following I/O capabilities:

- 1) Seven universal inputs:
 - a. 10K Type II thermistor.
 - b. 0 to 10 VDC analog.
 - c. Binary.
- 2) Five binary outputs configurable as floating or ON/OFF.
- 3) Four universal binary or analog 0 to 10 VDC outputs.
- 4) Integrated or Dedicated:
 - a. Space temperature.
 - b. Space humidity.
 - c. Passive infrared (PIR) motion detection.
 - d. Light level sensor.
- 5) Up to 20 Zigbee 3.0 Ecco-System and Zigbee Green devices with optional Zigbee wireless radio, device choices includes:
 - a. Temperature and humidity.
 - b. Temperature, humidity, and CO2.
 - c. Door or window contact.
 - d. Wall or ceiling PIR with temperature and humidity.
 - e. Water leak detection.

- F. The controller can be programmed with user-customizable script using LUA open programming language within reserved memory space of 8 kb. LUA programming provides the ability to enhance controller's inherent control capabilities or create custom control strategies.
- G. The controller includes minimum of two level password protection to prevent unauthorized access where level 1 password is for basic daily user functionality and level 2 for installer or management and configuration.

2.3. Temperature Sensors

A. General Requirements:

- 1) Provide temperature devices that use precision thermistors accurate to plus/minus 1 degree F over minus 30 to 230 degrees F range.
- 2) Provide space temperature sensors with plus/minus 0.5 degree F accuracy over 40 to 100 degrees F range.
- 3) Do not provide sensors that generate pneumatic signal for sensing temperature except where noted.

B. Room-Mounted Temperature Sensors:

- 1) Off-white enclosure made of high-impact ABS plastic for standard electrical box mounting.
- 2) Manual Override: Push button for selecting after-hours operation.
- 3) Setpoint Adjust: Sliding mechanism for adjusting space temperature setpoint.
- 4) Display: LCD for viewing space temperature, setpoint, and other operator-selectable parameters with built-in buttons to adjust setpoints directly from the sensor.

C. Duct-Mounted Temperature Sensors:

- 1) Sensing element fully encapsulated in potting material within stainless steel probe. Use for air-handling applications where coil or duct area less than 14 sq ft.

D. Duct-Mounted Averaging Temperature Sensors:

- 1) Provide averaging sensors for ducts larger than 14 sq ft.
- 2) Construct using rigid or flexible copper tubing with at least one thermistor for every 3 feet with minimum tube length of 6 feet.

E. Pipe-Mounted Temperature Sensors:

- 1) Provide for temperature measurement of chilled, hot water, and refrigerant applications. Select sensor probe length suitable for intended application.
- 2) Provide each sensor with corresponding pipe-mounted sensor unless indicated otherwise. Select stainless steel wells for noncorrosive fluids below 250 degrees F and 300 series stainless steel for all other applications.

F. Outside-Mounted Temperature Sensors:

- 1) Provide fully encapsulated sensing element in potting material within stainless steel probe for mounting on the north side of building.
- 2) Encase probe-end in PVC solar radiation shield mounted in weatherproof enclosure. Operating range minus 40 to 122 degrees F.
- 3) Service Range: Minus 40 to 122 degrees F.

2.4. Humidity Transmitters

A. Wall-Mounted Humidity Transmitters:

- 1) Off-white enclosure made of high-impact ABS plastic for standard electrical box mounting.
- 2) Replaceable thin-film capacitive humidity-sensing element with integrated temperature sensor.
- 3) Accuracy: Plus/minus 2 percent at full scale. NIST traceable.
- 4) Calibration: Multipoint calibration onboard in nonvolatile memory.
- 5) Setpoint Adjust: Sliding mechanism for adjusting space temperature setpoint.
- 6) Display: LCD for viewing the space humidity and other operator-selectable parameters.
- 7) Service Range: 0 to 100 percent RH noncondensing, 50 to 95 degrees F.
- 8) Output: 4 to 20 mA, 0 to 5 VDC, or 0 to 10 VDC. Field selectable.
- 9) Power Supply: 24 VAC or 12 to 30 VDC.

B. Duct-Mounted Humidity Transmitters:

- 1) Transmitter fully encapsulated in potting material within stainless steel probe.
- 2) Enclosure made of high-impact ABS plastic for duct mounting.
- 3) Replaceable thin-film capacitive humidity sensing element.
- 4) Accuracy: Plus/minus 1 or 2 percent at full scale. NIST certified as option.
- 5) Calibration: Multipoint calibration onboard in nonvolatile memory.
- 6) Display: LCD for viewing the space humidity and other operator-selectable parameters.
- 7) Service Range: 0 to 95 percent RH noncondensing, minus 31 to 140 degrees F.
- 8) Output: Analog, 4 to 20 mA, 0 to 5 VDC, or 0 to 10 VDC.
- 9) Optional Output Protocols: BACnet MS/TP or Modbus RTU.

- 10) Power Supply: Three-wire volt mode at 20 to 30 VDC or 24 VAC or loop powered at 20 to 30 VDC, analog models, 50 to 60 Hz.

C. Outdoor-Mounted Humidity Transmitter:

- 1) Transmitter fully encapsulated in potting material within a stainless steel probe.
- 2) Probe encased in PVC solar radiation shield mounted in weatherproof enclosure.
- 3) Replaceable thin-film capacitive humidity sensing element.
- 4) Accuracy: Plus/minus 1 or 2 percent at full scale. NIST certified as option.
- 5) Calibration: Multipoint calibration onboard in nonvolatile memory.
- 6) Service Range: 0 to 95 percent RH noncondensing, minus 40 to 131 degrees F.
- 7) Output: 4 to 20 mA, 0 to 5 VDC, or 0 to 10 VDC.
- 8) Power Supply: Three-wire volt mode at 20 to 30 VDC or 24 VAC or loop powered at 20 to 30 VDC, analog models, 50 to 60 Hz.

2.5. Differential Pressure Transmitter for Airside Applications

- A. Microprocessor profiled ceramic capacitive sensing element with built-in LCD.
- B. Transmitter: Field configurable for wall mounting or duct mounting with static probe.
- C. Bluetooth option available for direct communication using Veris app.
- D. Accuracy: Plus/minus 1 percent regardless of selected scale range including linearity, repeatability, hysteresis, stability, and temperature compensation.
- E. Calibration: Include provision for zeroing by pushbutton or digital input.
- F. Response Time: Between 2 to 20 seconds, field selectable.
- G. Repeatability: Plus/minus 20 ppm with plus/minus 1 percent of measured value.
- H. Maximum Service Pressure: 200 percent of factory design pressure.
- I. Output: 4 to 20 mA, 0 to 5 VDC, or 0 to 10 VDC. Field selectable.
- J. Measurement Range: 0.1 to 10 in-wc.
- K. Measurement Span: Field selectable for unidirectional or bidirectional operation using either in-wc or Pa units, and one of 14 different measurement range spans.

2.6. DIFFERENTIAL PRESSURE TRANSMITTERS FOR WATERSIDE APPLICATIONS

- A. Microprocessor-based sensing element with LCD and two independent gauge pressure sensors to measure and calculate differential pressure.
- B. Four switch selectable measurement ranges with selectable electronic surge damping.

- C. Include electronic port swap and test mode for producing automatic full-scale output.
- D. Wetted parts made of 17-4 PH stainless steel with preinstalled bypass valve manifold.
- E. Enclosure: NEMA 250 Type 4, white powder-coated aluminum.
- F. Maximum Pressures: 2x-proof and 5x-burst across full measurement range.
- G. Accuracy: Plus/minus 1 percent of full scale and plus/minus 2 percent of full scale regardless of selected measurement scale range.
- H. Calibration: Include provision for zeroing by pushbutton or digital input.
- I. Stability: Plus/minus 0.25 percent.
- J. Output: 4 to 20 mA, 0 to 5 VDC, or 0 to 10 VDC. Field selectable.
- K. Sensor Temperature Operating Range: Minus 4 to 185 degrees F.
- L. Environmental Operating Range: 10 to 90 percent RH noncondensing, 14 to 131 degrees F.

2.7. Current Sensors

- A. Provide current status switches for fan, pump, motor, and electrical load monitoring.
- B. Split core or solid core type with digital or scaled analog output signal.

2.8. Current Status Switches

A. Current Status Switches for Constant Load Devices:

- 1) Factory programmed current sensor to detect motor undercurrent situations such as belt or coupling loss on constant loads.
- 2) Sensor to store current draw in nonvolatile memory with pushbutton to clear memory.
- 3) Sensor to indicate status from 0.5 to 175 A setpoint using visual LED indicator.
- 4) Split core sensor, induced powered from monitored load and isolated to 600 VAC rms.
- 5) Output: Normally open SPST contact with 0.1 A at 30 VAC/VDC rating.

B. Current Status Switches for Constant Load Devices, Self-Calibrating Type:

- 1) Microprocessor-based, self-learning, self-calibrating current switch. Calibration-free status for both under and overcurrent.
- 2) During initial power-up, automatically learns average line current with no further action required by the installer.
- 3) Split core sensor, induced powered from monitored load and isolated to 600 VAC rms.
- 4) Display: Backlit LCD; illuminates when monitored current exceeds 4.5 A.

- 5) Sensor to indicate status from 2.5 to 200 A setpoint chosen by setting slide-switch to the nominal trip point limit of plus/minus 40 percent of load, plus/minus 60 percent of load, or ON/OFF.
- 6) Output: Normally open SPST contact with 0.1A at 30 VAC/VDC rating.

C. Current Status Switches for Variable Frequency Drive Application:

- 1) Microprocessor-controlled, self-learning, self-calibrating current sensor to detect motor undercurrent and overcurrent situations such as belt loss, coupling shear, and mechanical failure on variable loads.
- 2) Sensor to store current draw in nonvolatile memory with pushbutton to clear memory and relearn.
- 3) Split core sensor, induced powered from monitored load and isolated to 600 VAC rms. Sensor to indicate status from 1.5 to 150 A and from 12 to 115 Hz using visual LED indicator.
- 4) Alarm Limits: Plus/minus 20 percent of learned current in every 5 Hz frequency band.
- 5) Output: Normally open SPST contact with 0.1A at 30 VAC/VDC rating.

2.9. Liquid Flowmeters

A. Liquid Flow, Insertion-Type Turbine Flowmeters:

- 1) Manufacturers:
 - a. Veris Industries; SDI Series: www.veris.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Insertion-type turbine flow meter for use in pipe sizes 1-1/2 inch and larger.
- 3) Hot-tap configuration with isolation valves and mounting hardware to install removable sensor from pipelines difficult to shut down or drain.
- 4) Performance:
 - a. Repeatability: Plus/minus 5 percent.
 - b. Velocity Range: 0.3 to 20 ft/s.
 - c. Pressure Rating: 1,000 psi at 70 degrees F.
 - d. Pressure Drop: 0.5 psi or lower at 10 ft/s for pipe sizes 1-1/2 inch and larger.
 - e. Accuracy: Plus/minus one percent of rate over optimum flow range when installed between 10 upstream and 5 downstream straight-pipe diameters.

- 5) Maximum Temperature Rating: 300 degrees F.
- 6) Materials: Stainless steel or brass body with stainless steel impeller.
- 7) Transmitter:
 - a. Power Supply: 12 to 30 VAC or 8 to 35 VDC.
 - b. Output: Frequency.
 - c. Service Temperature Range: 14 to 150 degrees F.
 - d. Display: LCD, 8-character, 3/8 inch in height.
 - e. Enclosure: NEMA 250 Type 4, polypropylene with Viton-sealed acrylic cover.

B. Liquid Flow-Energy Transmitter, Noninvasive Ultrasonic Clamp-on Flowmeter:

- 1) Manufacturers:
 - a. Veris Industries; FST and FSR Series: www.veris.com/#sle.
 - b. Substitutions: See Section 01 6000 - Product Requirements.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Clamp-on digital correlation transit-time ultrasonic flow meter designed for clean liquids or liquids containing small amounts of suspended solids or aeration.
- 3) Compatible Liquids: Water, brine, raw sewage, ethylene, glycol, glycerin, and others.
- 4) Energy Metering: Provide pipe-mounted temperature sensors for Btu/h (kW) calculations.
- 5) Pipe Surface Temperature Range by Pipe Diameter Size:
 - a. From 1/2 to 2 inch: Minus 40 to 185 degrees F.
 - b. 2-1/2 inch and Larger: Minus 40 to 250 degrees F.
- 6) Performance:
 - a. Flow Accuracy:
 - 1) 1/2 to 3/4 inch Pipe Sizes: 1 percent of full scale.
 - 2) 1 to 2 inch Pipe Sizes: 1 percent of reading from 4 to 40 ft/s.
 - 3) 2-1/2 to 100 inch Pipe Sizes: 1 percent of reading from 2 to 40 ft/s.
 - b. Velocity Range:
 - 1) 1/2 to 2 inch Pipe Size: 2 to 40 ft/s.

- 2) 2 to 100 inch Pipe Size: 1 to 40 ft/s.
 - c. Flow Sensitivity: 0.001 ft/s.
 - d. Flow Repeatability: Plus/minus 0.01 percent of reading, bidirectional.
 - e. Temperature Accuracy, Energy: 32 to 212 degrees F; 0.45 degrees F absolute with 0.18 degrees F differential.
 - f. Temperature Sensitivity: 0.05 degrees F.
 - g. Temperature Repeatability: Plus/minus 0.05 percent of reading.

2.10. Analog Electric-Pneumatic Transducers

- A. Microcontrolled poppet valve for high accuracy and with no system air loss. Field configurable for pressure sensing in multiple applications.
- B. Performance:
 - 1) Accuracy: One percent full scale; combined linearity, hysteresis, and repeatability.
 - 2) Compensated Temperature Range: 25 to 140 degrees F.
 - 3) Temperature Coefficient: Plus/minus 0.12 percent per degree F.
 - 4) Operating Environment: 10 to 90 percent RH, noncondensing; 25 to 140 degrees F.
- C. Supply Pressure: 45 psi, maximum.
- D. Control Range: 0 to 20 or 3 to 15 psi, jumper selectable.
- E. Pressure Differential: 0.1 psi from supply to branch.
- F. Manual Override: Jumper selectable mode, digital pushbutton adjust.
- G. Alarm Contact: 100 mA at 30 VAC/VDC.
- H. Display: 3-1/2 digit LCD, 3-1/2 inches.
- I. Housing: Standard snap-track mounted with clear dust cover.
- J. Control Input: 4 to 20 mA, 0 to 10 VDC, or 0 to 5 VDC, jumper selectable.
- K. Power Supply: 20 to 30 VAC or 22 to 30 VDC.

2.11. Pressure-Independent Control Valves

- A. Manufacturers:
 - 1) Schneider Electric; Smart PICV: www.se.com/#sle.
 - 2) Substitutions: Not permitted.

- 3) Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. Construction: No cartridges requiring replacement or maintenance.

- 1) Sizes 2 inch, NPS and Smaller: PN 16, stainless steel components.
- 2) Sizes 2-1/2 to 10 inch, NPS: ASME B16.1, Class 125, cast iron body with ASTM A126, Class B, stainless steel components.

C. Accuracy:

- 1) Size 3/4 inch, NPS and Smaller:
 - a. Low and Standard Flow Units: Set-flow within 2.3 to 58 psi differential pressure range across 0 to 100 percent of rated flow.
 - b. High Flow Units: Within 5 percent of set-flow within 5 to 58 psi differential pressure range across 0 to 100 percent of rated flow.
- 2) Size 1 to 1-1/4 inch, NPS:
 - a. Standard Flow Units: Set-flow within 2.9 to 58 psi differential pressure range across 0 to 100 percent of rated flow.
 - b. High Flow Units: Within 5 percent of set-flow within 5 to 58 psi differential pressure range across 0 to 100 percent of rated flow.
- 3) Size 1-1/2 to 4 inch, NPS:
 - a. Within 5 percent of set-flow within 4.35 to 58 psi differential pressure range across 0 to 100 percent of rated flow.
- 4) Size 5 to 10 inch, NPS:
 - a. Standard Flow Units: Set-flow within 5.8 to 58 psi differential pressure range across 0 to 100 percent of rated flow.
 - b. High Flow Units: Within 5 percent of set-flow within 8.7 to 58 psi differential pressure range across 0 to 100 percent of rated flow.

D. Flow Characteristics: Linear control or equal percentage, selectable at valve actuator side.

E. Flow Adjust: Field adjustable using percentage of rated valve flow setting.

F. Position Feedback: Output signal integrated into proportional actuator.

G. Authority: 100 percent with modulation below 1 percent regardless of flow settings.

H. Close-Off Rating: 232 psi regardless of valve size.

2.12. Control Valve Actuators

A. 1/2 to 3/4 inch Ball Valve Actuators:

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- 1) Manufacturers:
 - a. Schneider Electric; VBB/VBS: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
 - 2) Size unit for torque required to overcome system close-off pressure.
 - 3) Coupling: Direct coupled to valve body without use of external devices or tools.
 - 4) Auxiliary End-Switch: SPST, 24 VAC/VDC, 1 to 5 mA maximum.
 - 5) Controller Signal: 2-position, floating, or proportional; 0 to 5 VDC, 0 to 10 VDC, 5 to 10 VDC, or 4 to 20 mA. Switchable via DIP switches without removal of cover.
 - 6) Standard manual operating lever with position indicator.
 - 7) Power: 24 VAC for floating or proportional control, 110 to 230 VAC for 2-position or multivoltage control.
 - 8) Operating Temperature Limits:
 - a. 2-Position: 32 to 169 degrees F.
 - b. Floating and Proportional: 32 to 140 degrees F.
 - 9) Wiring: Removable terminal block, 10-foot plenum cable, or 18-inch appliance wire.
 - 10) Housing: NEMA 250 Type 2, IEC IP31. Actuators with terminal block or plenum cable leads; UL (DIR) file number E9429-rated.
- B. 1/2 to 3 inch 2-Way and 1/2 to 2 inch 3-Way Ball Valve Actuators:
- 1) Manufacturers:
 - a. Schneider Electric; VB-2000: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
 - 2) NEMA 250 Type 2, sized for torque required to overcome system close-off pressure.
 - 3) Spring return (SR) and nonspring return (NSR) models. Spring return actuators to provide return direction choice.
 - 4) Control: 2-position, floating, or proportional control.
 - 5) Equipped with pigtail leads, manual override, and auxiliary switch(es).

- 6) Operating Temperature Limits:
 - a. General: Minus 22 to 140 degrees F.
 - b. Floating NSR with 33 lb-in Torque: Minus 25 to 130 degrees F.

C. 1/2 to 2 inch Bronze, 67 or 78 lb Linear Globe Valve Actuators:

- 1) Manufacturers:
 - a. Schneider Electric; MG350V: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Type: NEMA 250 Type 2 (IP53) rating, nonspring return type with selectable direct-acting or reverse-acting operation, and manual override with automatic release.
- 3) Control Input: Proportional, 2-position floating, or pulse width modulated (PWM) with field selectable 0.59 to 2.93 or 0.1 to 25.5 second input signal range and position-output signal.
- 4) Position-Output Signal: 2 to 10, 0 to 10, or 0 to 5 VDC output signal, field selectable.
- 5) Auto Calibration: Provides precise control by scaling input signal to match valve stem travel.
- 6) Motor Indication: Bicolor LED status indication for auto calibration and alarm.
- 7) Removable wiring screw terminal with 1/2 inch conduit opening.
- 8) Service Temperature Ranges:
 - a. Up to 266 degrees F Fluid Side: 23 to 131 degrees F ambient.
 - b. Up to 281 degrees F Fluid Side: 23 to 127 degrees F ambient.
 - c. Up to 340 degrees F Fluid Side: 23 to 115 degrees F ambient.
 - d. Up to 400 degrees F Fluid Side: 23 to 102 degrees F ambient.

D. 1/2 to 2 inch Bronze, 105 lb, Linear Globe Valve Actuators:

- 1) Manufacturers:
 - a. Schneider Electric; SpaceLogic Mx51-7103: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

- 2) Type: NEMA 250 Type 2 (IP54) rating, direct-mount, spring return type with selectable direct-acting or reverse-acting operation, and manual override with automatic release.
- 3) Control Input: 2-position floating, or proportional; 4 to 20 mA or 0 to 10, 2 to 10, 0 to 3, or 6 to 9 VDC selectable. Automatically sets input span to match valve travel.
- 4) Position-Output Signal: 2 to 10, 0 to 10, or 0 to 5 VDC output signal, field selectable.
- 5) Auto Calibration: Provides precise control by scaling input signal to match valve stem travel.
- 6) 1/2 inch nominal linear stroke with stroke-overload protection.
- 7) Power: 24, 120, or 230 VAC.
- 8) Service Temperature: Up to 366 degrees F fluid side and minus 22 to 140 degrees F ambient.

E. 1/2 to 2 inch Bronze, 220 lb Linear Globe Valve Actuators:

- 1) Manufacturers:
 - a. Schneider Electric; SpaceLogic Mx51-720x: www.se.com/#sle.
 - b. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Type: NEMA 250 Type 2 (IP54) rating, direct-mount, spring return type with selectable direct-acting or reverse-acting operation, and manual override.
- 3) Control Input: 2-position, floating, or proportional; 4 to 20 mA or 0 to 10, 2 to 10, or 6 to 9 VDC selectable. Automatically sets input span to match valve travel.
- 4) Position-Output Signal: 2 to 10 VDC output signal which can be used to operate up to four additional slave actuators.
- 5) 1/2 or 1 inch nominal linear stroke.
- 6) Service Temperature Ranges:
 - a. Up to 281 degrees F Fluid Side: 0 to 140 degrees F ambient.
 - b. Up to 300 degrees F Fluid Side: 0 to 120 degrees F ambient.
 - c. Up to 340 degrees F Fluid Side: 0 to 100 degrees F ambient.
 - d. Up to 366 degrees F Fluid Side: 0 to 90 degrees F ambient.
- 7) Power: 24 and 120 VAC. Use 120 VAC for 2-position models.

F. 1/2 to 2 inch Bronze, Linear Globe Valve Actuators with SR Linkages:

- 1) Manufacturers:

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- a. Schneider Electric; SpaceLogic Series: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Type: Spring return, overload protected actuator with 35, 60, 133, or 150 lb-in of torque.
 - 3) Control Input: 2-position, floating, or proportional; 4 to 20 mA or 0 to 10, 2 to 10, or 6 to 9 VDC selectable. Automatically sets input span to match valve travel.
 - 4) Position-Output Signal: Built-in auxiliary switch for interfacing or signaling.
- G. 1/2 to 2 inch Bronze Body, Linear Globe Valve Actuators with SR and NSR Linkages:
- 1) Manufacturers:
 - a. Schneider Electric; Forta M400A-VB: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
 - 2) Type: Overload protected actuator with selectable direct-acting or reverse-acting operation, feedback, and manual override with automatic release.
 - 3) Force: 90, 180, or 337 lb for nonspring return (NSR) type or 157 lb for spring return (SR) type with internal torque protection throughout stroke.
 - 4) Housing: NEMA 250 Type 2 rating for NSR and Type 4 for SR models.
 - 5) Control Input: Floating or proportional; 4 to 20 mA, 0 to 10 VDC, 2 to 10 VDC selectable with 500-ohm resistor included. Automatically sets input span to match valve travel.
 - 6) Position-Output Signal: Built-in auxiliary switch for interfacing or signaling.
 - 7) Characteristic: Valve sequencing and flow curves to either equal percentage or linear.
 - 8) Power: 24 VAC or 24 VDC.
 - 9) Service Temperature Ranges:
 - a. Chilled Water Applications: 14 to 122 degrees F ambient.
 - b. Up to 281 degrees F Fluid Side: 14 to 113 degrees F ambient.
 - c. Up to 300 degrees F Fluid Side: 14 to 107 degrees F ambient.
 - d. Up to 340 degrees F Fluid Side: 14 to 100 degrees F ambient.

- e. Up to 366 degrees F Fluid Side: 14 to 90 degrees F ambient.

H. 2-1/2 to 6 inch Cast Iron Flanged Globe Valve Linear Actuators with Linkage:

- 1) Manufacturers:
 - a. Schneider Electric; Forta M800A: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Type: Overload protected actuator with selectable direct-acting or reverse-acting operation, and manual override with automatic release.
- 3) Force: 180 or 337 lb with internal torque protection throughout stroke.
- 4) Housing: NEMA 250 Type 2 rating, vertical mount only.
- 5) Control Input: Floating, or proportional; 4 to 20 mA, 0 to 10 VDC, or 2 to 10 VDC selectable with 500-ohm resistor included. Automatically sets input span to match valve travel.
- 6) Position-Output Signal: Built-in auxiliary switch for interfacing or signaling.
- 7) Characteristic: Valve sequencing and flow curves to either equal percentage or linear with 2 to 10 VDC feedback.
- 8) Power: 24 VAC or 24 VDC.
- 9) Service Temperature Ranges:
 - a. Chilled Water Applications: 14 to 122 degrees F ambient.
 - b. Up to 281 degrees F Fluid Side: 14 to 113 degrees F ambient.
 - c. Up to 300 degrees F Fluid Side: 14 to 107 degrees F ambient.

I. 2-1/2 to 6 inch Cast Iron Flanged Globe Valve 220 lb Actuators:

- 1) Manufacturers:
 - a. Schneider Electric; SpaceLogic Mx61-720x: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Type: Direct-mount, spring return, overload protected actuator with selectable direct-acting or reverse-acting operation, and manual override with automatic release.
- 3) Force: 220 lb with 1/2 or 1 inch nominal linear stroke.

- 4) Housing: NEMA 250 Type 2 (IP54) rating, vertical mount only.
- 5) Control Input: 2-position, floating, or proportional; 4 to 20 mA, 0 to 10 VDC, 2 to 10 VDC, or 6 to 9 VDC selectable with 500-ohm resistor included. Automatically sets input span to match valve travel.
- 6) Position-Output Signal: Feedback on proportional model with 2 to 10 VDC output signal or to operate up to four additional slave actuators.
- 7) Power: 24 VAC or 120 VAC for 2-position actuation.
- 8) Service Temperature Range: Up to 300 degrees F fluid side and 0 to 140 degrees F ambient.

J. 2-1/2 to 6 inch Cast Iron Flanged Globe Valve Actuators with SR linkage:

- 1) Manufacturers:
 - a. Schneider Electric; SpaceLogic Series: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Type: Direct-mount, spring return, overload protected actuator with selectable direct-acting or reverse-acting operation, and manual override with automatic release.
- 3) Torque: 60, 133, or 150 lb-in.
- 4) Housing: NEMA 250 Type 2 (IP54) rating or Type 4 for 150 lb-in unit.
- 5) Control Input: 2-position, floating, or proportional.
- 6) Position-Output Signal: Auxiliary switch output to signal or interfacing other units.

K. 2 to 18 inch 2-Way and 2 to 16 inch 3-Way, Linear, Butterfly Valve Actuator with NSR linkage:

- 1) Manufacturers:
 - a. Schneider Electric; S70 Series: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Type: Direct-mount, nonspring return (NSR), overload protected actuator with selectable direct-acting or reverse-acting operation, and manual override handwheel, two auxiliary switches, and built-in heater.
- 3) Torque: 60, 133, or 150 lb-in.
- 4) Housing: NEMA 250 Type 4 rating.

- 5) Control Input: 2-position or proportional; 4 to 20 mA or 0 to 10 VDC.
- 6) Valve Coordination: Include internal wiring isolation for parallel wiring of multiple units to eliminate risk of feedback from one actuator to another.
- 7) Power: 24 VAC and 120 VAC.

L. 2 to 4 inch 2-Way and 3-Way Butterfly Valve SR Actuators:

- 1) Manufacturers:
 - a. Schneider Electric; SpaceLogic Mx41-7153: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Type: NEMA 250 Type 2 rating, direct-mount, spring return (SR), overload protected actuator with selectable direct-acting or reverse-acting operation, and manual override with automatic release.
- 3) Control Input: 2-position or proportional; 4 to 20 mA, 0 to 10 VDC, or 2 to 10 VDC.
- 4) Include internal wiring isolation for parallel wiring of multiple units to eliminate risk of feedback from one actuator to another.
- 5) Position-Output Signal: Feedback on proportional model; 4 to 20 mA or with 2 to 10 VDC with two SPDT auxiliary switches.
- 6) Power: 24 VAC.
- 7) Service Temperature Range: Minus 22 to 140 degrees F ambient.

M. 2 to 6 inch 2-Way and 3-Way Butterfly Valve NSR Actuators:

- 1) Manufacturers:
 - a. Schneider Electric; SpaceLogic NR-22xx-5xx: www.se.com/#sle.
 - b. Substitutions: Not permitted.
 - c. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.
- 2) Type: NEMA 250 Type 2 rating, direct-mount, nonspring return (NSR), overload protected actuator with selectable direct-acting or reverse-acting operation, and manual override with automatic release.
- 3) Control Input: 2-position or proportional; 4 to 20 mA, 0 to 10 VDC, or 2 to 10 VDC.
- 4) Include internal wiring isolation for parallel wiring of multiple units to eliminate risk of feedback from one actuator to another.

- 5) Position-Output Signal: Feedback on proportional model; 4 to 20 mA or with 2 to 10 VDC with two SPDT auxiliary switches.
- 6) Power: 24 VAC.
- 7) Service Temperature Range: Minus 4 to 122 degrees F ambient.

N. Globe Valve Actuators and Operators: See Section 25 3513.

2.13. Control and Smoke Dampers

A. Construction:

- 1) 13 gauge, 3/32-inch galvanized sheet steel frame mechanically joined with linkage concealed in the side channel to eliminate noise and friction.
- 2) Provide compressible spring stainless steel side seals and acetal or bronze bearings.
- 3) Single or multiple blade type with maximum blade not exceeding 8 inches.
- 4) 3/8 sq in steel zinc-plated pins with parallel or opposed blade rotation.

B. High Performance Applications: Provide control dampers that will meet or exceed UL 555S Class I leakage rating of 4 cfm/sf at 1 in-wc.

C. Provide opposed blade dampers for modulating control and parallel blade for 2-position control.

2.14. Damper Actuators

A. Manufacturers:

- 1) Schneider Electric; SpaceLogic Series: www.se.com/#sle.
- 2) Substitutions: Not permitted.
- 3) Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. Size for torque required for damper seal at maximum design conditions and system close-off pressure.

C. Direct-Coupled Damper Actuators:

- 1) Nonhydraulic type designed for minimum 100,000 full-stroke cycles at rated torque.
- 2) Capable of accommodating 3/8, 1/2, or 1 inch round or 3/8, 1/2, or 3/4 inch square damper shafts.

D. Multiple Units: Provide gang-mount units for torque loads of 133, 270 lb-in or more.

E. Overload protected electronically throughout rotation except for select floating actuators with mechanical clutch.

- F. Spring Return (SR) Actuators: Incorporate mechanical spring-return fail safe mechanism.
- G. Nonspring Return (NSR) Actuators: Stay at last controller commanded position. Include external manual gear release to allow positioning when not powered.
- H. Use NEMA 250 Type 2 rating for general service or Type 4 for higher rating application or outdoors.
- I. Control Input: 2-position or proportional; 4 to 20 mA, 0 to 10 VDC, or 2 to 10 VDC.
- J. Security: Ensure actuator product design prevents external modifications without special tools.
- K. Power: 24 VAC, 24 VDC, 120 VAC, or 230 VAC; use 24 VAC for proportional models.
- L. Service Temperature Ranges:
 - 1) 44, 88, and 133 lb-in Torque Units: Minus 25 to 130 degrees F ambient.
 - 2) 30, 35, 60, 150, and 300 lb-in Torque Units: Minus 30 to 60 degrees F ambient.
 - 3) 270 lb-in Torque Units: Minus 22 to 122 degrees F ambient.

2.15. Smoke Detectors

- A. Type of Assembly: UL 268A-listed smoke detector housing with sample tube(s) and photoelectric smoke detector head.
- B. Operational Range: Air velocities from 300 to 4,000 fpm.
- C. Permit duct-mount smoke detector housing installation without detector cover removal.

2.16. Airflow Measuring Stations

- A. Select flow station to operate over 0 to 5,000 fpm range with plus/minus 2 percent accuracy over 500 fpm readings or plus/minus 10 fpm for readings less than 500 fpm.

2.17. Door Switches

- A. Balanced-magnetic switch, complying with UL 634, installed on frame with integral overcurrent device to limit current to 80 percent of switch capacity. Bias magnet and minimum of 1 Normally Closed, Form A, Single-Pole/ Single-Throw, encapsulated reed switch shall resist compromise from introduction of foreign magnetic fields.
- B. Rating: 100mA at 28VDC minimum.
- C. Door Switch: Listed for indoor locations, having flush-mounted balance-magnet type and unobtrusive flush-mounted door frame switch unit.
 - 1) Magnet and switch unit shall be 3/4" diameter.
 - 2) Exterior shall be white

D. Wiring:

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- 1) Provide and route the wiring for the door switch within the door frame to a j-box provided above the ceiling.
 - 2) Provide the switch unit with a minimum of 5'-0" 2-wire lead.
- E. Door switch shall be connected to BAS.
- F. Coordinate with door hardware contractor.

PART 3 EXECUTION

- 3.1. Verification of Conditions
- A. Verify existing conditions before starting work.
 - B. Verify that systems, piping, ductwork, and spaces are ready to receive work.
- 3.2. Installation
- A. Install and terminate connections in accordance with manufacturer's written instructions.
 - B. Control and Smoke Dampers: Coordinate provision and installation of blank-off plates and other ductwork conversions necessary to install smaller than duct size dampers.
 - C. Products Supplied but Not Installed Under This Section: Hand off products to respective trades then coordinate and supervise respective installation.
 - D. Provide wiring, cables, and tubing as required to interface installed products into onboard equipment controllers.

END OF SECTION

SECTION 23 1123 - FACILITY NATURAL-GAS PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Pipe, pipe fittings, valves, and connections for natural gas piping systems.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 09 9113 - Exterior Painting.
- C. Section 09 9123 - Interior Painting.
- D. Section 23 0553 - Identification for HVAC Piping and Equipment.

1.3. REFERENCE STANDARDS

- A. ANSI Z21.18/CSA 6.3 - Gas Appliance Pressure Regulators; 2007 (Reaffirmed 2016).
- B. ANSI Z21.80/CSA 6.22 - Line Pressure Regulators; 2011 (Addendum A, 2012).
- C. ANSI Z223.1 - National Fuel Gas Code; 2016.
- D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.
- E. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2016.
- F. ASME B31.1 - Power Piping; 2016.
- G. ASME B31.9 - Building Services Piping; 2014.
- H. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- I. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- J. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2017.
- K. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 1992 (Reapproved 2014).
- L. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2010.
- M. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2015.
- N. ICC-ES AC106 - Acceptance Criteria for Pre drilled Fasteners (Screw Anchors) in Masonry Elements; 2015.

- O. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2015.
- P. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2016.
- Q. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- R. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends; 2011.
- S. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals 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.
- C. Welder Certificate: Include welders certification of compliance with ASME BPVC-IX.
- D. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

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. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME BPVC-IX.
- E. Identify pipe with marking including size, ASTM material classification, and ASTM specification.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1. NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40 black.

- 1) Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.
- 2) Joints: Threaded or welded to ASME B31.1.

2.2. FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 Inches and Under:

- 1) Ferrous pipe: Class 150 malleable iron threaded unions.

B. Flanges for Pipe Size Over 1 Inch:

- 1) Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.

2.3. PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

- 1) If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
- 2) Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
- 3) Trapeze Hangers: Welded steel channel frames attached to structure.
- 4) Vertical Pipe Support: Steel riser clamp.

B. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

- 1) Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
- 2) Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
- 3) Concrete Screw Type Anchors: Complying with ICC-ES AC193.
- 4) Masonry Screw Type Anchors: Complying with ICC-ES AC106.

2.4. BALL VALVES

A. Manufacturers:

- 1) Apollo Valves; _____: www.apollovalves.com/#sle.
- 2) Grinnell Products; _____: www.grinnell.com/#sle.
- 3) Nibco, Inc; _____: www.nibco.com/#sle.
- 4) Viega LLC; _____: www.viega.us/#sle.
- 5) Substitutions: See Section 01 6000 - Product Requirements.

- B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze body, 304 stainless steel ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder or threaded ends with union.

2.5. PLUG VALVES

- A. Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

2.6. STRAINERS

- A. 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.

2.7. LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS INDICATORS

- A. Compliance Requirements:

- 1) Appliance Regulator: ANSI Z21.18/CSA 6.3.
- 2) Line Pressure Regulator: ANSI Z21.80/CSA 6.22.

- B. Materials in Contact With Gas:

- 1) Housing: Aluminum, steel (free of non-ferrous metals).
- 2) Seals and Diaphragms: NBR-based rubber.

- C. Maximum Body Pressure: 10 psi.

- D. Output Pressure Range: 1 inch wc to 80 inch wc.

PART 3 EXECUTION

3.1. 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.

3.2. 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. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
 - 1) Refer to Section 22 0719.
- H. Provide access where valves and fittings are not exposed.
 - 1) Coordinate size and location of access doors with Section 08 3100.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
 - 1) Painting of interior piping systems and components is specified in Section 09 9123.
 - 2) Painting of exterior piping systems and components is specified in Section 09 9113.
- K. Install valves with stems upright or horizontal, not inverted.
- L. Sleeve pipes passing through partitions, walls and floors.
- M. Pipe Hangers and Supports:
 - 1) Install in accordance with ASME B31.9.
 - 2) Support piping in accordance with Sections 22 0529 and 23 0529.
 - 3) Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
 - 4) Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - a. Painting of interior piping systems and components is specified in Section 09 9123.
 - b. Painting of exterior piping systems and components is specified in Section 09 9113.

3.3. APPLICATION

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Install ball valves for throttling, bypass, or manual flow control services.
- D. Provide plug valves in natural gas systems for shut-off service.

3.4. SCHEDULES

A. Pipe Hanger Spacing:

- 1) Metal Piping:
 - a. Pipe Size: 1/2 inches to 1-1/4 inches:
 - 1) Maximum Hanger Spacing: 6.5 ft.
 - 2) Hanger Rod Diameter: 3/8 inches.
 - b. Pipe Size: 1-1/2 inches to 2 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 3/8 inch.
 - c. Pipe Size: 2-1/2 inches to 3 inches:
 - 1) Maximum Hanger Spacing: 10 ft.
 - 2) Hanger Rod Diameter: 1/2 inch.

END OF SECTION

SECTION 23 2113 - HYDRONIC PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water piping, above grade.
- C. Chilled water piping, above grade.
- D. Equipment drains and overflows.
- E. Pipe hangers and supports.
- F. Unions, flanges, mechanical couplings, and dielectric connections.
- G. Flow controls.

1.2. RELATED REQUIREMENTS

- A. Section 23 0516 - Expansion Fittings and Loops for HVAC Piping.
- B. Section 23 0523 - General-Duty Valves for HVAC Piping.
- C. Section 23 0548 - Vibration and Seismic Controls for HVAC.
- D. Section 23 0553 - Identification for HVAC Piping and Equipment.
- E. Section 23 0719 - HVAC Piping Insulation.
- F. Section 23 2114 - Hydronic Specialties.

1.3. REFERENCE STANDARDS

- A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2013.
- B. ASME B16.15 - Cast Copper Alloy Threaded Fittings Classes 125 and 250; 2013.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- E. ASME B16.34 - Valves - Flanged, Threaded and Welding End; 2017.
- F. ASME B31.9 - Building Services Piping; 2014.
- G. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- H. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- I. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.

- J. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2013).
- K. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2011 (Amended 2012).
- L. AWWA C606 - Grooved and Shouldered Joints; 2015.
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data:
 - 1) Include data on pipe materials, pipe fittings, valves, and accessories.
 - 2) Indicate valve data and ratings.
 - 3) Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

1.5. QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.1. HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
 - 1) Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
 - 2) Use non-conducting dielectric connections whenever joining dissimilar metals.
 - 3) Grooved mechanical joints may be used in accessible locations only.
 - a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
 - b. Grooved mechanical connections and joints comply with AWWA C606.
 - c. Use rigid joints unless otherwise indicated.
 - 4) Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

- 1) Where grooved joints are used in piping, provide grooved valve/equipment connections if available; if not available, provide flanged ends and grooved flange adapters.

D. Valves: Provide valves where indicated:

- 1) Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
- 2) Isolate equipment using butterfly valves with lug end flanges or grooved mechanical couplings.
- 3) For throttling, bypass, or manual flow control services, use globe, ball, or butterfly valves.
- 4) For throttling and isolation service in chilled and condenser water systems, use only butterfly valves.
- 5) In heating water, chilled water, or condenser water systems, butterfly valves may be used interchangeably with gate and globe valves.
- 6) For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.

2.2. HEATING WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn, using one of the following joint types:

- 1) Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
 - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
 - b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
- 2) Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.3. CHILLED WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), hard drawn; using one of the following joint types:

- 1) Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
 - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
 - b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

- 2) Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
- 3) Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.4. EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn; using one of the following joint types:

2.5. PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.

- 1) If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
- 2) Hangers for Pipe Sizes 1/2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
- 3) Hangers for Cold Pipe Sizes 2 Inches and Greater: Carbon steel, adjustable, clevis.
- 4) Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.

- B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.6. UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe 2 Inches and Less:

- 1) Copper Pipe: Bronze, soldered joints.

- B. Flanges for Pipe 2 Inches and Greater:

- 1) Copper Piping: Bronze.
- 2) Gaskets: 1/16 inch thick preformed neoprene.

- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

- 1) Dimensions and Testing: In accordance with AWWA C606.
- 2) Mechanical Couplings: Comply with ASTM F1476.
- 3) Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
- 4) When pipe is field grooved, provide coupling manufacturer's grooving tools.

- D. Dielectric Connections:

- 1) Waterways:

- a. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
- b. Dry insulation barrier able to withstand 600 volt breakdown test.
- c. Construct of galvanized steel with threaded end connections to match connecting piping.
- d. Suitable for the required operating pressures and temperatures.

2) Flanges:

- a. Dielectric flanges with same pressure ratings as standard flanges.
- b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
- c. Dry insulation barrier able to withstand 600 volt breakdown test.
- d. Construct of galvanized steel with threaded end connections to match connecting piping.
- e. Suitable for the required operating pressures and temperatures.

2.7. PRESSURE INDEPENDENT TEMPERATURE CONTROL VALVES AND BALANCING VALVES

- A. Control Valves: Factory-fabricated pressure independent with internal differential pressure regulator (DPRV) which automatically adjusts to normal changes in system pressure and provides 100 percent control valve authority at all positions of the valve.
 - 1) Maintain proportional and linear flow coil characteristics.
 - 2) PICV to accurately control the flow from 0 to 100 percent full rated flow with an operating pressure differential range of 3 to 60 psig.
 - 3) Provide ANSI/FCI 70-2 Class 4 shut-off on all sizes and field serviceable.
 - 4) Provide control valve to incorporate control, balancing and flow limiting. Hydronic system pressure independent control valve bodies to comply with ASME B16.34 or ASME B16.15 pressure and temperature class ratings based on the design operating temperature and 150 percent of the system design operating pressure and have the following characteristics:
 - a. 2 NPS and Smaller: Class 150 bronze or brass body with union connections, stainless steel trim, stainless steel rising stem, stainless steel disc or ball, and screwed ends with backseating capacity repackable under pressure.
- B. Electronic Actuators: Direct-mounted, self-calibrating type designed for minimum 60,000 full-stroke cycles at rated force.
- C. Provide actuator with visible position indication. Fail positions on power failure to include in-place, open or closed as indicated in the controls specifications.

2.8. FLOW CONTROLS

- A. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
- B. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and to avoid interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Slope piping and arrange to drain at low points.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 0516.
 - 1) Flexible couplings may be used in header piping to accommodate thermal growth, thermal contraction in lieu of expansion loops.
 - 2) Use flexible couplings in expansion loops.

3.2. SCHEDULES

- A. Hanger Spacing for Copper Tubing.
 - 1) 1/2 inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 - 2) 1 inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 - 3) 1-1/2 inch and 2 inch: Maximum span, 8 feet; minimum rod size, 3/8 inch.

END OF SECTION

SECTION 23 2114 - HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Air vents.
- B. Strainers.
- C. Pressure-temperature test plugs.
- D. Balancing valves.
- E. Combination flow controls.

1.2. RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

PART 2 PRODUCTS

2.1. AIR VENTS

- A. Manufacturers:
 - 1) Armstrong International, Inc: www.armstronginternational.com.
 - 2) ITT Bell & Gossett: www.bellgossett.com.
 - 3) Taco, Inc: www.taco-hvac.com/.
- B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- C. Float Type:
 - 1) Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
- D. Washer Type:
 - 1) Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

2.2. STRAINERS

A. Manufacturers:

- 1) Armstrong International, Inc: www.armstronginternational.com.
- 2) Flexicraft Industries: www.flexicraft.com/#sle.
- 3) Grinnell Products, a Tyco Business: www.grinnell.com.
- 4) The Metraflex Company; LPD Y Strainer: www.metroflex.com.

B. Size 2 inch and Under:

- 1) Screwed brass or iron body for 175 psi working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

2.3. PRESSURE-TEMPERATURE TEST PLUGS

A. Manufacturers:

- 1) Ferguson Enterprises Inc: www.fnw.com.
- 2) Peterson Equipment Company Inc: www.petesplug.com.
- 3) Sisco Manufacturing Company Inc: www.siscomfg.com.

B. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.

C. Application: Use extended length plugs to clear insulated piping.

2.4. BALANCING VALVES

A. Size 2 inch and Smaller:

- 1) Provide ball or globe style with flow balancing, flow measurement, and shut-off capabilities, memory stops, minimum of two metering ports and NPT threaded or soldered connections.
- 2) Metal construction materials consist of bronze.

2.5. COMBINATION FLOW CONTROLS

A. Manufacturers:

- 1) Armstrong International: www.armstronginternational.com.
- 2) ITT Bell & Gossett: www.bellgossett.com.
- 3) Taco Inc: www.taco-hvac.com.

B. Construction: Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet with blowdown/backflush drain.

- C. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.
- D. Control Mechanism: Stainless steel or nickel plated brass piston or regulator cup, operating against stainless steel helical or wave formed spring.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install specialties in accordance with manufacturer's instructions.
- B. Provide manual air vents at system high points and as indicated.
- C. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

END OF SECTION

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; 2017.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- E. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data for duct materials.

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, and approved by manufacturer.

PART 2 PRODUCTS

2.1. DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to NFPA 90A standards.
- B. Ducts: Galvanized steel, unless otherwise indicated.
- C. Low Pressure Supply (Heating Systems): 1/2 inch w.g. pressure class, galvanized steel.

- D. Low Pressure Supply (System with Cooling Coils): 1/2 inch w.g. pressure class, galvanized steel.
- E. Medium and High Pressure Supply: 1/2 inch w.g. pressure class, galvanized steel.
- F. Return and Relief: 1/2 inch w.g. pressure class, galvanized steel.
- G. General Exhaust: 1/2 inch w.g. pressure class, galvanized steel.
- H. Outside Air Intake: 1/2 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. Stainless Steel for Ducts: ASTM A666, Type 304.
- C. 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.
- D. 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).
- E. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.4. MANUFACTURED DUCTWORK AND FITTINGS

- A. Flexible Ducts: Two ply vinyl film supported by helically wound spring steel wire.
 - 1) Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 - 2) Maximum Velocity: 4000 fpm.

- 3) Temperature Range: Minus 10 degrees F to 160 degrees F.
- B. Flexible Ducts: Multiple layers of aluminum laminate supported by helically wound spring steel wire.
 - 1) Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
 - 2) Maximum Velocity: 4000 fpm.
 - 3) Temperature Range: Minus 20 degrees F to 210 degrees F.
- 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).

2.5. CASINGS

- A. Fabricate casings in accordance with SMACNA (DCS) and construct for operating pressures indicated.
- B. Mount floor mounted casings on 4 inch high concrete curbs. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, provide liner of galvanized 18 gage, 0.0478 inch expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.
- C. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- C. Flexible Ducts: Connect to metal ducts with adhesive plus sheet metal screws.
- 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.

3.2. CLEANING

- A. See Section 01 7400- Cleaning, for additional requirements.
- B. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.
- C. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION

SECTION 23 3300 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Backdraft dampers - metal.
- C. Duct access doors.
- D. Duct test holes.
- E. Fire dampers.
- F. Flexible duct connections.
- G. Volume control dampers.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- B. Section 23 0548 - Vibration and Seismic Controls for HVAC.
- C. 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. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2017.
- C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).
- D. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- E. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1. AIR TURNING DEVICES/EXTRACTORS

- A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2. BACKDRAFT DAMPERS - METAL

- A. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3. DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Access doors with sheet metal screw fasteners are not acceptable.

2.4. DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.5. FIRE DAMPERS

- A. Manufacturers:
 - 1) Louvers & Dampers, Inc, a brand of Mestek, Inc: www.louvers-dampers.com.
 - 2) Nailor Industries, Inc: www.nailor.com.
 - 3) Ruskin Company, a brand of Johnson Controls: www.ruskin.com.
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Horizontal Dampers: Galvanized steel, 22 gage, 0.0299 inch frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- D. Multiple Blade Dampers: 16 gage, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- E. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.6. FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.

- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
 - 1) Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
 - 2) Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

2.7. VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Splitter Dampers:
 - 1) Material: Same gage as duct to 24 inches size in either direction, and two gages heavier for sizes over 24 inches.
 - 2) Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - 3) Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw .
- C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
 - 1) Blade: 18 gage, 0.0478 inch, minimum.
- D. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

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. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 by 4 inch for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- F. Demonstrate re-setting of fire dampers to Owner's representative.

- G. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- H. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
- I. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- J. Use splitter dampers only where indicated.

END OF SECTION

SECTION 23 3423 - HVAC POWER VENTILATORS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Roof exhausters.
- B. Ceiling exhaust fans.
- C. Upblast roof exhausters.
- D. Inline centrifugal fans.

1.2. REFERENCE STANDARDS

- A. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- B. AMCA 99 - Standards Handbook; 2016.
- C. AMCA 204 - Balance Quality and Vibration Levels for Fans; 2005.
- D. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.
- E. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; 2014.
- F. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.
- G. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.
- D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- 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 Fan Belts: One set for each individual fan.

1.4. QUALITY ASSURANCE

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Carnes, a division of Carnes Company Inc: www.carnes.com.
- B. Greenheck Fan Corporation: www.greenheck.com.
- C. Loren Cook Company: www.lorencook.com.
- D. PennBarry, Division of Air System Components: www.pennbarry.com.
- E. Twin City Fan & Blower: www.tcf.com.

2.2. POWER VENTILATORS - GENERAL

- A. Static and Dynamically Balanced: AMCA 204 - Balance Quality and Vibration Levels for Fans.
- B. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.
- C. Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.
- D. Fabrication: Conform to AMCA 99.
- E. Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

2.3. ROOF EXHAUSTERS

- A. Fan Unit: direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- B. Roof Curb: 16 inch high of aluminum with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.
- C. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- D. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.
- E. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

2.4. UPBLAST ROOF EXHAUSTERS

- A. Direct Drive Fan:
 - 1) Fan Wheel:

- a. Type: Non-overloading, backward inclined centrifugal.
- b. Material: Aluminum.
- 2) Statically and dynamically balanced.
- 3) Motors:
 - a. Open drip-proof (ODP).
 - b. Heavy duty ball bearing type.
 - c. Mount on vibration isolators or resilient cradle mounts, out of air stream.
 - d. Fully accessible for maintenance.
- 4) Housing:
 - a. Construct of heavy gage aluminum including curb cap, windband, and motor compartment.
 - b. Rigid internal support structure.
 - c. One-piece fabricated or fully welded curb-cap base to windband for leak proof construction.
 - d. Construct drive frame assembly of heavy gage steel, mounted on vibration isolators.
 - e. Provide breather tube for fresh air motor cooling and wiring.

B. Shafts and Bearings:

- 1) Fan Shaft:
 - a. Ground and polished steel with anti-corrosive coating.
 - b. First critical speed at least 25 percent over maximum cataloged operating speed.
- 2) Bearings:
 - a. Permanently sealed or pillow block type.
 - b. Minimum L10 life in excess of 100,000 hours (equivalent to L50 average life of 500,000 hours), at maximum cataloged operating speed.
 - c. 100 percent factory tested.

C. Drive Assembly:

- 1) Motor pulley adjustable for final system balancing.
- 2) Readily accessible for maintenance.

D. Disconnect Switches:

- 1) Factory mounted and wired.
 - 2) Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 3) Finish for Painted Steel Enclosures: Provide manufacturer's standard or factory applied gray unless otherwise indicated.
 - 4) Positive electrical shutoff.
 - 5) Wired from fan motor to junction box installed within motor compartment.
- E. Roof Curb: 16 inch high self-flashing of aluminum with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.
- F. Drain Trough: Allows for single-point drainage of water, grease, and other residues.
- G. Options/Accessories:
- 1) Birdscreen:
 - a. Provide stainless steel construction.
 - 2) Dampers: Provide motorized type.
 - a. Provide 24V open/close damper actuator, power close, and spring fail safe open, complete with end switch
 - 3) Drain Connection:
 - a. Aluminum construction.
 - 4) Finishes: Standard factory finish.
 - 5) Grease Trap:
 - a. Aluminum.
 - b. Includes drain connection.
 - c. Collects grease residue.
 - 6) Hinge Kit:
 - a. Aluminum hinges.
 - b. Hinges and restraint cables mounted to base (sleeve).
 - c. Allows fan to tilt away for access to wheel and ductwork for inspection and cleaning.
 - 7) Heat Baffle: Prevents heat from radiating into motor compartment.

- 8) Tie-down Points: Four brackets located on windband secures fan in heavy wind applications.
- 9) External motor speed controllers for field mounting.

2.5. INLINE CENTRIFUGAL FANS

- A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
- B. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhausters with cadmium plated steel lag screws to roof curb.
- C. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D. Install backdraft dampers on inlet to roof and wall exhausters.
- E. Provide backdraft dampers on outlet from ceiling exhauster fans and as indicated.

END OF SECTION

SECTION 23 3433 - AIR CURTAINS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Air curtains with hot water heat.

1.2. RELATED REQUIREMENTS

- A. Section 23 2113 - Hydronic Piping: Hot water heating piping.

1.3. REFERENCE STANDARDS

- A. AMCA 220 - Laboratory Methods of Testing Air Curtains for Aerodynamic Performance Ratings; 2012.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Product Data: Manufacturer's descriptive literature for products specified in this section; indicate options specified.
- C. Manufacturer's Instructions: Printed installation instructions for each product specified.
- D. Shop Drawings: Indicate installation and connection details for air curtains.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Berner International Corp.: www.berner.com.
- B. MARS Air Systems: www.marsair.com.
- C. Powered Aire, Inc..
- D. Substitutions: See Section 01 6000 - Product Requirements.

2.2. AIR CURTAINS

- A. Product Description: Self-contained, electrically-operated, air curtain for mounting at head of door openings.
 - 1) Maximum Mounting Height: 8 feet.
 - 2) Maximum Door Width: 6 feet.
- B. Housing:
 - 1) Material: Galvanized steel.
 - 2) Factory-provided mounting brackets.
 - 3) Finish: Painted epoxy.

- 4) Color: White.
- C. Blower Assembly: Heavy-duty motor; forward curved centrifugal fans, double inlet, double width.
- D. Water Coils:
 - 1) Type: Cleanable.
 - 2) Piping Connections: Threaded on same end.
 - 3) Tube Material: Copper, complying with ASTM B 75 (ASTM B 75M).
 - a. Tube Diameter: 0.625 inch.
 - 4) Fins: Aluminum or Copper.
 - 5) Fin and Tube Joint: Mechanical bond or Silver brazed.
 - 6) Headers: Seamless copper tube with brazed joints, prime coated.
 - 7) Frames: Galvanized-steel channel frame.
 - 8) Ratings: According to ASHRAE 33.
 - 9) Working-Pressure Ratings: 200 psig .
- E. Performance: Tested in accordance with AMCA 220.
- F. Control: ON/OFF control; air curtain turns on when door is opened and off when door is closed. On board interface for BAS.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that required utilities are in correct location and are of correct capacities for specified products.
- B. Verify that mounting surfaces have sufficient strength to support units.
- C. Verify that space is ready for installation of units.
- D. Verify clearances required to maintain the units.

3.2. INSTALLATION

- A. Install air curtains in accordance with shop drawings and manufacturer's printed installation instructions.
- B. Maintain clearances required to maintain the units.
- C. Ensure proper connection to utilities.

END OF SECTION

SECTION 23 3700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.
- C. Louvers.
- D. Gravity ventilators.

1.2. RELATED REQUIREMENTS

1.3. REFERENCE STANDARDS

- A. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.
- B. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2015.
- C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.
- E. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.5. QUALITY ASSURANCE

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. American Louver Company; ALC Grilles and Registers: www.americanlouver.com.
- B. Carnes, a division of Carnes Company Inc: www.carnes.com.
- C. Price Industries: www.price-hvac.com.
- D. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com.
- E. Ruskin, Inc.; www.ruskin.com.

2.2. RECTANGULAR CEILING DIFFUSERS

- A. Type: Provide square and rectangular, multi-louvered diffuser to discharge air in 360 degree, one way, two way, three way, and four way pattern with sectorizing baffles where indicated.
- B. Connections: As indicated on drawings.
- C. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.
- D. Fabrication: Aluminum or aluminum with baked enamel finish.
- E. Color: As selected by Architect from manufacturer's standard range.
- F. Accessories: Provide radial opposed blade volume control damper; gaskets for surface mounted diffusers with damper adjustable from diffuser face.

2.3. DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS

- A. Type: Duct-mounted, rectangular register with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.

2.4. CEILING SUPPLY REGISTERS/GRILLES

- A. Type: Streamlined and individually adjustable curved blades to discharge air along face of grille, one-way deflection.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- C. Construction: Made of aluminum extrusions with factory enamel finish.
- D. Color: As selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.5. CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting.
- C. Fabrication: Aluminum with 20 gage, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

2.6. WALL SUPPLY REGISTERS/GRILLES

- A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- C. Fabrication: Aluminum with 20 gage, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.7. WALL EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting.
- C. Fabrication: Aluminum extrusions, with factory baked enamel finish.
- D. Color: To be selected by Architect from manufacturer's standard range.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

2.8. LOUVERS

- A. Type: 4 inch or 6 inch deep with blades on 45 degree slope, heavy channel frame, 1/2 inch square mesh screen over exhaust and 1/2 inch square mesh screen over intake.
- B. Color: To be selected by Architect from manufacturer's standard range.

2.9. GRAVITY VENTILATORS

- A. Hood Intake and Relief Gravity Ventilator:

1) Manufacturers:

- a. American Coolair Corporation: www.coolair.com.
- b. Greenheck Fan Corporation: www.greenheck.com.
- c. Loren Cook Company: www.lorencook.com.

2) General:

- a. Low silhouette for intake and relief applications with natural gravity or negative pressure system(s).
- b. Performance ratings and factory testing to be in accordance with AMCA 511 and AMCA 550.

- c. Equipment to bear permanently affixed manufacturer's nameplate listing model and serial number.
- 3) Hood and Base:
 - a. Material: Aluminum.
 - b. Hood Construction: Precision formed, arched panels with interlocking seams.
 - c. Vertical End Panels: Fully locked into hood end panels.
 - d. Curb Cap: Pre-punched mounting holes for installation.
- 4) Birdscreen:
 - a. Fabricate in accordance with ASTM B221 (ASTM B221M).
 - b. Construction: 1/2 inch Galvanized mesh.
 - c. Horizontally mounted across hood intake area.
- 5) Hood Support: Galvanized steel construction and fastened so hood can be removed completely from the base or hinged open.
- 6) Options/Accessories:
 - a. Roof Curbs:
 - 1) Pitched Roofs: Welded, straight side curb with flashing flange and wood nailer.
 - 2) Material: Aluminum.
 - 3) Insulation Thickness: 1 inch.
 - b. Provide extended base minimum 7 inch extension to base height making overall base 12 inches in height to prevent snow or moisture intake.
 - c. Curb Seal: Rubber seal between fan and roof curb.
 - d. Dampers:
 - 1) Type: Gravity.
 - 2) Factory designed to prevents outside air from entering back into building when fan is off.
 - 3) Balanced for minimal resistance to flow.
 - 4) Galvanized frames with pre-punched mounting holes.
 - e. Factory Finish: Baked enamel matching or complementing building colors.
 - f. Hood Insulation or Coating: Provide 1/2 inch fiberglass insulation lining or anti-condensate coating to prevent condensation and reduce sound levels.

g. Insect Screen:

- 1) Fabricate in accordance with ASTM B221 (ASTM B221M).
- 2) Construct of fine mesh aluminum.
- 3) Fitted to top of the throat to prevent entry of insects.
- 4) Coating: Thermo-setting polyester urethane.

h. Tie-Down Points: Aluminum brackets located on hood supports to secure fan in heavy wind applications.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.
- E. 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.
- F. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 9123.

END OF SECTION

SECTION 23 4133 - HIGH-EFFICIENCY PARTICULATE FILTRATION

PART 1 GENERAL

1.1.SUMMARY

A. Section Includes:

- 1) HEPA filter fan modules.
- 2) Filter gages.

1.2. ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include dimensions; operating characteristics; required clearances and access; rated flow capacity, including initial and final pressure drop at rated airflow; efficiency and test method; fire classification; furnished specialties; and accessories for each model indicated.
- B. Shop Drawings: For air filters. Include plans, elevations, sections, details, and attachments to other work.
- 1) Show filter rack assembly, dimensions, materials, and methods of assembly of components.
 - 2) Include setting drawings, templates, and requirements for installing anchor bolts and anchorages.
 - 3) Include diagrams for power, signal, and control wiring.

1.3. INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4. CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of filter and rack to include in emergency, operation, and maintenance manuals.

1.5. MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- 1) Provide one complete set(s) of filters for each filter bank. If system includes prefilters, provide only prefilters.

1.6. REFERENCE STANDARDS

- A. IEST-RP-CC001 - HEPA and ULPA Filters; 2016, with Errata (2017).

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PART 2 PRODUCTS

2.1. PERFORMANCE REQUIREMENTS

A. ASHRAE Compliance:

- 1) Finish of Interior Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

B. Comply with IEST-RP-CC001.5.

C. Comply with UL 586.

D. Comply with IEST-RP-CC007.2.

E. Comply with NFPA 90A and NFPA 90B.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended use.

2.2. HEPA FILTER FAN MODULES

A. Description: Factory-fabricated, HEPA filter ceiling module with fan by one of the following Manufacturers:

- 1) Price
- 2) Camfil
- 3) Clean Air Solution

B. Casing:

- 1) Configuration: Plenum inlet.
- 2) Module Material: Extruded aluminum, 16 gage with mill finish.
- 3) Suspension: Ceiling grid.

C. Media: Fibrous glass, constructed of continuous sheets with closely spaced pleats with aluminum separators.

- 1) Frame Material: Aluminum.
- 2) Face Gasket: Neoprene expanded rubber.
- 3) Faceguard: Stainless steel.

D. Accessories: Filter test port and powercord.

E. Control: Variable speed.

F. Motor:

- 1) Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
- 2) Type: Electronically commutated motor.
- 3) Fan-Motor Assembly Isolation: Rubber isolators.
- 4) Efficiency: Premium efficient.

2.3. FILTER GAGES

- A. Diaphragm type with dial and pointer in metal case, vent valves, black figures on white background, and front recalibration adjustment.
- B. Accessories: Static-pressure tips, tubing, gage connections, and mounting bracket.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Equipment Mounting:
 - 1) Comply with requirements for vibration isolation and seismic-control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Position each filter unit with clearance for normal service and maintenance. Anchor filter holding frames to substrate.
- C. Do not operate fan system until filters (temporary or permanent) are in place. Replace temporary filters that were used during construction and testing with new, clean filters.
- D. Install filter-gage static-pressure tips upstream and downstream from filters. Install filter gages on filter banks with separate static-pressure taps upstream and downstream from filters. Mount filter gages on outside of filter housing or filter plenum in an accessible position. Adjust and level inclined gages.
- E. Coordinate filter installations with duct and air-handling unit installations.

3.2. FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Air filter will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.3. CLEANING

- A. After completing system installation and testing, adjusting, and balancing air-handling and air-distribution systems, clean filter housings and install new filter media.

3.4. PROTECTION

- A. Protect installed products and accessories from damage during construction.

END OF SECTION

HIGH-EFFICIENCY PARTICULATE FILTRATION		23 4133-4
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SECTION 23 7313 - MODULAR INDOOR CENTRAL-STATION AIR-HANDLING UNITS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Casing construction.
- B. Economizer with Return Fan section.
- C. Coil section.
- D. Supply Fan Section
- E. Controls.

1.2. RELATED REQUIREMENTS

- A. Section 23 0513 - Common Motor Requirements for HVAC Equipment.
- B. Section 23 0548 - Vibration and Seismic Controls for HVAC.
- C. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
- D. Section 23 3300 - Air Duct Accessories: Flexible duct connections.

1.3. REFERENCE STANDARDS

- A. AHRI 260 (I-P) - Sound Rating of Ducted Air Moving and Conditioning Equipment; 2017.
- B. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2014.
- C. ASHRAE Std 62.1 - Ventilation for Acceptable Indoor Air Quality; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2016.
- E. ASTM B177/B177M - Standard Guide for Engineering Chromium Electroplating; 2011 (Reapproved 2017).
- F. NEMA MG 1 - Motors and Generators; 2017.
- G. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2018.

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H. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Revised 2009).

I. UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.

J. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data:

- 1) Published Literature: Indicate dimensions, weights, capacities, ratings, gauges and finishes of materials, and electrical characteristics and connection requirements.
- 2) Filters: Data for filter media, filter performance data, filter assembly, and filter frames.
- 3) Fans: Performance and fan curves with specified operating point clearly plotted, power, RPM.
- 4) Sound Power Level Data: Fan outlet and casing radiation at rated capacity.
- 5) Electrical Requirements: Power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.

C. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements.

1.6. QUALITY ASSURANCE

1.7. DELIVERY, STORAGE, AND HANDLING

A. Accept products on site in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs. Inspect for damage.

B. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

C. Do not operate units until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.8. WARRANTY

A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Carrier Corporation: www.carrier.com.
- B. Trane Inc: www.trane.com.
- C. York International Corporation / Johnson Controls Inc: www.york.com.

2.2. CASING CONSTRUCTION

A. Full Perimeter Base Rail:

- 1) Construct of galvanized steel.
- 2) Provide base rail of sufficient height to raise unit for external trapping of condensate drain pans.

B. Casing:

- 1) Construct of one piece, two-inch solid, R-13 insulated, double wall panels.
- 2) Provide mid-span, no through metal, internal thermal break.
- 3) Construct outer panels of galvanized steel and inner panels of galvanized steel.
- 4) Casing Air Pressure Performance Requirements:
 - a. Able to withstand up to 8 in-wc positive or negative static pressure.
 - b. Not to exceed 0.0042 inches per inch deflection at 1.5 times design static pressure up to a maximum of plus 8 in-wc in positive pressure sections and minus 8 in-wc in negative pressure sections.

C. Access Doors:

- 1) Construction, thermal and air pressure performance same as casing.
- 2) Provide surface mounted handles on hinged, swing doors.

D. Outside Air and Exhaust Air louvers: see schedule.

E. Unit Flooring: Construct with sufficient strength to support minimum 300 lb expected people loads and equipment loads associated with maintenance activities.

F. Casing Leakage: Seal joints and provide airtight access doors so that air leakage does not exceed one percent of design flow at the specified casing pressure.

G. Insulation:

- 1) Provide minimum thermal thickness of 12 R throughout.
- 2) Completely fill panel cavities in each direction to prevent voids and settling.

- 3) Comply with NFPA 90A.

H. Drain Pan Construction:

- 1) Provide cooling coil and humidifier sections with an insulated, double wall, galvanized steel drain pan complying with ASHRAE Std 62.1 for indoor air quality and sufficiently sized to collect all condensate.
- 2) Slope in two planes to promote positive drainage and eliminate stagnate water conditions.
- 3) Locate outlet of sufficient diameter at lowest point of pan to prevent overflow at normal operating conditions.
- 4) Provide visible external drain connections constructed of drain pan material, extended sufficient distance beyond the base to accommodate field installed, condensate drain trapping.

I. Finish:

- 1) Indoor Units:
 - a. Provide exterior, galvanized steel panels with painted surface complying with ASTM B177/B177M.
 - b. Color: Manufacturer's standard color.

2.3. ECONOMIZER WITH RETURN FAN SECTION

- A. Return fan: The fan assembly shall be a direct-drive plenum fan with high efficiency welded-aluminum impeller that is dynamically balanced as an assembly. Fan shall be maintenance free throughout its operating life. Fans shall be balanced to G6.3 per AMCA 204. No external vibration isolation is necessary. Access to motor and fan assembly through hinged access door. Access door shall be sized for removal of entire motor and fan assembly. Fans shall be arranged for top or back inlet.
- B. Motor contains integrated PID controller and accepts 0-10VDC input for variable speed control. Signal is wired back to the UC600 controller or terminal strip.
- C. Dampers: damper arrangement in the economizer section allows for exhaust air out the unit, return air through the air, and outside air intake into the unit. The dampers are ultra-low-leak, parallel blade dampers with edge and jamb seals. Dampers are tested and certified in accordance with AMCA 511 for air performance and air leakage. Leakage rate shall not exceed 3cfm/ft² at one-inch w.g. and 8 cfm/ft² at four-inch w.g. Dampers are double-skin airfoil design or equivalent. Damper blades and frames are galvanized steel. The damper has a properly sized drive for use with an optional factory-mounted actuator.
- D. 2-inch pleated media filters made with 100% synthetic fibers that are continuously laminated to a supported steel-wire grid with water repellent adhesive shall be provided. Filters shall be capable of operating up to 625 fpm face velocity without loss of filter efficiency and holding capacity. The filters shall have a MERV 8 rating when tested in accordance with the ANSI/ASHRAE Standard 52.2.

- E. 4 inch high efficiency filters constructed with a fine fiber media made into closely spaced pleats shall be provided. The filters shall be capable of operating up to 625 fpm face velocity without loss of filter efficiency and holding capacity. The filter media shall be sealed into a frame assembled in a rigid manner. The manufacturer shall supply a side access filter rack capable of holding 4 inch high efficiency filters.
- F. The 4 inch high efficiency filters shall have a MERV 13 rating when tested in accordance with the ANSI/ASHRAE Standard 52.2.
- G. An averaging temperature sensor shall be serpentine across the module. All capillaries bends shall be radiused and fastened with capillary clips to prevent crimping and minimize wear.
- H. Mixing Section Damper Actuators:
 - 1) Spring return actuators shall be mounted with the back air damper linked normally closed and the top air damper linked normally open.

2.4. COIL SECTION

- A. Casing: Galvanized steel. Provide access to both sides of coils. Enclose coils with headers and return bends exposed outside casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.
- B. Drain Pans: 24 inch downstream of coil and down spouts for cooling coil banks more than one coil high.
- C. Eliminators: Three break of galvanized steel, mounted over drain pan.
- D. Fabrication:
 - 1) Tubes: 5/8 inch OD seamless copper expanded into fins, brazed joints.
 - 2) Fins: Aluminum.
 - 3) Casing: Die formed channel frame of galvanized steel.
- E. Water Heating Coils:
 - 1) Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints.
 - 2) Configuration: Drainable, with threaded plugs for drain and vent; serpentine type with return bends on smaller sizes and return headers on larger sizes.
- F. Water Cooling Coils:
 - 1) Headers: Cast iron, seamless copper tube, or prime coated steel pipe with brazed joints.
 - 2) Configuration: Drainable, with threaded plugs for drain and vent; threaded plugs in return bends and in headers opposite each tube.
- G. Hot Water Heating Coil: see schedule.
- H. Water Cooling Coil: see schedule.
- I. Condensate Overflow Switch

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- 1) A float switch conforming to UL 508 shall be factory-installed in the drain pan that will detect a high condensate water level and be used to shut off the air handler in the event that the primary drain is blocked to comply with IMC 2006. The float switch shall be located at a point higher than the primary drain line connection and below the overflow rim of the drain pan.

J. Access Section with Coil

- 1) Unit(s) shall include a separate section housing a coil section and access section as one assembly. Section shall include a stainless steel drainpan and an access door of sufficient size to allow for visual inspection of the leaving face of the first coil in the airstream and entering face of the second coil in the airstream. Access door shall be of the same construction as all other doors on the unit.

K. Low Limit

- 1) A single-pole single throw low limit switch shall be serpentine across the leaving side of the coil with routing to maximize coil coverage and cover critical top and bottom 3 inches of the coil for any given capillary and coil area configuration. The bends of the capillaries shall be curved and fastened with capillary clips to prevent crimping and minimize wear. Low limit switch shall include a manual reset button. Contacts open on temperature decrease below set point. Set point is default set to 35F at factory, but is adjustable if increased setpoint is needed due to installation site ducting to coil causing cold spot in a unique location of the coil.

2.5. HOSE KITS AND VALVES

A. Hoses:

- 1) Provide hoses for all units for connection to main water supply and return headers.
- 2) Length: 2 feet.
- 3) Material: Braided stainless steel rated to minimum 400 psi at 265 degrees F.

B. Automatic Balancing Valves:

- 1) Brass body for shutoff and hydronic balancing.

C. Y Strainers:

- 1) Bronze body.
- 2) "Y" type configuration with brass cap.
- 3) Maximum Operating Pressure: Minimum 450 psi.
- 4) Screen: Stainless steel.

2.6 SUPPLY FAN SECTION

The fan shall be a single-width, single-inlet, 10-bladed direct-drive plenum fan. The fan shall consist of a backward-curved, welded steel wheel. Motor bearing life of the direct-drive plenum fan shall be not less than L-10 250,000 hrs.

- A. Motor Frame
- B. The motor shall be mounted integral to the isolated fan assembly and furnished by the unit manufacturer. The motor is mounted inside the unit casing. The motor shall meet or exceed all NEMA Standards Publication MG 1 requirements and comply with NEMA Premium efficiency levels when applicable except for fractional horsepower motors which are not covered by the NEMA classification. The motor shall be T-frame, squirrel cage with size, type, and electrical characteristics as shown on the equipment schedule.
- C. Fan Isolation
- D. All fans shall be internally isolated to inhibit noise and vibration through the ductwork and building structure. A flexible connection shall be installed between fan and unit casing to ensure complete isolation. If fans and motors are not internally isolated, then the entire unit shall be externally isolated from the building, including supply and return duct work, piping, and electrical connections. External isolation shall be furnished by the installing contractor in order to avoid transmission of noise and vibration through the ductwork and building structure.
- E. Fan Discharge Temperature Sensor
- F. A button or probe temperature sensor shall be mounted in the fan discharge.
- G. Airflow Switch
- H. A differential pressure switch piped to the discharge and suction sides of the fan shall indicate fan status.

2.7 CONTROLS

- A. DDC Controller:
 - 1) Provide panel-mounted, factory wired, application-specific (ASC) or advanced application-programmable controller (APC).
 - 2) Include built-in or provide local screen push-button interface for local monitoring, adjustment, tuning, data logging, and troubleshooting.
 - 3) Factory configured to handle internal equipment using manufacturer's specific instructions unless directly specified on listed sequence of operation.

- 5) Factory wired into panel-mounted auxiliary relay(s) to handle scheduled or interlocked cycle-duty operation of externally linked equipment as indicated on drawings.
 - 6) Factory installed, wired, programmed, and tested, including each component.
 - 7) BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.
- B. Mixing Section Dampers:
- 1) Outdoor Air Damper: Fail closed using spring-return actuator.
 - 2) Return Air Damper: Fail open using spring-return actuator.
- C. Temperature Sensors: Provide for fan discharge, supply, return, mixed air, and coil section. Use averaging type for coil sections.
- D. Low Limit Switches:
- 1) Factory wire to momentary push-button reset circuit.
 - 2) Provide separate low limit for each coil in a coil stack.
- E. Fan Status: Provide pressure switch to determine running status.
- F. Loaded Filter Section: Tube to filter section to indicate sectional filter status.
- G. Condensate Overflow Switches:
- 1) Comply with UL 508; shut down unit in the event of primary drain blockage.
 - 2) Factory install float switch in drain pan to detect high water condensate level.
 - 3) Locate float switch above primary drain line connection and below drain pan rim.
- H. Relays, Unit-Mounted, Output-Linked: Provide for external loads including motor starters, relief dampers, pumps, condensing units, and other equipment as specified in the drawings.
- I BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet MS/TP.
- J External Point Mapping: Provide mapping table for each parameter included in the local visual interface with software-toggle flag to allow reduced mapping of available points.
- K Control Valves: Field-installed, modulating, ball type with position tracking; manufacturer provided.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Bolt sections together with gaskets.
- C. Isolate fan section with flexible duct connections.

- D. Install flexible duct connections between fan inlet and discharge ductwork and air handling unit sections. Ensure that metal bands of connectors are parallel with minimum 1 inch flex between ductwork and fan while running.
- E. Install assembled unit on vibration isolators. Install isolated fans with resilient mountings and flexible electrical leads. Install restraining snubbers as indicated; see Section 23 0548. Adjust snubbers to prevent tension in flexible connectors when fan is operating.
- F. Provide fixed sheaves required for final air balance.
- G. Make connections to coils with unions or flanges.
- H. Hydronic Coils:
 - 1) Hydronic Coils: Connect water supply to leaving air side of coil (counterflow arrangement).
 - 2) Provide shut-off valve on supply line and lockshield balancing valve with memory stop on return line.
 - 3) Locate water supply at bottom of supply header and return water connection at top.
 - 4) Provide manual air vents at high points complete with stop valve.
 - 5) Ensure water coils are drainable and provide drain connection at low points.
- I. Field-wire each factory provided control for field installation.
- J. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface.

3.2 SYSTEM STARTUP

- K. Prepare and start equipment and systems in accordance with manufacturers' instructions and recommendations.
- L. Adjust for proper operation within manufacturer's published tolerances.

3.3 CLOSEOUT ACTIVITIES

- M. See Section 01 7800 - Closeout Submittals for closeout submittals.
- N. Training: Train Owner's personnel on operation and maintenance of system.
 - 1) Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2) Provide minimum of two hours of training.

END OF SECTION

Modular Indoor Central-Station Air-Handling Units		23 7313-9
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SECTION 23 7433 - DEDICATED OUTDOOR AIR UNITS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Indoor-mounted DOAS.

1.2. REFERENCE STANDARDS

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.
- B. AHRI 270 - Sound Performance Rating of Outdoor Unitary Equipment; 2015.
- C. ASHRAE Std 23 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- D. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 54 - National Fuel Gas Code; 2018.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL (DIR) - Online Certifications Directory; Current Edition.
- H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.
- D. Operation And Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
- 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 Filters: One set of each type and size.

1.4. WARRANTY

- A. See Section 01 7800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. CaptiveAire Systems; _____: www.captiveaire.com/#sle.
B. Greenheck; _____: www.greenheck.com/#sle.
C. Trane.

2.2. INDOOR - MOUNTED DOAS

A. Packaged Unit:

1) Casing and Components:

- a. Fabrication: AHRI 210/240 and UL 207 construction, ASHRAE Std 23 tested.
- b. 18 gauge, 0.0478 inch steel panels reinforced with structural angles and channels to ensure rigidity.
- c. Provide bolted access panels to access each sections from either side of unit.
- d. Provide hinged door with lockable handle for serviceable sections.
- e. Drain Pan: Galvanized steel with corrosion-resistant coating.

2) Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.

3) Regulatory Requirements: AHRI 270 rated, NFPA 70, and UL (DIR) listed.

4) Insulation: Minimum 1/2 inch thick acoustic duct liner for lining cabinet interior.

5) External Surface Finish: Heat resistant baked enamel.

6) Outside Air Damper with Rain Hood and Screen:

- a. Set outdoor air dampers to fully open when fan starts and close 30 seconds after fan stops, adjustable.
- b. Dampers to modulate when unit is on economizer, space pressurization, or CO2 control.

B. Filter Section:

1) Filter: Removable, 2 inches thick MERV-8 and 4" MERV-14, see sched.

2) Monitoring: Provide gauge with loaded setpoint-adjustable signal flag or external tag. Provide loaded filter alarm switch wired into unit controls with illuminated indicator on local control panel face.

C. Heating Section:

1) Hot Water Coil:

- a. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.

D. Cooling Section:

1) Chilled Water:

- a. Provide copper tube aluminum fin coil assembly with galvanized drain pan and connection.
- b. Provide capillary tubes or thermostatic expansion valves for units of 6 Tons capacity and less, and thermostatic expansion valves and alternate row circuiting for units 7.5 Tons cooling capacity and larger.

- E. Enthalpy Economizer Section: Provide factory-installed sensors, electrically-actuated return air damper, and electrically-actuated exhaust damper fully coordinated with return, exhaust, or return-exhaust fan section. Configure controls for fault-detection diagnostics.

F. Fan Section:

- 1) Provide direct or plenum mounted variable-speed fan motors; see Section 23 0513.
- 2) Draw-through, forward-curved fan, constructed of corrosion-resistant, galvanized material and designed for efficient, quiet operation.
- 3) Factory program for both soft start and constant flow output over static pressure range.
- 4) Provide preinstalled neutral wire protection when required to support specified fan type.
- 5) Motor to include thermal overload protection, quick disconnect plug, and permanently lubricated bearings.
- 6) Belt-Driven Motor Requirements: Provide adjustable blower motor/sheave combination device based on indicated flow performance requirements. Statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy-duty, self-aligning, prelubricated ball bearings and V-belt drive with matching motor sheaves and belts.
- 7) Variable Speed Control: Configure controller to maintain adjustable flow setpoint for modulating or speed-switched units; see Section 23 0934.
- 8) Fan Turndown: Design control features to allow fan speed reduction to adjustable 50 percent of its capacity when the zone set point temperature is satisfied or when unit runs in fan-only mode.

G. Unit Controls:

1) DDC:

- a. Tested to monitor and handle sequencing functions and other operational modes using field-mounted thermostat and other sensors.
- b. Coordination and Sequencing:
 - 1) Internal Devices: Include compressors, blower, sensors, switches, valves, safeties, other components.
 - 2) Field-Installed Devices: Solenoid valves, thermostat, EWT sensors, LWT sensors, internal and remote contacts, and other devices required for operation.
 - 3) Safeties: At minimum include anti-short-cycle compressor protection, condensate overflow, refrigerant high pressure, refrigerant low pressure, loss-of-charge, refrigerant freeze protection, and freestat.
 - 2) On-board Control Panel: Interface to include on-off-auto switch, summer-winter switch, heat-off-cool switch, indicating lights for supply fan, pilot operation, burner operation, lockout indication, and clogged filter indication.
 - 3) Interlocked Functions:
 - a. Controlled by BAS.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Follow NFPA 54 guidelines to provide natural gas system connection; see Section 23 1123.
- C. Install unit on vibration isolator pad or roof curb; see Section 23 0548.
- D. Provide flexible duct connections on outlet from unit; see Section 23 3300.
- E. Connect drain pan outlet to nearest building drain system piping.
- F. Adjusting: Use plenum static pressure readings against manufacturer calibration chart to adjust primary airflow as other measuring methods will not work.

END OF SECTION

SECTION 23 8200 - CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Electric baseboard.

1.2. REFERENCE STANDARDS

- A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.3. ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide typical catalog of information including arrangements.
- C. Shop Drawings:
 - 1) Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
 - 2) Indicate air coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
 - 3) Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
 - 4) Submit the following for blower-coil units indicating:
 - a. Overall dimensions including installation, operation, and service clearances.
 - b. Lift points, recommendations, and center of gravity.
 - c. Unit shipping, installation, and operating weights including dimensions.
 - d. Fan curves with specified operating point clearly plotted.
 - e. Safety and start-up instructions.
- D. Manufacturer's Instructions: Indicate installation instructions and recommendations.

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- E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.
- F. Warranty: Submit manufacturer's 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 Products specified in this section with minimum three years documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1. ELECTRIC BASEBOARD

- A. Manufacturers:
 - 1) Heatrex: www.heatrex.com.
 - 2) Marley Engineered Products: www.marleymep.com.
 - 3) Vulcan Radiator, a Mestek Company: www.vulcanrad.com.
- B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.
- C. Assembly: Suitable for flush mounting on any floor surface with wire raceway, thermal safety cut-out, and electric terminal box.
- D. Heating Elements:
 - 1) Enclosed nickel chromium wire in steel, stainless steel, or aluminum sheathing or tubing.
 - 2) Mechanically bonded, aluminum finned, heating elements.
 - 3) Heating element securely anchored and free-floating for noise free operation.
- E. Enclosure:
 - 1) Minimum 24 gage, 0.0239 inch thick back panel and 20 gage, 0.0359 inch thick sheet steel, exposed front panels, end caps, corners, and joiner pieces.
 - 2) All joints to snap together without fasteners.
 - 3) Provide easily removable front panel.

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F. Finish:

- 1) Factory applied, baked enamel finish.
- 2) Color: As selected from color chart.

G. Controls: Wall mounted electric thermostat.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install in accordance with manufacturer's recommendations.
- B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.
- C. Do not damage equipment or finishes.
- D. Baseboard Radiation:
 - 1) Center elements under window.
 - 2) Install end caps where units butt against walls.

3.2. FIELD QUALITY CONTROL

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

3.3. CLEANING

- A. After construction and painting is completed, clean exposed surfaces of units.
- B. Vacuum clean coils and inside of units.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.

3.4. CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

END OF SECTION

Convection Heating and Cooling Units		23 8200-3
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SECTION 238219 - FAN COIL UNITS

PART 1 - GENERAL

SUMMARY

Section Includes:

Ducted fan coil units and accessories.

ACTION SUBMITTALS

Product Data: For each type of product.

Include rated capacities, operating characteristics, and furnished specialties and accessories.

Shop Drawings:

Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Include diagrams for power, signal, and control wiring.

Seismic Qualification Certificates: For fan coil units, accessories, and components, from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Field quality-control reports.

Sample Warranty: For special warranty.

CLOSEOUT SUBMITTALS

Operation and Maintenance Data: For fan coil units to include in emergency, operation, and maintenance manuals.

In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

Maintenance schedules and repair part lists for motors, coils, integral controls, and filters.

MAINTENANCE MATERIAL SUBMITTALS

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Fan Coil Unit Filters: Furnish 2 spare filters for each filter installed.

Fan Belts: Furnish 1 spare fan belt for each unit installed.

QUALITY ASSURANCE

Comply with NFPA 70.

ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

COORDINATION

Coordinate layout and installation of fan coil units and suspension system components with other construction that penetrates or is supported by ceilings, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

Coordinate size and location of wall sleeves for outdoor-air intake.

WARRANTY

Special Warranty: Manufacturer agrees to repair or replace components of condensing units that fail in materials or workmanship within specified warranty period.

Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

SYSTEM DESCRIPTION

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Factory-packaged and -tested units rated according to AHRI 440, ASHRAE 33, and UL 1995.

DUCTED FAN COIL UNITS

Manufacturers:
Carrier

Fan Coil Units		23 8219-2
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Trane
Airtherm

Fan Coil Unit Configurations: Horizontal, slimline, four-pipe ducted system and vertical, floor mounted, ducted supply and return, four-pipe system.

Coil Section Insulation: 1-inch- thick, coated glass fiber complying with ASTM C 1071 and attached with adhesive complying with ASTM C 916.

Surface-Burning Characteristics: Insulation and adhesive shall have a combined maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84 by a qualified testing agency.

Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

Main and Auxiliary Drain Pans: Stainless steel. Fabricate pans and drain connections to comply with ASHRAE 62.1.

Chassis: Galvanized steel where exposed to moisture, with baked-enamel finish and removable access panel or , with powder-coat finish and removable access panel. Floor-mounting units shall have leveling screws.

Cabinets: Steel with baked-enamel finish in manufacturer's standard paint color.

Supply-Air Plenum: Sheet metal plenum finished and insulated to match the chassis.

Return-Air Plenum: Sheet metal plenum finished to match the chassis.

Mixing Plenum: Sheet metal plenum finished and insulated to match the chassis with outdoor- and return-air, formed-steel dampers.

Dampers: Galvanized steel with extruded-vinyl blade seals, flexible-metal jamb seals, and interlocking linkage.

Filters: Minimum arrestance and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2 and all addendums.

MERV Rating: see schedule.

Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm), rated for a minimum working pressure of 200 psig (1378 kPa) and a maximum entering-water temperature of 220 deg F (104 deg C). Include manual air vent and drain.

Direct-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, multispeed motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and painted-steel or galvanized-steel fan scrolls.

Belt-Driven Fans: Double width, forward curved, centrifugal; with permanently lubricated, single-speed motor installed on an adjustable fan base resiliently mounted in the cabinet. Aluminum or painted-steel wheels, and painted-steel or galvanized-steel fan scrolls.

Motors: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

Factory, Hydronic Piping Package: ASTM B 88, Type L copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet, and outlet.

Two-way, modulating control valve for chilled-water coil.

Two-way, modulating control valve for heating coil.

Hose Kits: Minimum 400-psig (2758-kPa) working pressure and operating temperatures from 33 to 211 deg F (0.5 to 99 deg C). Tag hose kits to equipment designations.

Minimum Diameter: Equal to fan coil unit connection size.

Two-Piece Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.

Calibrated-Orifice Balancing Valves: Bronze body, ball type; 125-psig (860-kPa) working pressure, 250 deg F (121 deg C) maximum operating temperature; with calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, threaded ends, and a memory stop to retain set position.

Automatic Flow-Control Valve: Brass or ferrous-metal body; 300-psig (2070-kPa) working pressure at 250 deg F (121 deg C); with removable, corrosion-resistant, tamperproof, self-cleaning piston spring; factory set to maintain constant indicated flow with plus or minus 10 percent over differential pressure range of 2 to 80 psig (13.8 to 552 kPa).

Y-Pattern Hydronic Strainers: Cast-iron body (ASTM A 126, Class B); 125-psig (860-kPa) working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 (DN 15) hose-end, full-port, ball-type blowdown valve in drain connection.

Wrought-Copper Unions: ASME B16.22.

Basic Unit Controls:

Control voltage transformer.

Wall-mounting thermostat with the following features.

Heat-cool-off switch.

Fan on-auto switch.

Fan-speed switch.

DDC Terminal Controller:

Scheduled Operation: Occupied and unoccupied periods on seven-day clock with a minimum of four programmable periods per day.

Unoccupied-Period-Override Operation: Two hours.

Unit Supply-Air Fan Operation:

Occupied Periods: Fan runs continuously.

Unoccupied Periods: Fan cycles to maintain room setback temperature.

Hydronic-Cooling-Coil Operation:

Occupied Periods: Modulate control valve to maintain room temperature.

Unoccupied Periods: Close control valve.

Heating-Coil Operation:

Occupied Periods: Modulate control valve to provide heating if room temperature falls below thermostat set point.

Unoccupied Periods: Start fan and modulate control valve if room temperature falls below setback temperature.

Outdoor-Air Damper Operation:

Occupied Periods:

Position damper to fixed minimum position.

Unoccupied Periods: Close outdoor-air damper.

Interface with DDC System for HVAC Requirements:

Interface relay for scheduled operation.

Interface relay to provide indication of fault at the central workstation.

Provide BACnet interface for central DDC system for HVAC workstation for the following functions:

Adjust set points.

Fan coil unit start, stop, and operating status.

Data inquiry, including supply- and room-air temperature.

Occupied and unoccupied schedules.

Electrical Connection: Factory wire motors and controls for a single electrical connection.

PART 3 - EXECUTION

EXAMINATION

Examine areas, with Installer present, to receive fan coil units for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

Examine roughing-in for piping and electrical connections to verify actual locations before fan coil unit installation.

Proceed with installation only after unsatisfactory conditions have been corrected.

INSTALLATION

Install fan coil units level and plumb.

Install fan coil units to comply with NFPA 90A.

Suspend fan coil units from structure with elastomeric hangers. Vibration isolators are specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

Verify locations of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches above finished floor.

Install new filters in each fan coil unit within two weeks after Substantial Completion.

CONNECTIONS

Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Specific connection requirements are as follows:

Install piping adjacent to machine to allow service and maintenance.

Connect piping to fan coil unit factory hydronic piping package. Install piping package if shipped loose.

Connect condensate drain to indirect waste.

Install condensate trap of adequate depth to seal against fan pressure. Install cleanouts in piping at changes of direction.

Connect supply-air and return-air ducts to fan coil units with flexible duct connectors specified in Section 233300 "Air Duct Accessories." Comply with safety requirements in UL 1995 for duct connections.

Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

FIELD QUALITY CONTROL

Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

Perform the following tests and inspections with the assistance of a factory-authorized service representative:

Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

Operate electric heating elements through each stage to verify proper operation and electrical connections.

Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

Remove and replace malfunctioning units and retest as specified above.

Prepare test and inspection reports.

DEMONSTRATION

Train Owner's maintenance personnel to adjust, operate, and maintain fan coil units.

END OF SECTION 238219

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.

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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 Engineer.
- 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.
- 6) Coordination Drawings:
 - a. Acceptance by the Architect does not imply acceptance of any deviations from contract documents requirements or acceptance of uncoordinated work. Review is for general conformance to the design concept and general compliance with the information given in the contract documents.

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) Lighting controls and wiring.
 - 5) Conduit systems for Video, Data, Nurse Call, and Fire Alarm.

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1.5. REGULATORY REQUIREMENTS

A. Codes: Comply with the codes adopted by authority having jurisdiction:

- 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. Other Regulations: Comply with the latest applicable regulations and ordinances of the following:

- 1) U. S. and State Department of Labor Safety Regulations pertaining to the completed project.
- 2) Clean Air Act.
- 3) Clean Water Act.
- 4) Requirements of product listings by nationally recognized listing agencies as recognized by the Occupational Safety and Hazards Agency (OSHA) and the Architect / Engineer.

C. Contradictions: Where Codes are contradictory, follow the most stringent, unless otherwise indicated in Plans or Specifications. Architect (Engineer) shall determine which is most stringent.

D. Contract Documents Not in Compliance:

- 1) Where the Drawings and Specifications do not comply with the minimum requirements of the Codes, either notify the Architect(Engineer) in writing during the Bidding Period of the revisions required to meet Code requirements, or provide an installation which complies with the Code requirements. After entering into contract, Contractor will be held to complete all work necessary to meet these requirements without additional expense to the Owner.

E. Codes area 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.

F. 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) Owner shall pay all inspections and testing charges.
- 3) Notify Architect (Engineer) two (2) business days before tests.
- 4) Inspections reports and Test Reports shall be provide to the Architect (Engineer) for review and shall be included in the final Record Documents.

1.6. OWNER-FURNISHED EQUIPMENT

- A. All equipment called out in the Specifications or shown on the Drawings as "Owner-Furnished Equipment" or equipment furnished by other Divisions shall be installed and connected under this Contract. Provide rough-ins for all future connections indicated.

1.7. 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 (Engineer) 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. Any manufacturer not listed shall be considered a substitution. Follow substitution instructions in Front End Documents.
- B. 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 (Engineer) 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 (Engineer) 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.

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- 2) Where coordination requirements conflict with individual system requirements, comply with the Architect's (Engineer'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. Minimum cross-sectional area will provide an average of 500 fpm and a maximum of 750 fpm velocity through return air plenum at specified supply air quantity unless otherwise noted.
- 2) Report any obstructions by work of other Divisions to Architect / Engineer.

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:

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- 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

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SECTION 26 0519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Single conductor building wire.
- B. Metal-clad cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Oxide inhibiting compound.
- F. Wire pulling lubricant.
- G. Cable ties.

1.2. RELATED REQUIREMENTS

- A. Section 07 8400 - Firestopping.
- 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.

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. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.
- I. NEMA WC 70 - Nonshielded Power Cable 2000 V or Less for the Distribution of Electrical Energy; 2009.

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- J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- Q. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- R. UL 1569 - Metal-Clad 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 the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals 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. Conform to 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.

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- 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 permitted only as follows:
 - 1) Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet.

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 Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- I. 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.
- J. 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.
- K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- L. 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.

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- c. 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.
- d. 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/#sle.
- b. Encore Wire Corporation: www.encorewire.com/#sle.
- c. Southwire Company: www.southwire.com/#sle.
- 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. METAL-CLAD CABLE

A. Manufacturers:

- 1) AFC Cable Systems Inc: www.afcweb.com/#sle.
- 2) Encore Wire Corporation: www.encorewire.com/#sle.
- 3) Southwire Company: www.southwire.com/#sle.
- 4) Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

C. Conductor Stranding:

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- 1) Size 10 AWG and Smaller: Solid.
 - 2) Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Provide dedicated neutral conductor for each phase conductor where indicated or required.
- G. Grounding: Full-size integral equipment grounding conductor.
- 1) Provide additional isolated/insulated grounding conductor where indicated or required.
- H. Armor: Steel, interlocked tape.

2.5. 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.

2.6. WIRING 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. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

E. 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.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. 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.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. 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.
- H. Terminate cables using suitable fittings.
- 1) Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- I. Install conductors with a minimum of 12 inches of slack at each outlet.
- J. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- M. 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.
- N. 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.

- O. Insulate ends of spare conductors using vinyl insulating electrical tape.
- P. 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.
- Q. Identify conductors and cables in accordance with Section 26 0553.
- R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- S. 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

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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 the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittals procedures.

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- 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. Conform to 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.

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.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).

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 compression connectors for accessible connections.
- 3) Manufacturers - Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT): www.altfab.com.
 - b. Burndy: 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.

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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) 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

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SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.2. RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 05 5000 - Metal Fabrications: Materials and requirements for fabricated metal supports.
- C. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- D. Section 26 0533.16 - BOXES: Additional support and attachment requirements for boxes.
- E. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- F. Section 26 5600 - Exterior Lighting: Additional support and attachment requirements for exterior 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.

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- 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 the contract documents. Obtain direction before proceeding with work.

B. Sequencing:

- 1) Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 3000.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals 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. 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. 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/#sle.
 - c. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.

- d. Thomas & Betts Corporation: www.tnb.com/#sle.
 - 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/#sle.
 - b. Erico International Corporation: www.erico.com/#sle.
 - c. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - d. Thomas & Betts Corporation: www.tnb.com/#sle.
 - 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/#sle.
 - b. Thomas & Betts Corporation: www.tnb.com/#sle.
 - c. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
 - 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/#sle.
 - b. Erico International Corporation: www.erico.com/#sle.
 - c. PHP Systems/Design: www.phpsd.com/#sle.
 - d. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
 - 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/#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.
 - e. Substitutions: See Section 01 6000 - Product Requirements.
- 15) Manufacturers - Powder-Actuated Fastening Systems:
 - a. Hilti, Inc: www.us.hilti.com/#sle.
 - b. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com/#sle.
 - c. Powers Fasteners, Inc: www.powers.com/#sle.
 - d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
 - 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. Box Support and Attachment: Also comply with Section 26 0533.16.

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- L. Interior Luminaire Support and Attachment: Also comply with Section 26 5100.
- M. Exterior Luminaire Support and Attachment: Also comply with Section 26 5600.
- N. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- 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

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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. Liquidtight flexible metal conduit (LFMC).
- D. Electrical metallic tubing (EMT).
- E. Rigid polyvinyl chloride (PVC) conduit.
- F. Conduit fittings.
- G. Accessories.

1.2. RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Concrete encasement of conduits.
- B. Section 07 8400 - Firestopping.
- C. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- D. Section 26 0526 - Grounding and Bonding for Electrical Systems.
 - 1) Includes additional requirements for fittings for grounding and bonding.
- E. Section 26 0529 - Hangers and Supports for Electrical Systems.
- F. Section 26 0533.16 - BOXES.
- G. 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. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
- G. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.

- H. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2015.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- L. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.
- M. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- N. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- O. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- P. UL 1242 - Electrical Intermediate Metal Conduit-Steel; 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 the 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 3300 - Submittals for submittal 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. Conform to 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. Underground:

- 1) Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or rigid PVC conduit.
- 2) Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), or rigid PVC conduit.
- 3) Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), or rigid PVC conduit.
- 4) Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
- 5) Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.
- 6) Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection.

- 7) Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges.
- 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. Exposed, Exterior: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- J. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
- K. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
 - 1) Maximum Length: 6 feet.
- L. 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. Transformers.
 - b. 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.
 - 5) Underground, Interior: 3/4 inch (21 mm) trade size.
 - 6) Underground, Exterior: 3/4 inch (21 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/#sle.
 - 2) Republic Conduit: www.republic-conduit.com/#sle.
 - 3) Wheatland Tube Company: www.wheatland.com/#sle.
 - 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/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - 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/#sle.
- 2) Republic Conduit: www.republic-conduit.com/#sle.
- 3) Wheatland Tube Company: www.wheatland.com/#sle.
- 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/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - 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. LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:

- 1) AFC Cable Systems, Inc: www.afcweb.com/#sle.
- 2) Electri-Flex Company: www.electriflex.com/#sle.
- 3) International Metal Hose: www.metalhose.com/#sle.
- 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/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - 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. ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

- 1) Allied Tube & Conduit; _____: www.alliedeg.com/#sle.
- 2) Republic Conduit: www.republic-conduit.com/#sle.
- 3) Wheatland Tube Company; _____: www.wheatland.com/#sle.
- 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/#sle.
 - b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
 - c. Thomas & Betts Corporation: www.tnb.com/#sle.
 - 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.
- 6) Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.7. RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:

- 1) Cantex Inc: www.cantexinc.com/#sle.
- 2) Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
- 3) JM Eagle: www.jmeagle.com/#sle.
- 4) Substitutions: See Section 01 6000 - Product Requirements.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:

- 1) Manufacturer: Same as manufacturer of conduit to be connected.
- 2) Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.8. ACCESSORIES

- A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.
- B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.
- E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- F. 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. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. 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.
 - c. Within joists in areas with no ceiling.
 - 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) Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 7) Arrange conduit to maintain adequate headroom, clearances, and access.
 - 8) Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 9) Arrange conduit to provide no more than 150 feet between pull points.
 - 10) Route conduits above water and drain piping where possible.

- 11) Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
- 12) Maintain minimum clearance of 6 inches between conduits and piping for other systems.
- 13) 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.
- 14) Group parallel conduits in the same area together on a common rack.

G. 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.

H. 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.

I. 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.

J. Underground Installation:

- 1) Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches.
- 2) Provide underground warning tape in accordance with Section 26 0553 along entire conduit length for service entrance where not concrete-encased.

K. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):

- 1) Include proposed conduit arrangement with submittals.
- 2) Maximum Conduit Size: 1 inch (27 mm) unless otherwise approved.
- 3) Install conduits within middle one third of slab thickness.
- 4) Secure conduits to prevent floating or movement during pouring of concrete.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 3000 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

M. 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.

N. 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.

O. 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.

P. Provide grounding and bonding in accordance with Section 26 0526.

Q. 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.
- C. Floor boxes.

1.2. RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete.
- B. Section 07 8400 - Firestopping.
- C. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
- D. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- E. Section 26 0529 - Hangers and Supports for Electrical Systems.
- F. Section 26 0533.13 - Conduit for Electrical Systems:
 - 1) Conduit bodies and other fittings.
 - 2) Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- G. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 26 2726 - Wiring Devices:
 - 1) Wall plates.
 - 2) Floor box service fittings.
 - 3) Poke-through assemblies.
 - 4) Access floor boxes.
 - 5) Additional requirements for locating boxes for wiring devices.
- I. 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.

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- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013.
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; 2013.
- K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; 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 the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures and floor boxes.
- C. Samples:
 - 1) Floor Boxes: Provide one sample(s) of each floor box proposed for substitution upon request.
- D. 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.
- E. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, and floor boxes.
- 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) Keys for Lockable Enclosures: Two of each different key.

1.6. QUALITY ASSURANCE

- A. Conform to 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 nonmetallic boxes where exposed rigid PVC conduit is used.
- 5) Use suitable concrete type boxes where flush-mounted in concrete.
- 6) Use suitable masonry type boxes where flush-mounted in masonry walls.
- 7) Use raised covers suitable for the type of wall construction and device configuration where required.
- 8) Use shallow boxes where required by the type of wall construction.
- 9) Do not use "through-wall" boxes designed for access from both sides of wall.
- 10) Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
- 11) Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
- 12) Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
- 13) Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
- 14) 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. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
 - c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
- 15) Wall Plates: Comply with Section 26 2726.
- 16) 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/#sle.
- 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.

D. Floor Boxes:

- 1) Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 2726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
- 2) Use cast iron floor boxes within slab on grade.
- 3) Use sheet-steel or cast iron floor boxes within slab above grade.

- 4) Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
- 5) Manufacturer: Same as manufacturer of floor box service fittings.

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) Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
- 9) 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.
- 10) 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.
- 11) 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. Floor-Mounted Cabinets: Mount on properly sized nominal 4 inch high concrete pad constructed in accordance with Section 03 3000.
- M. Install boxes as required to preserve insulation integrity.
- N. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- O. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.
- Q. Close unused box openings.
- R. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- S. Provide grounding and bonding in accordance with Section 26 0526.
- T. 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.

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 3300 - Submittals for submittal 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. Conform to 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. 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.

- b. 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.

- c. Time Switches:

- 1) Identify load(s) served and associated circuits controlled. Include location.
 - d. 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) Use voltage marker to identify highest voltage present for each piece of electrical equipment.
- 3) Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
- 4) Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
- 5) 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.
- 6) 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.
- 7) 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.
- 8) 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 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".

E. 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/#sle.
 - c. Panduit Corp: www.panduit.com/#sle.
 - 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.hellermanntyton.com.
 - 3) Panduit Corp: www.panduit.com/#sle.
 - 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/#sle.
 - 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 overlamine, 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 0923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Occupancy sensors.
- B. Outdoor motion sensors.
- C. Time switches.
- D. In-wall time switches.
- E. In-wall interval timers.
- F. Outdoor photo controls.
- G. 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.
 - 1) Includes finish requirements for wall controls specified in this section.
 - 2) Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.
- F. Section 26 5100 - Interior Lighting.
- G. Section 26 5600 - Exterior 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); 2014.
- 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 the 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 3300 - Submittals 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. Conform to 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 Building Automation, Inc: www.hubbellautomation.com
- 2) Lutron Electronics Company, Inc: www.lutron.com/#sle.
- 3) WattStopper: www.wattstopper.com/#sle.
- 4) Acuity Controls: www.Acuitybrands.com
- 5) Eaton (Cooper) Controls: www.Cooperindustries.com/content/public/en/lighting.html
- 6) 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 settings up to 30 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 incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, 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) Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
- 14) Where wired sensors are indicated, wireless sensors are acceptable provided that all components and wiring modifications necessary for proper operation are included.

15) Wireless 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.

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/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/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. 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.

G. Power Packs for Wireless Occupancy Sensors:

- 1) Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line voltage loads.
- 2) Input Supply Voltage: Dual rated for 120/277 V ac.
- 3) Load Rating: As required to control the load indicated on drawings.
- 4) Provide auxiliary contact closure output where indicated.
- 5) Rated Life of Relay: One million cycles.

H. Accessories:

- 1) Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors for occupancy sensors located in Gymnasiums and other locations as indicated on drawings..

2.3. OUTDOOR PHOTO CONTROLS

A. Manufacturers:

- 1) Intermatic, Inc; _____: www.intermatic.com/#sle.
- 2) Tork, a division of NSI Industries LLC; _____: www.tork.com/#sle.
- 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.

C. Locking Receptacle-Mounted Outdoor Photo Controls

- 1) Description: Plug-in locking type photo control unit complying with ANSI C136.10 for mounting on a compatible receptacle, listed and labeled as complying with UL 773.
- 2) Housing: Weatherproof, impact resistant UV stabilized polypropylene, color to be selected.
- 3) Photo Sensor: Cadmium sulfide.
- 4) Light Level Activation: 1 to 3 footcandles turn-on and 1.5 to 1 turn-off to turn-on ratio with instant turn-on and delayed turn-off.
- 5) Voltage: As required to control the load indicated on the drawings.
- 6) Failure Mode: Fails to the on position.
- 7) Load Rating: As required to control the load indicated on the drawings.
- 8) Surge Protection: 160 joule metal oxide varistor.

D. Button Type Outdoor Photo Controls

- 1) Description: Direct-wired photo control unit complying with ANSI C136.24 with weatherproof gasketed wall plate where required or indicated, listed and labeled as complying with UL 773A.
- 2) Housing: Weather resistant polycarbonate.
- 3) Photo Sensor: Cadmium sulfide.
- 4) Light Level Activation: 1 to 3 footcandles turn-on and 3 to 1 turn-off to turn-on ratio with delayed turn-off.
- 5) Voltage: As required to control the load indicated on the drawings.
- 6) Failure Mode: Fails to the on position.
- 7) Load Rating: As required to control the load indicated on the drawings.

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: Unless otherwise indicated, as follows:
 - a. Wall Switch Occupancy Sensors: 48 inches above finished floor.
 - b. In-Wall Time Switches: 48 inches above finished floor.
 - c. In-Wall Interval Timers: 48 inches above finished floor.
 - 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. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- 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 2416 - PANELBOARDS

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Lighting and appliance panelboards.
- B. Overcurrent protective devices for panelboards.

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 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3. REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2009.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- E. NEMA PB 1 - Panelboards; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; 2013.
- G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 67 - Panelboards; Current Edition, Including All Revisions.
- L. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

- N. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.
- O. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- P. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.
- Q. UL 1699 - Arc-Fault Circuit-Interrupters; 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 the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
- 4) Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
- 5) Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

- 1) Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

- 1) Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
- 2) Include wiring diagrams showing all factory and field connections.
- 3) Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
- 4) Include documentation of listed series ratings upon request.

D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

- E. Field Quality Control Test Reports.
- F. 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.
- G. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- 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) Panelboard Keys: Two of each different key.
 - 3) See Section 26 2813 for requirements for spare fuses and spare fuse cabinets.

1.6. QUALITY ASSURANCE

- A. Conform to 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 panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8. FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1) Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Eaton Corporation: www.eaton.com.

- B. Schneider Electric; Square D Products: www.schneider-electric.us.
- C. Siemens Industry, Inc: www.usa.siemens.com.
- D. Substitutions: See Section 01 6000 - Product Requirements.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2. PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1) Altitude: Less than 6,600 feet.
 - 2) Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
 - 1) Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1) Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 2) Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1) Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250 Type 4X, stainless steel.
 - c. Kitchen Areas: NEMA 250, Tpe 4X, Stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

- e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
- 2) Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
- 3) Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
 - d. Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts..
- 4) Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Load centers are not acceptable.

2.3. LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:

- 1) Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
- 2) Main and Neutral Lug Type: Mechanical.

C. Bussing:

- 1) Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
- 2) Phase and Neutral Bus Material: Copper.
- 3) Ground Bus Material: Copper.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:

- 1) Provide surface-mounted or flush-mounted enclosures as indicated.
- 2) Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
- 3) Provide clear plastic circuit directory holder mounted on inside of door.

2.4. OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

- 1) Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- 2) Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- 3) Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Copper, suitable for terminating copper conductors only.
- 4) Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
 - b. Provide interchangeable trip units where indicated.
- 5) Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
- 6) Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.

- c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
 - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
 - e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
- 7) Do not use tandem circuit breakers.
 - 8) Do not use handle ties in lieu of multi-pole circuit breakers.
 - 9) Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
 - 10) Provide the following features and accessories where indicated or where required to complete installation:
 - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
 - c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.
 - d. Undervoltage Release: For tripping circuit breaker upon predetermined drop in coil voltage with field-adjustable time delay to prevent nuisance tripping.
 - e. Alarm Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped.

2.5. SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required supports in accordance with Section 26 0529.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- I. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.
- J. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- K. Provide grounding and bonding in accordance with Section 26 0526.
- L. Install all field-installed branch devices, components, and accessories.
- M. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- N. Provide filler plates to cover unused spaces in panelboards.
- O. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
 - 1) Emergency and night lighting circuits.
 - 2) Fire detection and alarm circuits.
 - 3) Communications equipment circuits.
 - 4) Intrusion detection and access control system circuits.
 - 5) Video surveillance system circuits.
- P. Identify panelboards 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. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers. Tests listed as optional are not required.
 - 1) Perform insulation-resistance tests on all control wiring with respect to ground.
 - 2) Test functions of the trip unit by means of secondary injection.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
 - 1) Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Test AFCI circuit breakers to verify proper operation.
- G. Test shunt trips to verify proper operation.
- H. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
- I. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4. ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5. CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 2726 - WIRING DEVICES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates.
- E. Floor box service fittings.

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 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. 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 the contract documents to obtain direction prior to proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

C. Operation and Maintenance Data:

- 1) Wall Dimmers: Include information on operation and setting of presets.
- 2) GFCI Receptacles: Include information on status indicators.

D. Project Record Documents: Record actual installed locations of wiring devices.

E. 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. Conform to 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. MANUFACTURERS

- A. Hubbell Incorporated: www.hubbell-wiring.com.
- B. Leviton Manufacturing Company, Inc: www.leviton.com.
- C. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us
- D. Substitutions: See Section 01 6000 - Product Requirements.
- E. Source Limitations: Where possible, provide products for each type of wiring device produced by a single manufacturer and obtained from a single supplier.
- F. 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.

2.2. 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. Provide GFCI protection for receptacles serving electric drinking fountains.
- H. Unless noted otherwise, do not use combination switch/receptacle devices.
- I. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.3. WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.

- C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
- D. Flush Floor Box Service Fittings: White wiring devices with aluminum cover and ring/flange.

2.4. ALL WIRING DEVICES

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Finishes:

2.5. WALL SWITCHES

- A. Manufacturers:
 - 1) Hubbell Incorporated: www.hubbell-wiring.com.
 - 2) Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 - 3) Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 - 4) Substitutions: See Section 01 6000 - Product Requirements.
- 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.

2.6. WALL DIMMERS

- A. Manufacturers:
 - 1) Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 - 2) Greengate/Copper Lighting: www.coperindustries.com :
 - 3) Wattstopper: www.wattstopper.com
 - 4) 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.

2.7. RECEPTACLES

A. Manufacturers:

- 1) Hubbell Incorporated: www.hubbell-wiring.com.
- 2) Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
- 3) Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- 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) Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
- 3) 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.
- 4) USB/Duplex Receptacle: Industrial specification grade, 20A, 125V, NEMA 5-20R; duplex with Two USB charging ports. Overall 3.1A USB charging capability.
- 5) USB Charging Station Receptacle: Industrial specification grade, 125V, Four USB charging ports. Overall 4.2A USB charging capability.

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) Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
- 4) Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

E. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

2.8. WALL PLATES

A. Manufacturers:

- 1) Hubbell Incorporated: www.hubbell-wiring.com/#sle.
- 2) Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
- 3) Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- 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. Wall Plates: Comply with UL 514D.

- 1) Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
- 2) Size: Standard; _____.
- 3) Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

E. Weatherproof Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.9. FLOOR BOX SERVICE FITTINGS

A. Manufacturers:

- 1) Hubbell Incorporated: www.hubbell-wiring.com.
- 2) Thomas & Betts Corporation: www.tnb.com/#sle.
- 3) Wiremold, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Description: Service fittings compatible with floor boxes provided under Section 26 0533.16 with components, adapters, and trims required for complete installation.

C. Flush Floor Service Fittings:

- 1) Dual Service Flush Combination Outlets:
 - a. Cover: Rectangular.
 - b. Configuration:
 - 1) Power: Two standard convenience duplex receptacle(s) with duplex flap opening(s).
 - 2) Communications: _____.
 - 3) Voice and Data Jacks: Provided by others.
- 2) Accessories:
 - a. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

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: Unless otherwise indicated, as follows:
 - a. Wall Switches: 48 inches above finished floor.
 - b. Wall Dimmers: 48 inches above finished floor.
 - c. Receptacles: 18 inches above finished floor or 6 inches above counter.
 - 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.
 - 5) Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- 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. Perform field inspection, testing, and adjusting in accordance with Section 01 4000.
- C. Inspect each wiring device for damage and defects.
- D. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- E. Test each receptacle to verify operation and proper polarity.
- F. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- G. 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 2813 - FUSES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Fuses.

1.2. RELATED REQUIREMENTS

- A. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- B. Section 26 2416 - Panelboards: Fusible switches.
- C. Section 26 2816.16 - Enclosed Switches: Fusible switches.

1.3. REFERENCE STANDARDS

- A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.
- D. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1) Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
 - a. Fusible Enclosed Switches: See Section 26 2816.16.
 - 2) Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
 - 3) Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
 - 1) Spare Fuse Cabinet: Include dimensions.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

Fuses		26 2813-1
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- 1) See Section 01 6000 - Product Requirements, for additional provisions.
- 2) Extra Fuses: One set(s) of three for each type and size installed.
- 3) Fuse Pullers: One set(s) compatible with each type and size installed.
- 4) Spare Fuse Cabinet Keys: Two.

1.6. QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com.
- B. Littelfuse, Inc: www.littelfuse.com.
- C. Mersen: ep-us.mersen.com.
- D. Substitutions: See Section 01 6000 - Product Requirements.

2.2. APPLICATIONS

- A. Feeders:
 - 1) Fusible Switches up to 600 Amperes: Class RK1, time-delay.
- B. Individual Motor Branch Circuits: Class RK1, time-delay.

2.3. FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.

1) Class RK1, Fast-Acting, Non-Time-Delay Fuses:

H. Provide the following accessories where indicated or where required to complete installation:

- 1) Fuseholders: Compatible with indicated fuses.
- 2) Fuse Reducers: For adapting indicated fuses to permit installation in switch designed for fuses with larger ampere ratings.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.2. INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.
- C. Install spare fuse cabinet where indicated.
- D. Identify spare fuse cabinet in accordance with Section 26 0553.

END OF SECTION

SECTION 26 2816.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Enclosed safety switches.

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 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 2813 - Fuses.

1.3. REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.
- I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1) Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within 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) Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

- 4) Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1) Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
 - 2) Include wiring diagrams showing all factory and field connections.
- D. Field Quality Control Test Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- F. Project Record Documents: Record actual locations of enclosed switches.
- G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- 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. Conform to 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. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.8. FIELD CONDITIONS

- A. Maintain ambient temperature between -22 degrees F and 104 degrees F during and after installation of enclosed switches.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Eaton Corporation: www.eaton.com.
- B. Schneider Electric; Square D Products: www.schneider-electric.us.
- C. Siemens Industry, Inc: www.usa.siemens.com.
- D. Substitutions: See Section 01 6000 - Product Requirements.
- E. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2. ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1) Altitude: Less than 6,600 feet.
 - 2) Ambient Temperature: Between -22 degrees F and 104 degrees F.
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1) Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2) Minimum Ratings:
 - a. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

- 1) Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- I. Conductor Terminations: Suitable for use with the conductors to be installed.
- J. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1) Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 - b. Outdoor Locations: Type 3R.
 - 2) Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
- M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- N. Heavy Duty Switches:
 - 1) Comply with NEMA KS 1.
 - 2) Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Copper, suitable for terminating copper conductors only.
 - 3) Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
 - a. Provide means for locking handle in the ON position where indicated.
- O. Provide the following features and accessories where indicated or where required to complete installation:
 - 1) Hubs: As required for environment type; sized to accept conduits to be installed.
 - 2) Integral fuse pullers.
 - 3) Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.
 - 4) Viewing Window: Positioned over switch blades for visual confirmation of contact position with door closed.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. 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. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required supports in accordance with Section 26 0529.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 26 0526.
- H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- J. Identify enclosed switches 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 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4. ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5. CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces 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. Luminaire accessories.

1.2. RELATED REQUIREMENTS

- A. Section 26 0533.16 - BOXES.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.
- D. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.
- E. 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 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Cor 1, 2012).
- D. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- E. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- F. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- G. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society; 2008.
- H. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.
- I. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

- J. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2006.
- K. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- L. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.
- M. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.
- N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. NFPA 101 - Life Safety Code; 2015.
- P. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- Q. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
- R. UL 1029 - High-Intensity-Discharge Lamp Ballasts; Current Edition, Including All Revisions.
- S. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- T. 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 the contract documents to obtain direction prior to proceeding with work.

1.5. SUBMITTALS

A. See Section 01 3300 - Submittals for submittal procedures.

B. Shop Drawings:

- 1) 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) Ballasts: Include wiring diagrams and list of compatible lamp configurations.
 - 4) Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
 - 5) Fluorescent Emergency Power Supply Unit: Include list of compatible lamp configurations and associated lumen output.
- D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.
- E. 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.
- F. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.
- G. Field quality control reports.
- H. 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.
- I. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- J. 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 Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
- 4) Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.
- 5) Extra LED drivers: Ten percent of total quantity installed for each type of driver, but not less than two of each type..

K. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6. QUALITY ASSURANCE

- A. Conform to 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 all LED luminaires, including drivers.
- C. Provide two year manufacturer warranty for all linear fluorescent ballasts.
- D. Provide five year pro-rata warranty for batteries for emergency lighting units.
- E. Provide ten year pro-rata warranty for batteries for self-powered exit signs.
- F. Provide three year full warranty for fluorescent emergency power supply units.

PART 2 PRODUCTS

2.1. MANUFACTURERS - LUMINAIRES

- A. Furnish products from one of the Manufacturers listed in the luminaire schedule found 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..

2.2. 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 lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp 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.
 - 3) Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- 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. Manufacturers - Powered and Self-Luminous Signs:

- 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. Description: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

- 1) Number of Faces: Single or double as indicated or as required for the installed location.
- 2) Directional Arrows: As indicated or as required for the installed location.

C. Self-Powered Exit Signs:

- 1) Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
- 2) Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
- 3) Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- 4) Provide low-voltage disconnect to prevent battery damage from deep discharge.

D. Accessories:

- 1) Provide compatible accessory high impact polycarbonate vandal shields for exit signs located in Gymnasiums..

2.5. DRIVERS

A. Manufacturers:

- 1) General Electric Company/GE Lighting; _____: www.gelighting.com/#sle.
- 2) Lutron Electronics Company, Inc; www.lutron.com/#sle.
- 3) Osram Sylvania; _____: www.sylvania.com/#sle.
- 4) Philips Lighting Electronics/Advance; _____: www.advance.philips.com.

- 5) Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
- 6) Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Drivers - General Requirements:

- 1) Provide ballasts containing no polychlorinated biphenyls (PCBs).
- 2) Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

C. 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.

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.
- D. Tube Guards for Linear Fluorescent Lamps: Provide clear virgin polycarbonate sleeves with endcaps where indicated.

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. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- 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. 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.
- M. Remote Drivers: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.
- 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. 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 26 5600 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Exterior luminaires.
- B. Luminaire accessories.

1.2. RELATED REQUIREMENTS

- A. Section 03 3000 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- C. Section 26 0533.16 - BOXES.
- D. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including outdoor motion sensors, time switches, and outdoor photo controls.
- E. Section 26 5100 - Interior Lighting.

1.3. REFERENCE STANDARDS

- A. AASHTO LTS - Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals; American Association of State Highway and Transportation Officials; 6th Edition, with 2015 Interim Revisions.
- 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. IEEE C2 - National Electrical Safety Code; 2012.
- D. IES LM-63 - IESNA Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- E. IESNA LM-5 - Photometric Measurements of Area and Sports Lighting Installations; 2004 (Reaffirmed 2007).
- F. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002 (Reaffirmed 2008).
- G. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.
- H. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; Illuminating Engineering Society; 2008.

- I. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; Illuminating Engineering Society; 2015.
- J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- K. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.
- L. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2011.
- M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- O. 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 placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
 - 2) Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Shop Drawings:
 - 1) Provide photometric calculations where luminaires are proposed for substitution upon request.
 - 2) Provide structural calculations for each pole proposed for substitution.
- 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, weight, effective projected area (EPA), and installed accessories; 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) Lamps: Include rated life and initial and mean lumen output.
 - 4) Poles: Include information on maximum supported effective projected area (EPA) and weight for the design wind speed.
- D. Sustainable Design Documentation: Submit manufacturer's product data on lamp mercury content and rated lamp life, showing compliance with specified requirements.
- E. 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 of each product finish illustrating color and texture upon request.
- F. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.
- G. Field Quality Control Reports.
- 1) Include test report indicating measured illumination levels.
- H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- I. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- J. 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 Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
 - 3) Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.
 - 4) Extra LED drivers: Ten percent of total quantity installed for each type, but not less than two of each type.
 - 5) Extra Fuses: Five percent of total quantity installed for each type, but not less than two of each type.
 - 6) Touch-Up Paint: 2 gallons, to match color of pole finish.
- K. Project Record Documents: Record actual connections and locations of pole foundations, luminaires, and any pull or junction boxes.

1.6. QUALITY ASSURANCE

- A. Conform to 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, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

1.8. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide three year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Furnish products from one of the Manufacturers listed in the luminaire schedule found 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..

2.2. 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 lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, 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. Provide luminaires listed and labeled as suitable for wet locations where indicated.
- I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.
- J. 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.

2.4. DRIVERS

A. Manufacturers:

- 1) Manufacturer Limitations: Where possible, for each type of luminaire provide ballasts produced by a single manufacturer.
- 2) Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Drivers - General Requirements:

- 1) Provide ballasts containing no polychlorinated biphenyls (PCBs).
- 2) Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- 3) Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

2.5. 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. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires in accordance with NECA/IESNA 501.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. 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 in 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.
- G. Pole-Mounted Luminaires:
 - 1) Maintain the following minimum clearances:
 - a. Comply with IEEE C2.

- 2) Foundation-Mounted Poles:
 - a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 3000.
 - 1) Install anchor bolts plumb per template furnished by pole manufacturer.
 - 2) Position conduits to enter pole shaft.
 - b. Install foundations plumb.
 - c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
 - d. Tighten anchor bolt nuts to manufacturer's recommended torque.
 - e. Install non-shrink grout between pole anchor base and concrete foundation, leaving small channel for condensation drainage.
 - f. Install anchor base covers or anchor bolt covers as indicated.
 - 3) Grounding:
 - a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
 - 4) Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.
 - 5) Install non-breakaway in-line fuse holders and fuses complying with Section 26 2813 in pole handhole or transformer base for each ungrounded conductor.
 - 6) Install weather resistant GFI duplex receptacle with weatherproof cover as specified in Section 26 2726 in designated poles.
- H. Install accessories furnished with each luminaire.
- I. Bond products and metal accessories to branch circuit equipment grounding conductor.
- J. 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. 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. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Architect.

3.6. CLEANING

- A. Clean surfaces according to NECA/IESNA 501 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. 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 31 1000 - SITE CLEARING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.

1.2. RELATED REQUIREMENTS

- A. Section 32 9115 - Landscape Soil Preparation: Fill material for filling holes, pits, and excavations generated as a result of removal operations

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1. SITE CLEARING

- A. Comply with other requirements specified in Section 01 7000.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.2. EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Utility information shown on the plans are based on data provided by the client. Contractor shall use caution during excavation and repair any existing utilities damaged during excavation.
- C. Protect existing utilities to remain from damage.
- D. Do not disrupt public utilities without permit from authority having jurisdiction. Do not disrupt private utilities without permission from the owner.
- E. Protect existing structures and other elements that are not to be removed.

3.3. VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, lawns, and planting beds.
- B. Do not remove or damage vegetation beyond the limits indicated on drawings.
- C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:

1) As indicated on the plans.

D. Vegetation Removed: Do not burn, bury, landfill, or leave on site.

1) Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.

2) Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.

E. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.4. DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 31 2316 - EXCAVATION

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Excavating for building volume below grade, footings, slabs-on-grade, paving, and site structures.
- B. Trenching for utilities outside the building.

1.2. RELATED REQUIREMENTS

- A. Document SCI NO. 2004-0063.10, TASK 100: Geotechnical report; bore hole locations and findings of subsurface materials.
- B. Section 31 1000 - Site Clearing: Vegetation and existing debris removal.
- C. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.
- D. Section 31 2323 - Fill: Fill materials, backfilling, and compacting.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures
- B. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Bedding and Fill to Correct Over-Excavation:
 - 1) See Section 31 2323 for bedding and corrective fill materials at general excavations.
 - 2) See Section 31 2316.13 for bedding and corrective fill materials at utility trenches.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.2. PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 1000 for clearing, grubbing, and removal of existing debris.
- C. Locate, identify, and protect utilities that remain and protect from damage.
- D. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

- E. Protect plants, lawns, rock outcroppings, and other features to remain.
- F. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

3.3. EXCAVATING

- A. Excavate to accommodate new structures and construction operations.
- B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- E. Soil removal and replacement under footings and slabs
 - 1) Under foundations and floor slabs, soil shall be removed to a minimum depth of 2 feet beneath the bottom standard shallow spread footing and 3 feet beneath the bearing elevation of the floor slabs
 - 2) Over excavations shall extend at least 2 feet beyond the outside edge of the footing and building footprint.

3.4. SUBGRADE PREPARATION

- A. See Section 31 2323 for subgrade preparation at general excavations.

3.5. FILLING AND BACKFILLING

- A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.
- B. See Section 31 2323 for fill, backfill, and compaction requirements at general excavations.

3.6. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces by Architect before placement of foundations.

3.7. CLEANING

- A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 2200.
- B. Remove excess excavated material from site.

Excavation		31 2316-2
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3.8. PROTECTION

- A. Divert surface flow from rains or water discharges from the excavation.
- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 31 2316.13 - TRENCHING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Backfilling and compacting for utilities outside the building as shown on plans.

1.2. RELATED REQUIREMENTS

- A. Section 31 2316 - Excavation: Building and foundation excavating.
- B. Section 31 2323 - Fill: Backfilling at building and foundations.

1.3. DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.

1.4. REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2017.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012, with Editorial Revision (2015).
- C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).
- D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012, with Editorial Revision (2015).
- E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.
- F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.
- G. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures
- B. Compaction Density Test Reports.

PART 2 PRODUCTS

2.1. FILL MATERIALS

- A. General Fill: Subsoil excavated on-site.

- 1) Graded.

Trenching		31 2316.13-1
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- 2) Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
- 3) Conforming to ASTM D2487-11 Group Symbol CL,ML, CL-ML,SP, SW,GP AND GW.

B. Structural Fill - Fill Type ____: Subsoil excavated on-site.

C. Granular Fill: Coarse aggregate, conforming to State of Missouri Highway Department standard.

2.2. ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, woven.

PART 3 EXECUTION

3.1. EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.2. PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Notify utility company to remove and relocate utilities.

C. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

D. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.3. TRENCHING

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove excavated material that is unsuitable for re-use from site.

H. Remove excess excavated material from site.

- I. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4. PREPARATION FOR UTILITY PLACEMENT

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.5. BACKFILLING

- A. Backfill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
- F. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- G. Correct areas that are over-excavated.
 - 1) Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.
- H. Compaction Density Unless Otherwise Specified or Indicated:
 - 1) Under paving, slabs-on-grade, and similar construction: 98 percent of maximum dry density.
- I. Reshape and re-compact fills subjected to vehicular traffic.

3.6. BEDDING AND FILL AT SPECIFIC LOCATIONS

- A. Utility Piping, Conduits, Duct Bank, and _____ and _____:
 - 1) Bedding: Use general fill.
 - 2) Cover with general fill.
 - 3) Fill up to subgrade elevation.
 - 4) Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

3.7. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- E. Frequency of Tests: _____.

3.8. CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 31 2323 - FILL

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Filling, backfilling, and compacting for building volume below grade.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.2. RELATED REQUIREMENTS

- A. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.
- B. Section 31 2316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

1.3. DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.

1.4. REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop; 2017.
- B. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN m/m³)); 2012, with Editorial Revision (2015).
- C. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures
- B. Compaction Density Test Reports.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where designated by the Owner.
 - 1) Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2) Prevent contamination.
 - 3) Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.1. FILL MATERIALS

A. General Fill: Subsoil excavated on-site.

- 1) Graded.
- 2) Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
- 3) Conforming to ASTM D2487-11 Group Symbol CL, ML, CL-ML, SP, SW, GP AND GW.
- 4) Liquid limit: 45
- 5) Plasticity index (PI): 25

B. Granular Fill: Coarse aggregate, conforming to State of Missouri Highway Department standard.

C. Topsoil: Topsoil excavated on-site.

- 1) Graded.
- 2) Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
- 3) Acidity range (pH) of 5.5 to 7.5.
- 4) Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. Verify areas to be filled are not compromised with surface or ground water.

3.2. PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.3. FILLING

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.

- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- F. Correct areas that are over-excavated.
 - 1) Use general fill, flush to required elevation, compacted to minimum 90 percent of maximum dry density.
- G. Compaction Density Unless Otherwise Specified or Indicated:
 - 1) Under paving, slabs-on-grade, and similar construction: 90 percent of maximum dry density.
 - 2) At landscape areas: 88 percent of maximum dry density.
 - 3) At other locations: 90 percent of maximum dry density.
- H. Reshape and re-compact fills subjected to vehicular traffic.
- I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4. FILL AT SPECIFIC LOCATIONS

- A. Use general fill unless otherwise specified or indicated.
- B. Under Interior Slabs-On-Grade:
 - 1) Use granular fill.
 - 2) Compact to 95 percent of maximum dry density.
- C. At Foundation Walls and Footings:
 - 1) Use general fill.
 - 2) Compact each lift to 90 percent of maximum dry density.
 - 3) Do not backfill against unsupported foundation walls.
 - 4) Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
- D. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:
 - 1) Bedding: Use general fill.
 - 2) Cover with general fill.

- 3) Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

E. At Lawn Areas:

- 1) Use general fill.
- 2) Fill up to 6 inches below finish grade elevations.
- 3) Compact to 95 percent of maximum dry density.

F. At Planting Areas Other Than Lawns :

- 1) Use general fill.
- 2) Compact to 95 percent of maximum dry density.

G. Under Monolithic Paving and Monolithic Paver Setting Beds:

- 1) Compact subsoil to 95 percent of its maximum dry density before placing fill.
- 2) Use general fill.
- 3) Fill up to subgrade elevation.
- 4) Compact to 95 percent of maximum dry density.
- 5) See Section 32 1123 for aggregate base course placed over fill.

3.5. TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

3.6. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor") or AASHTO T 180.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Frequency of Tests: Every other lift.
- E. Proof roll compacted fill at surfaces that will be under slabs-on-grade.

3.7. CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32 1123 - AGGREGATE BASE COURSES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Aggregate base course.

1.2. RELATED REQUIREMENTS

- A. Section 31 2323 - Fill: Compacted fill under base course.
- B. Section 32 1313 - Concrete Paving: Finish concrete surface course.

1.3. REFERENCE STANDARDS

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base and Surface Courses; 2017.
- B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- C. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2011.

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures
- B. Materials Sources: Submit name of imported materials source.
- C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. When aggregate materials need to be stored on site, locate where directed by Owner.
- B. Aggregate Storage, General:
 - 1) Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2) Prevent contamination.
 - 3) Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Coarse Aggregate: Coarse aggregate, conforming to State of Missouri Highway Department standard.
- B. Fine Aggregate: Sand; conforming to State of Missouri Highway Department standard.

2.2. SOURCE QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.
- B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.
- B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.2. PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.3. INSTALLATION

- A. Under Portland Cement Concrete Paving:
 - 1) Place coarse aggregate to a total compacted thickness of 4 inches.
 - 2) Compact to 95 percent of maximum dry density.
- B. Place aggregate in maximum 4 inch layers and roller compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.4. CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32 1313 - CONCRETE PAVING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Concrete sidewalks, integral curbs, and parking areas.

1.2. RELATED REQUIREMENTS

- A. Section 03 1000 - Concrete Forming and Accessories.
- B. Section 03 3000 - Cast-in-Place Concrete.
- C. Section 03 3533 - Stamped Concrete Finishing: Additional requirements for patterned surfaces.
- D. Section 07 9200 - Joint Sealants: Sealing joints.
- E. Section 31 2323 - Fill: Compacted subbase for paving.

1.3. REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 305R - Guide to Hot Weather Concreting; 2010.
- D. ACI 306R - Guide to Cold Weather Concreting; 2016.
- E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- G. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- H. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- I. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.
- J. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- K. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
- L. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

- M. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- N. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- O. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
- P. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2014.
- Q. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004, with Editorial Revision (2013).

1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Product Data: Provide data on joint filler, admixtures, and curing compound.

PART 2 PRODUCTS

2.1. FORM MATERIALS

- A. Form Materials: As specified in Section 03 1000, conform to ACI 301.

2.2. REINFORCEMENT

- A. Steel Welded Wire Reinforcement: Plain type, ASTM A1064/A1064M; in flat sheets; unfinished.
- B. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi yield strength; deformed billet steel bars; unfinished finish.

2.3. CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.
- B. Cement: ASTM C150/C150M, Normal - Type I Portland cement, gray color.
- C. Fine and Coarse Mix Aggregates: ASTM C33/C33M.
- D. Fly Ash: ASTM C618, Class C or F.
- E. Water: Clean, and not detrimental to concrete.
- F. Air-Entraining Admixtures: ASTM C260/C260M.
- G. Chemical Admixtures: ASTM C494/C494M, Type A - Water Reducing, Type C - Accelerating, and Type G - Water Reducing, High Range and Retarding.

2.4. ACCESSORIES

- A. Curing Compound: ASTM C309, Type 1, Class B.

- B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

- 1) Material: ASTM D1751, cellulose fiber.

2.5. CONCRETE MIX DESIGN

- A. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.

- 1) For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

- B. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

- C. Concrete Properties:

- 1) Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4000 psi.
 - 2) Fly Ash Content: Maximum 25 percent of cementitious materials by weight.
 - 3) Water-Cement Ratio: Maximum 45 percent by weight.
 - 4) Total Air Content: 3 percent, determined in accordance with ASTM C173/C173M.
 - 5) Maximum Slump: 4 inches.

2.6. MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

- B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

3.2. SUBBASE

- A. Re-use existing subbase in place.

3.3. PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.

3.4. FORMING

- A. Place and secure forms to correct location, dimension, profile, and gradient.
- B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

3.5. REINFORCEMENT

- A. Place reinforcement as indicated.

3.6. COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.7. PLACING CONCRETE

- A. Do not place concrete when base surface is wet.
- B. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.
- C. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

3.8. JOINTS

- A. Align curb, gutter, and sidewalk joints.

3.9. FINISHING

- A. Area Paving: Light broom, texture perpendicular to pavement direction.
- B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.
- C. Curbs and Gutters: Light broom, texture parallel to pavement direction.

3.10. TOLERANCES

- A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- B. Maximum Variation From True Position: 1/4 inch.

3.11. FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

- 1) Provide free access to concrete operations at project site and cooperate with appointed firm.
- B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
 - 1) Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

3.12. PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

END OF SECTION

SECTION 32 3119 - DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Decorative aluminum fences.
- B. Automatic gate operators.

1.2. REFERENCE STANDARDS

- A. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2017.
- B. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- F. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1) Preparation instructions and recommendations.
 - 2) Storage and handling requirements and recommendations.
 - 3) Installation methods.
- C. Shop Drawings:
 - 1) Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.
- D. Manufacturer's Warranty.

1.4. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified and approved by fence manufacturer.

1.5. DELIVERY, STORAGE AND HANDLING

- A. Store materials in a manner to ensure proper ventilation and drainage. Protect against damage, weather, vandalism and theft.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Decorative Metal Fences and Gates:

- 1) Alumi-Guard; Belmont: www.alumi-guard.com/sle.
- 2) Ameristar Perimeter Security, USA; Echelon Plus: www.ameristarfence.com.
- 3) Ideal Aluminum Products; Maine: www.ideal-ap.com/#sle.

2.2. FENCES

- A. Fences: Complete factory-fabricated system of posts and panels, accessories, fittings, and fasteners; finished with electrodeposition coating, and having the following performance characteristics:
- B. Electro-Deposition Coating: Multi-stage pretreatment/wash with zinc phosphate, followed by epoxy primer and acrylic topcoat.
- 1) Total Coating Thickness: 2 mils, minimum.
 - 2) Color: As selected by Architect from manufacturer's standard range.
- C. Aluminum: ASTM B221.
- 1) Tubular Pickets, Rails and Posts: 6005-T5 alloy.
 - 2) Extrusions for Posts and Rails (Outer Channel): 6005-T5 alloy.
 - 3) Extrusions for Pickets and Rail (Inner Slide Channels): 6063-T5 alloy.
- D. Fasteners: ASTM A276/A276M, Type 302 stainless steel; finished to match fence components.

2.3. ALUMINUM FENCE

- A. Decorative Aluminum Fence System: Provide fence meeting the Test Load and Coating Performance requirements of ASTM F2408 for Industrial class.
- 1) Fence Panels: 6 feet high by 8 feet long.
 - a. Panel Style: Three rail.
 - b. Panel Strength: Capable of supporting 270 pounds minimum load applied at midspan without deflection.
 - c. Attach panels to posts with manufacturer's standard panel brackets and recommended fasteners.

- d. Posts: Aluminum extrusions; 2-1/2 inches square.
- e. Rails: Extruded aluminum channels.
- f. Pickets: Extruded aluminum tubes.
- 1) Style: Pickets with finial extend above top rail.
- 2) Integrally Formed Finial: Spear point.
- g. Fasteners: Manufacturer's standard stainless steel bolts, screws, and washers; factory finish fasteners to match fence.
- h. Accessories: Aluminum castings, extrusions and cold-formed strips; factory finished to match fence.
- 1) Flat post cap.
- i. Flexibility: Capable of following variable slope of up to 1:4.
- j. Color: As selected by Architect from manufacturer's standard range.

B. Decorative Aluminum Gates:

- 1) Gate Panels: Manufacturer's standard decorative aluminum fence panels.
- 2) Posts: Aluminum extrusions; 2 inches square.
- 3) Rails and Frame: Welded aluminum extrusions; 2 inches by 3 inches.
- 4) Hardware:
 - a. Latch: Manufacturer's standard mechanism; factory finished galvanized steel.
- 5) Operation: Automatic locking system.
 - a. Operator: Comply with UL 325, Class III and ASTM F2200.
 - b. Manufacturer's standard electric operating system with integral controls, remote latching and unlatching, safety devices, communication devices, and emergency vehicle access.
- 1) Contractor shall connect digital entry system to existing power source and fire alarm system.
- 6) Color: As selected by Architect from manufacturer's standard range.

2.4. Automatic Gate Operators

- A. Swinging Gates: Pre-wired, pedestal mounted gate operator for horizontal swinging gates, per ASTM F2200 and UL 325.
 - 1) Class: Class I.

- 2) Operating type: Swing arm.
- 3) Control Functions: Open, pause, and close.
- 4) Maximum Open/Close Time: 10 seconds.
- 5) Access: Card.
- 6) Maximum gate weight: 500 pounds (187 kilograms).
- 7) Horsepower Rating: Suitable for connected load.
- 8) Entrapment Protection Devices: Provide sensing devices and safety mechanisms complying with UL 325.
 - a. Primary Device: Provide electric sensing edge, wireless sensing, NEMA 1 photo eye sensors, or NEMA 4X photo eye sensors as required with momentary-contact control device.
- 9) Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - a. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 1) Outdoor Locations: Type 3R.

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. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Set fence posts in accordance with the manufacturer recommended spacing.
- C. When cutting rails immediately seal the exposed surfaces by:
 - 1) Removing metal shavings from cut area.
 - 2) Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
 - 3) Apply two coats of custom finish spray paint matching fence color.
 - 4) Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

- D. Space gate posts according to the manufacturers' drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected.
 - 1) Base type and quantity of gate hinges o the application; weight, height, and number of gate cycles.
 - 2) Identify the necessary hardware required for the application on the manufacturer's gate drawings.
 - 3) Provide gate hardware by the manufacturer of the gate and install in compliance with manufacturer's recommendations.
- E. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.3. ERECTION TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From Indicated Position: 1 inch.
- C. Minimum Distance from Property Line: 6 inches.

3.4. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.
- C. Post Settings: Randomly inspect three locations against design for:
 - 1) Hole diameter.
 - 2) Hole depth.
 - 3) Hole spacing.
- D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.
- E. Gates: Inspect for level, plumb, and alignment.
- F. Workmanship: Verify neat installation free of defects.

3.5. CLEANING

- A. Leave immediate work area neat at end of each work day.
- B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.
- C. Clean fence with mild household detergent and clean water rinse well.

- D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.
- E. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.6. CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. See Section 01 7900 - Demonstration and Training, for additional requirements.
- C. Demonstrate proper operation of equipment to Owner's designated representative.
- D. Demonstration: Demonstrate operation of system to Owner's personnel.
 - 1) Use operation and maintenance data as reference during demonstration.
 - 2) Conduct walking tour of project.
 - 3) Briefly describe function, operation, and maintenance of each component.
- E. Training: Train Owner's personnel on operation and maintenance of system.
 - 1) Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2) Provide minimum of two hours of training.

3.7. 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 32 9115 - LANDSCAPE SOIL PREPARATION

PART 1 - GENERAL

1.1.SUMMARY

- A. The General Conditions and Division - 1 Specification sections apply to the work of this section.
- B. The following documents form part of the Specifications to the extent stated. Where differences exist between Codes, Standards, Authorities Having Jurisdiction, and the Documents, the one affording the greatest protection and/or more stringent condition shall apply.
- C. Section includes:
 - 1) Planting Soils
 - 2) Soil Preparation
 - 3) Soil Amendments and Fertilizers
 - 4) Soil Testing
 - 5) Finish Grading
 - 6) Weed Control
- D. Site and Drawing Examination:
 - 1) Any sub-contractor submitting a proposal for this work shall first examine the site of the proposed work and all conditions at the site that he may fully understand any facilities, difficulties, and restrictions attending the execution of the contract. No subsequent allowances shall be made because of omission, error, or negligence, in connection with this provision.
 - 2) Any sub-contractor submitting a proposal for this work shall carefully examine the architectural and structural drawings and specifications in addition to the drawings and specifications for the work in his particular trade.

1.2. RELATED WORK

- A. Division 32 Section 9300 "Plant Material & Accessories"
- B. Division 32 Section 9200 "Turf"

1.3. DEFINITIONS

- A. CEC: Cation exchange capacity.
- B. Duff Layer: A surface layer of soil, typical of forested areas that is composed of mostly decayed leaves, twigs, and detritus.

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- C. Imported Soil: Soil that is transported to Project site for use.
- D. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- E. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- F. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- G. PPM: Parts per million.
- H. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- I. SSSA: Soil Science Society of America.
- J. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- K. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- L. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- M. USCC: U.S. Composting Council.

1.4. PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project Site prior to the commencement of the Landscape Soil Preparation scope. Attendees to include, but are not limited to the design build team and Landscape sub-contractor.

1.5. SITE CONDITIONS

- A. Underground Utilities:
 - 1) Prior to initiating any work of this section, the sub-contractor shall locate and identify all underground utilities.
- B. Subgrade Elevations:
 - 1) Excavation, filling and grading required to establish elevations shown on the drawings are not specified in this section.
 - 2) Subgrade elevations shall be established prior to placement of landscape soils to allow for placement to depths as indicated and required.
 - a. Sub-contractor is responsible to coordinate establishment of subgrade elevations as required for landscape soils.

- b. Conditions in which subgrade elevations have not been provided, sub-contractor is responsible to complete excavation required and properly dispose of resulting spoils off-site.

1.6. QUALITY ASSURANCE

- A. Sub-contractor's Quality Control Responsibilities: Sub-sub-contractor is solely responsible for quality control of the Work.
- B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances
 - 1) and regulations of Federal, State and Municipal authorities having jurisdiction. Obtain
 - 2) necessary approvals from all such authorities.
- C. Installer Qualifications: A qualified landscape installer whose work has resulted in successful installation of planting soils and the establishment of exterior plants.
 - 1) Installer to maintain an experienced full-time supervisor on project site when installing soils and when exterior planting is in progress.
 - 2) Landscape sub-contractor shall have experience in the proper and safe transportation and installation of soil material.
 - 3) The Landscape sub-contractor shall prepare and present to the Landscape Architect required soil submittals and their associated specified test results, (6) six months prior to the scheduled soil and plant installation for proper lead time for material locations, initial soil mix testing, and approval. IT is the responsibility of the Landscape sub-contractor, in conjunction with the Soil Supplier to submit material for the soil and compost tests.
- D. Soil-Mixing sub-contractor Qualifications:
 - 1) Soil-Mixing sub-contractor shall be able to provide soil mixes that meet the specifications within the tolerances assigned.
 - 2) Soil-Mixing sub-contractor shall be able to produce enough consistently uniform soil material for the project to meet the schedule demands.
 - 3) Soil-Mixing Sub-contractor shall be engaged at least (6) six months prior to scheduled soil installation, to allow for sufficient time for material searches and initial planting mix approval.
- E. Soil Testing Agency: All analytical services shall be completed by a qualified testing agency.

Reports and recommendations shall accompany all laboratory data.

 - 1) Tests shall be made in strict compliance with the standards of the Associate of Official Analytical Chemists and follow standards from ASTM, EPA, and/or Methods of Soil

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Analysis, SSSA.

- 2) Sub-sub-contractor is responsible for all testing and analysis costs.

F. Analysis and Testing of Materials: For each type of packaged material required for the Work of this section, provide manufacturer's certified analysis. For all other materials, provide complete analysis by a recognized laboratory made in strict compliance with the standards and procedures of the following:

- 1) International Society of Arboriculture (ISA)
- 2) American Society of Testing Materials (ASTM)
- 3) American Society of Agronomy (ASA)
- 4) Environmental Protection Agency (EPA)
- 5) Soil Science Society of America (SSSA)
- 6) Association of Official Agricultural Chemists (AOAC)

1.7. SUBMITTALS AND TESTING

A. Initial Soil Submittals:

- 1) Samples – For each bulk-supplied material in sealed containers labeled with content, source, and date obtained: providing an accurate representation of composition, color and texture.
- 2) Test Reports – For each bulk-supplied material as outlined in the Test Procedures and Reporting section.
- 3) Soil Analysis – Provide Initial Planting Soil Analysis for bulk-supplied material as outlined in the Test Procedures and Reporting section, before materials are blended or delivered to the job site.

B. Amended Soil Mixes:

- 1) Samples – For each specified type of amended soil.
- 2) Test Reports – For each amended soil mix as outlined in the Test Procedures and Reporting section.
- 3) Soil Analysis – Provide Amended Planting Soil Analysis for each amended soil mix as outlined in the Test Procedures and Reporting section.

C. Herbicides

- 1) Pre-Emergent

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2) Post-Emergent

1.8. **TEST PROCEDURES AND REPORTING:**

A. Topsoil – Testing for initial approval shall be tested using the following procedures:

- 1) Particle-size distribution by the Pipet method, as outlined in Methods of Soil Analysis, Part 1, 1986. This includes the removal of organic matter and carbonates with hydrogen peroxide.
- 2) Saturated hydraulic conductivity, total porosity, and bulk density by ASTM F1815-97 or
 - a. equivalent Methods of Soil Analysis determination for the tested sample.
- 3) Organic matter content (ASTM F1647-02a)
- 4) Salts and ammonium test.
- 5) Soil chemical and nutrient analysis shall be tested using Methods of Soil Analysis, Parts
 - a. 1 and 3, 1986 and 1996, or approved equivalent.
- 6) Soil moisture testing required prior to soil placement shall be by gravimetric oven dry method, as described in Soil Science Society of America, Methods of Soil Analysis, Part 1, 1986.

B. Composted Organic Materials – Provide analyses of composed organic materials are required

prior to initial soil mix acceptance. Analyses shall include all tests required to verify specified criteria in Part 2 of this Section.

C. Amended Planting Soil Mix(s) – The amended soil mix for initial approval shall be tested using the following procedures:

- 1) Particle-size distribution (ASTM F1632-03) – Perform for all soil layers. The ASTM F1632 test is acceptable for the loamy sand soil. Fines passing the #270 sieve are to be measured using the hydrometer method, as outlined in ASTM F1632.
- 2) Saturated hydraulic conductivity, total porosity, and bulk density (ASTM F1815-97) - Perform for all soil layers.
- 3) Organic matter content (ASTM F1647-02a)
- 4) Salts and ammonium test.
- 5) Soil moisture testing required prior to soil placement shall be by gravimetric oven dry method, as described in Soil Science Society of America, Methods of Soil Analysis, Part 1, 1986.
- 6) Specified topsoil testing for initial approval shall be testing using the following procedures.

D. Initial Amended Planting Soil Analysis:

- 1) Report suitability of tested soil planting soils for plant growth. Based upon the test results:
 - a. Provide required soil treatments and soil amendments to be incorporated to meet Performance Requirements of the planting soil. Rates of treatments and amendments to be provided in weight per 1000 sf. Ft or volume per cu. Yd. for nitrogen, phosphorus, and potash nutrients.
 - b. Provide type and quantity of additives required to adjust and/or reduce salt level content.
 - c. Provide type and quantity of additives required to establish acceptable pH factor.
- 2) Soil tests shall be run prior to topsoil sample approval and at Landscape Architect's discretion throughout topsoil installation.

E. Testing Intervals for Organic Amendments, Planting Soil Mixes, Topsoil, and Subgrade

- 1) Provide testing at the following intervals:
 - a. Amended soil tests: During the placement of planting soils, test every 1000 cubic yards of planting soil mix delivered to the job site. Test shall be for soil mix quality assurance to maintain adherence to particle size distribution, pH, organic matter, salts, and ammonium. Report organic matter content on a percent by weight basis. Testing applies to all soil layers of the Soil Profile.
 - b. Testing will be based upon above outline.

PART 2 - PRODUCTS

2.1. PLANTING SOILS SPECIFIED ACCORDING TO PERFORMANCE REQUIREMENTS

- A. Planting-Soil - Ornamental Planting: Imported, Topsoil, naturally formed soil from off-site sources and consisting of sandy clay loam or clay loam according to USDA textures; and modified to produce viable planting soil. Alternate soil textures may be provided pending compliance with Amended Planting Soil Criteria. Amend imported topsoil soil with materials specified in other articles of this Section to become Planting Soil complying with the following requirements:
 - 1) Sources: Take imported, un-amended topsoil from sources that are naturally well-drained

sites where topsoil occurs at least 4 inches deep, not from Agricultural sites, bogs, or marshes; and that do not contain residual agricultural chemicals, undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass.

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- 2) Additional Properties of Imported Soil before Amending: Minimum of 2 percent organic- matter content, friable, and with sufficient structure to give good tilth and aeration. Clean soil to be of the following:
 - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
 - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 4 percent by dry weight of the imported soil.
 - c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 1-1/2 inches in any dimension.
- 3) Physical Soil Parameters
 - a. CLAY - 5-25%
 - b. SILT - 25-50%
 - c. SAND - 25-50%
- 4) Percentage of Organic Matter: Minimum 4% to 8% percent by volume.
- 5) Soil Reaction: pH of 6 to 7.4
- 6) CEC of Total Soil: Minimum 12 meq/100 mL at pH of 7.0. Maximum 25 meq/100 mL.
- 7) Soluble-Salt Content: 1 to 2 dS/m measured by electrical conductivity.
- 8) Ideal Soil Fertility:
 - a. Mehlich III: 110 ppm
 - b. Bray II Phosphorus: 175 ppm
 - c. Calcium: 65-70% of Base Saturation
 - d. Magnesium: 10-17% of Base Saturation
 - e. Potassium: 4.5% of Base Saturation
 - f. Boron: 1-2 ppm
 - g. Iron: 225 ppm
 - h. Manganese: 100ppm
 - i. Copper: 5 ppm
 - j. Zinc: 15 ppm

2.2. INORGANIC SOIL AMENDMENTS

A. The following amendments shall be added as indicated by the Soil Testing Agency in order to achieve the amended Planting Soil(s) Requirements.

- 1) Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent.
- 2) Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- 3) Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- 4) Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.
- 5) Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM F 2396.
- 6) UMaxx Urea
- 7) Mono-Ammonium Phosphate

2.3. ORGANIC SOIL AMENDMENTS

A. The following amendments shall be added as indicated by the Soil Testing Agency in order to achieve the amended Planting Soil(s) requirements.

- 1) Compost: Well-composted, stable, and weed-free organic matter produced by composting

well acted leaf matter, and bearing USCC's "Seal of Testing Assurance," and as follows:
 - a. Leaf Compost may be utilized. Alternate local forms of compost falling within the specified ranges may be utilizing pending approval from Soil Testing Agency. Biosolids and animal waste will not be accepted.
 - b. Reaction: pH stable compost. pH of 6 to 7.2
 - c. Soluble-Salt Concentration: Less than 4 dS/m.
 - d. Organic-Matter Content: 40 to 60 percent of dry weight.
 - e. Particle Size: Minimum of 98 percent passing through a 1-inch sieve.

2.4. FERTILIZERS

A. Fertilizers shall be added as indicated by the Soil Testing Agency in order to achieve the amended Planting Soil(s) requirements. This includes, but is not limited to:

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- 1) Superphosphate: Commercial, phosphate mixture, soluble.
- 2) Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.
- 3) Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water insoluble nitrogen, phosphorus, and potassium.

2.5. MISCELLANEOUS

- A. Pesticide: Registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergence Herbicide: Sub-sub-contractor to provide Post-Emergence product as required to maintain a weed-free project. Post-emergence product must be compatible with specified planting species.

PART 3 - EXECUTION

3.1. EXAMINATION

- A. Verification of Conditions: Examine the areas to receive the Work and the conditions under which the Work would be performed. Remedy conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

3.2. PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix un-amended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Spread un-amended soil to total depth as indicated on the drawings, but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
 - 1) Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil. Amendments shall be applied at rates indicated on Soil Test Analysis and recommendations

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- a. Mix lime and sulfur with dry soil before mixing fertilizer. Apply at rates indicated on Soil Test Analysis.
 - b. Mix fertilizer with planting soil no more than seven days before planting. Apply at rates indicated on Soil Test Analysis.
- 2) Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 6 inches in loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- D. Compaction: Compact each blended lift of planting soil to 85 percent of maximum Standard Proctor density according to ASTM D 698 except where a different compaction value is indicated on Drawings.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
 - 1) Tolerance: ½ inch variance in 20 feet.
 - 2) Limit fine grading to areas which can be planted immediately after grading.
 - 3) The site shall be free from irregular surface changes and shall vary uniformly between fixed elevations.
 - 4) Restore landscape areas to specified conditions if any eroded locations, ruts, depressions, or settlement exists after fine grading and prior to planting.
 - 5) See Drawings for additional notes.

3.3. APPLYING COMPOST TO SURFACE OF PLANTING SOIL

- A. Application: Apply compost component of planting-soil mix at a thickness AS REQUIRED TO MEET PERFORMANCE SPECIFICATIONS of amended soil mixes. Apply compost to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine
 - 1) texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4. FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1) Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 2000 sq. ft. of in-place soil or part thereof.
 - 2) Performance Testing: For each amended planting-soil type, demonstrating compliance

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with specified performance requirements. Perform testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

- B. Soil will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.
- D. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.5. WEED CONTROL / TREATMENT

- A. All site locations to receive planting where weeds exist, shall be treated with post-emergent herbicide.
 - 1) Repeat treatment as required to ensure that no weeds are present at the beginning of work

on the landscape planting of the Project.
- B. Weeds shall not be present at the date of inspection for Beneficial Occupancy of the Project and at the conclusion of the maintenance and establishment period following acceptance of the
 - 1) Sub-sub-contractor's work.
- C. Post-emergent weed treatment includes:
 - 1) Removal of weeds and other undesirable ground cover vegetation in turf/grass and planting areas shall be accomplished a minimum of 14 days prior to soil preparation for planting operations.
 - 2) Care shall be taken not to affect existing trees, shrubs, and plants to be saved on the site.

3.6. PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with design build team's operations and others in proximity to the Work. Notify design build team before each application is performed.

3.7. PROTECTION AND CLEANING

- A. Protect area of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations.
 - 1) Storage of construction material, debris, or excavated material.
 - 2) Parking vehicles or equipment.
 - 3) Vehicle traffic

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- 4) Foot traffic.
 - 5) Erection of sheds or structures.
 - 6) Impoundment of water.
 - 7) Excavation or other digging unless otherwise indicated.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
- 1) Dispose of excess subsoil and unsuitable materials on-site where directed by the design team.
 - 2) All hardscape and paving areas affected by the soil preparation operations shall be thoroughly cleaned by sweeping and power washing.

END OF SECTION 32 91 15

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SECTION 32 9200 - TURF

PART 1 GENERAL

1.1.RELATED DOCUMENTS

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

1.2. SUMMARY

- A. This Section includes the following:
 - 1) Seeding.
 - 2) Lawn Renovation.
- B. Related Sections include the following:
 - 1) Section 31 1000 Site Clearing
 - 2) Section 32 9300 Plant Material & Accessories

1.3. DEFINITIONS

- A. Final Acceptance Date: The date the Owner issues the Letter of Final Acceptance.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Maintenance Period: The length of time determined that the contractor shall be responsible for care and maintenance of the turf lawn following installation. This may be before or after substantial completion or both.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Soil: Existing, on-site, imported or manufactured soil that has been modified with soil amendments or fertilizers to produce a soil mixture best for plant growth.
- G. Topsoil: Top layer of the soil profile consisting of “Planting Soil” to create the zone where plant roots grow. Its appearance is generally friable, pervious, and its coloring is black or darker shades of brown,

gray, or red than the underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other non-soil materials.

- H. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.
- I. Substantial Completion Date: The date on which the Letter of Substantial Completion is issued.
- J. Watering: Application of water through appropriate tools and from approved sources to establish and maintain turf.

1.4. SUBMITTALS

- A. Product Information for Verification and Approval: For each type of product indicated, the contractor shall submit the requested information, as provided by the supplier or manufacturer, to the Landscape Architect within 30 Days of Award of Contract.
- B. Product samples and data sheets:
 - 1) Erosion control blanket.
 - 2) Metal wire staples.
- C. Product Certificates:
 - 1) Grass Seed: From each respective vendor for each grass-seed monostand or mixture, provide certification stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging. Identify the source, including name and telephone number of supplier.
 - 2) Pre- and Post-Installation Fertilization product information sheet supplied by the product manufacturer.
 - 3) Pre- and Post-Installation Pesticides product information sheet supplied by product manufacturer.
- D. Qualification Data: All seeding and/or landscape installation contractors shall have a minimum of 5 years' experience in the Landscape Industry performing the described work. Submit references if requested by the Landscape Architect.
- E. Planting Schedule: Notify Landscape Architect a minimum of 10 days prior to anticipated start of seeding activities.
 - 1) Review the project manager's or general contractor's project master schedule as it relates to these planting activities. Notify Landscape Architect in writing of any execution concerns.
- F. Maintenance Manual: As part of awarding Substantial Completion Approval contractor shall provide to the owner and Landscape Architect a maintenance manual which consists of the following:
 - 1) Contact information for the installation contractor company, company owner, and project foreman for both the installation and maintenance.

- 2) Installation date(s) of the work or phases of work as well as a copy of the Substantial Completion Certificate once it is available.
- 3) Written description of recommended and standard practice maintenance procedures and activities for this project site in an outline and/or spreadsheet format, for a full calendar year and broken down by the month.
- 4) Copies of all Submittals provided in Section 1.4, A through E.
- 5) Submit printed hardcopy in a 3 ring binder and a digital file of this maintenance manual to the Owner and Landscape Architect.

1.5. QUALITY ASSURANCE

- A. Installer Qualifications: An experienced landscape installer who has successfully completed seeded lawn establishment and renovation work similar in material, design, and size to that indicated for this Project and whose work has resulted in construction projects having a record of successful performance during implementation and follow-up maintenance.
- B. Soil-Testing Laboratory Qualifications: See section Section 32 9115 “Landscape Soil Preparation”.
- C. Planting Soil Analysis: See section Section 32 9115 “Landscape Soil Preparation”.
 - 1) Review soil test report and provide written analysis (correspondence with) by the testing laboratory regarding the suitability of planting soil for seed germination and lawn growth.
 - 2) Written analysis shall include recommended quantities of organic or inorganic amendments, minerals, or fertilizers required to be added in order to produce a satisfactory planting soil.
- D. Pre-Installation Conference: Conduct a landscape pre-construction conference at the project site in compliance with requirements of Section One. Conference attendees to include owner’s representative, general contractor (construction manager), grading and excavation sub-contractor, pedestrian and vehicular pavement sub-contractor, landscape sub-contractor and installation sub-contractor’s daily on-site superintendent, and Landscape Architect. Agenda items:
 - 1) Review construction schedule, deliverables related to seeding schedule and installation phases (if any).
 - 2) Review site access and staging of materials.
 - 3) Availability of water for turf establishment.
 - 4) Confirm the installation and coordination of work by other trades and protection of work by others during construction.
 - 5) Confirm maintenance practices.
 - 6) Confirm seed mix.
 - 7) Review determination for satisfactory lawn.

- E. Post-Installation Conference: As part of the Substantial Completion walkthrough and prior to the start of the maintenance period, the following shall discuss and review, at a minimum, the following maintenance items. Attendees shall include owner's representative, general contractor (construction manager), landscape sub-contractor's foremen for both installation and maintenance and the Landscape Architect. Agenda items:

- 1) Review progress of the seeding installation as a whole and/or by phase.
- 2) Availability of water for continued turf establishment and maintenance.
- 3) A written schedule of preferred fertilizers and/or pesticides and their use.
- 4) Clear maintenance direction and protocol for the maintenance contractor going forward.

1.6. DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.7. SCHEDULING

- A. Seeding Restrictions: Install seed during one of the indicated periods. Coordinate planting periods with construction schedule and maintenance period to provide required, uninterrupted maintenance from date of installation through Final Completion.

- 1) Spring Planting: April 15th through June 15th.
- 2) Fall Planting: August 15th through September 30th.

- B. Weather Limitations:

- 1) Proceed with installation only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained.
- 2) Apply products during favorable weather conditions according to manufacturer's written instructions.
- 3) Do not attempt to install any materials in frozen, wet, or muddy conditions.
- 4) Uniformly moisten excessively dry planting soil that is not workable, dusty or not conducive to successful installation.

1.8. LAWN MAINTENANCE

- A. Begin maintenance operations immediately after each area is planted and continue until final acceptance is given, but for not less than the following periods:

- 1) From date of installation up to and until receiving written approval that the work is Substantially Complete.
- 2) Continue maintenance for a minimum of 60 days from the date of Substantial Completion and up to Final Acceptance.

- B. Maintenance shall include but is not limited to lawn establishment and care by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations.

1.9. WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Warrant the lawn's installed, living materials for a period of 90 days after date of Final Acceptance, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents beyond Contractor's control.

PART 2 PRODUCTS

2.1. SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed, certified as complying with the standards of the Association of Official Seed Certifying Agencies (AOSCA) and therefore qualifying for their official "blue" certified seed tags for meeting state, federal and international seed law requirements for seed purity and germination tolerances as well as the preservation of genetic purity and varietal identity.
- B. Seed Species and Tolerances:
 - 1) Seed Mix Type: Kentucky Bluegrass seed mix shall provide 97% of the seed blend by weight.
 - 2) Not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed.
- C. Turf Grass Seed Mix:
 - 1) Kentucky Bluegrass Seed Variety: "Jump Start" Kentucky Bluegrass variety as supplied by Pure Seed, Hubbard, OR, 97032, Telephone: 503.651.2130. Website: Pureseed.com.
 - a. 100.00% "Jump Start" Kentucky Bluegrass.
 - 2) Kentucky Bluegrass Seed Variety: "Ultra 3-D" sod blend by Summit Seed as supplied by Shades of Green Turf Supply, Merrillville, IN, 46410, Telephone: 708.983.8239. Website: www.shadesofgreenturf.com.
 - a. 97.58% Bewitched Kentucky Bluegrass
 - b. 2.42% Inert Matter
 - 3) Alternate Seed Blends: Approved Equal. Submit seed mix to Landscape Architect for approval a minimum of 30 days prior to seed installation.

2.2. PLANTING ACCESSORIES

- A. Selective Herbicides:

- 1) EPA registered and approved, of type recommended by manufacturer for application.
- 2) As submitted to and approved by Landscape Architect.

2.3. FERTILIZER

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Starter Fertilizer: Commercial-grade fertilizer blended to promote root growth by supplying essential nutrients near the germinating seed.
 - 1) Composition: 10 percent nitrogen, 20 percent phosphorous, and 5 percent potassium, by weight.
 - 2) Review soils report to confirm proper application rate of this product.
- D. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1) Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2) Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- E. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1) Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 - 2) Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.4. MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew and seed free, salt hay or threshed straw of wheat, rye, oats, or barley.

2.5. EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable straw fiber, or coconut-fiber mat enclosed in a biodegradable jute fiber net.
 - 1) Location(s): All slopes exceeding 3:1. See Civil Drawings.
 - 2) Longevity: 12 Months
 - 3) Product: Bionet S75BN Erosion Blanket

- 4) Manufacturer: North American Green by Tensar International Corporation, Poseyville, IN 47633, Telephone: 812.867.0247, tensarnagreen.com, or approved equal.

B. Manufacturer's recommended anchoring device(s):

- 1) Biodegradable pins: 4 inches long by 3/4" wide.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Confirm that all operations required per Section 32 9115 "Landscape Soil Preparation" have been completed prior to fine grading activities.
- C. Confirm that fine grading activities and grade elevations have been met per the drawings.

3.2. PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1) Protect adjacent and adjoining areas from hydro-mulch overspray.
- B. Provide and install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
- D. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- E. Apply seed starter fertilizer per manufacturer's recommendations for installation. Installation of fertilizer as part of the drill seeding process is acceptable if the machinery is equipped to perform this operation.
- F. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.3. SEEDING

- A. Sow seed with pull behind drill planting machine with a furrow opened through a double disc system and adjustable seed depth. Do not broadcast or drop seed. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1) Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow seed at the rate as recommended by the manufacturer or their supplier.
- C. Drill machine should place planting soil atop seed for optimal soil-seed contact, roll lightly, and water seeded areas with fine spray.

- D. Protect drill-seeded areas from hot, dry weather or drying winds by applying [hydroseed] [straw] mulch within 24 hours after completing seeding operations.
- E. Upon completion of seeding operations, apply straw mulch and erosion-control blankets, if required.

3.4. MULCH INSTALLATION

- A. Straw Mulch: Protect seeded areas by spreading straw mulch.
 - 1) Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1 ½" in loose depth over seeded areas.
 - 2) Spread by hand, blower, or other suitable equipment.
 - 3) Anchor straw by crimping into topsoil with suitable mechanical equipment.

3.5. LAWN RENOVATION

- A. Renovate existing lawn damaged by Contractor's operations, such as but not limited to storage of materials or equipment and movement of vehicles.
 - 1) Reestablishment of lawn will be required where settlement or washout occurs or where minor regrading is required.
- B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.
- C. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- D. Mow, de-thatch, core aerate, and rake existing lawn.
- E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- H. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches of existing soil.
- I. Provide new planting soil to fill low spots and meet finish grades.
- J. Apply seed and protect with straw as required for new lawns.
- K. Water newly planted areas and keep moist until new lawn is established.

3.6. SATISFACTORY LAWNS

- A. Substantial Completion Conference: Prior to the start of any maintenance period, schedule a meeting per Section 1.5-E Post-Installation Conference.

- B. Satisfactory Seeded Lawn: At end of maintenance period and to gain final acceptance, a healthy, uniform, close stand of grass must be established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. with any bare spots not exceeding 3 by 3 inches in size.
- C. Re-establish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.7. TURF MAINTENANCE

- A. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height in initial mowing and 40% in all subsequent mowings.
 - 1) Do not delay mowing until grass blades bend over and become matted.
 - 2) Do not mow when grass is wet.
 - 3) Schedule mowings to maintain the following minimum grass height: 3 inches.
- B. Turf Post-Installation Fertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.
 - 1) Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.
 - 2) Apply products per the manufacturer's rate and site condition recommendations and instructions.
 - 3) Notify the client a minimum of 24 hours in advance of any application.
 - 4) Apply only those products approved of during post-installation conference.

3.8. PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.9. CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.
- C. Remove erosion-control measures after grass establishment period, excluding erosion blankets and mulch.

3.10. TERMINATION OF THE MAINTENANCE PERIOD

A. Substantial Completion Procedure:

- 1) Complete all turf installation per the drawings and specifications including all maintenance requirements.
- 2) Submit a written request to the Landscape Architect for a substantial completion meeting on-site. Identify any work not completed or not per the drawings and specifications.
- 3) Provide all submittals requirements per Section 1.4

B. Final Acceptance Procedure:

- 1) Work will be accepted by the Owner and Landscape Architect upon satisfactory completion of all work, including maintenance period's corrective or replacement work under the Warranty Period.
- 2) Submit a written request to Landscape Architect for review for Final Acceptance at least fifteen (15) working days prior to anticipated Final Review date, which is at the end of the Maintenance Period.

C. Corrective Work:

- 1) Work requiring corrective action or replacement shall be performed within ten (10) calendar days after the Final Review.
- 2) Perform corrective work and materials replacement in accordance with the Drawings and Specifications, and shall be made by the Contractor at no cost to the Owner.
- 3) After corrective work is completed, the Contractor shall again request a Final Review for Final Acceptance as outlined above.
- 4) Continue maintenance of all landscaped areas until such time as all corrective measures have been completed and Final Acceptance received in writing.

D. Conditions for Acceptance of Work at End of Maintenance Period:

- 1) All seeded areas shall be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.
- 2) Correct all locations not meeting these conditions. An additional Warranty Period equal in length to the original shall be commenced for all such seeded areas.

END OF SECTION 32 9200

SECTION 32 9300 - PLANT MATERIAL & ACCESSORIES

PART 1 – GENERAL

1.1.SUMMARY

A. Section Includes:

- 1) Plant material.
- 2) Planting soils.
- 3) Tree stabilization.
- 4) Organic mulch.
- 5) Stone.

B. Related Sections:

- 1) Division 32 9200 Section "Turf".

1.2. DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- D. Finish Grade: Elevation of finished surface of planting soil.
- E. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- F. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- G. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- H. Planting Area: Areas to be planted.
- I. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

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- J. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- K. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- L. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- M. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- N. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- O. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.3. SUBMITTALS

- A. Product Data: Submit the following no later than 60 days after Notice to Proceed.
 - 1) Plant Material Order Forms: Including quantities, sizes, quality, and sources for plant materials.
 - 2) Plant Fertilizer cut sheets.
 - 3) Contractor qualifications.
- B. Samples for Verification: Submit the following at least 30 days prior to installation of plant material:
 - 1) Organic and Stone Mulch: 1-pint volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
 - 2) Stone Samples: 1 sample of each finish type of variable size that indicates full range of color for stone type.
- C. Warranty/Maintenance: Submit the following at the Final Completion Inspection:
 - 1) Warranty: Provide a one (1) year written guarantee for all plant material.
 - 2) Maintenance Instructions: Submit written recommendations procedures for landscape maintenance for one (1) calendar year.

1.4. QUALITY ASSURANCE

- A. Installer Qualifications: A landscape contractor with a minimum of 5 year's experience. Submit company qualifications and examples of at least (3) similar projects.
- B. Soil-Testing Laboratory Qualifications: See Specification 32 Section 9115 "Landscape Soil Preparation".

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- C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
- D. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
 - 1) Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
 - 2) Other Plants: Measure with stems, petioles, and foliage in their normal position.
- E. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
 - 1) Notify Landscape Architect of plant sources a minimum of 30 days prior to the commencement of planting operations.
- F. Pre-installation Conference: Conduct one conference at Project site a minimum of (14) calendar days prior to the start of work.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- B. Bulk Materials:
 - 1) Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2) Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3) Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.
- C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- D. Handle planting stock by root ball.

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- E. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
- 1) Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 2) Do not remove container-grown stock from containers before time of planting.
 - 3) Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.

1.6. PROJECT CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:
- 1) Notify Owner no fewer than two days in advance of proposed interruption of each service or utility.
 - 2) Do not proceed with interruption of services or utilities without Owner's written permission.
- C. Planting Restrictions: Plant during one of the following periods, unless submitted in writing and approved otherwise by Landscape Architect. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
- 1) Spring Planting: March 15 to June 1.
 - 2) Fall Planting: August 15 to November 15
- D. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- E. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
- 1) When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.7. WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

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- 1) Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
 - c. Faulty performance of tree stabilization.
 - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- 2) Warranty Periods from Date of Final Completion:
 - a. Trees, Shrubs, and Ornamental Grasses: 12 months.
 - b. Ground Covers, Perennials: 12 months.
- 3) Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 – PRODUCTS

2.1. PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 - 1) Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
 - 2) Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

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- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2. ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inc sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1) Organic Matter Content: 50 to 60 percent of dry weight.
 - 2) Feedstock: Agricultural, food, or industrial residuals; bio-solids; yard trimmings; or source-separated or compostable mixed solid waste.

2.3. FERTILIZERS

- A. Slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1) Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
 - 2) Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.4. PLANTING SOILS

- A. Planting Soil: ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 4 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
 - 1) Ratio of Loose Compost to Topsoil by Volume: 1:4.
 - 2) Weight of Commercial Fertilizer per 1000 Sq. Ft.: as recommended by manufacturer.
- B. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs, or marshes.
 - 1) Additional Properties of Imported Topsoil or Manufactured Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of

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obnoxious weeds and invasive plants including quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass; not infested with nematodes; grubs; or other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled pore space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.

- 2) Mix imported topsoil or manufactured topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil:
 - a. Ratio of Loose Compost to Topsoil by Volume: 1:4.
 - b. Weight of Commercial Fertilizer per 1000 Sq. Ft.: as recommended by soil testing reports.

2.5. MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1) Type: Shredded Hardwood Mulch
 - 2) Size Range: 3 inches maximum, 1/2 inch minimum.
 - 3) Color: Natural

2.6. STONE

- A. Natural Limestone Columns, (5) total, for Memorial per Drawings
 - 1) Type: Mankato Limestone available from Earthworks Natural Stone, www.earthworksstone.com.
 - 2) Size: Each 20"W x 20"D x 50"H at back and 30"H at front per Drawing Details
 - 3) Color: Gold to Buff
 - 4) Finish: Per Drawing Details

2.7. TREE STABILIZATION MATERIALS

- A. Stakes and Guys:
 - 1) Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
 - 2) Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.
 - 3) Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch in diameter.

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- 4) Guy Cables: Five-strand, 3/16-inch- diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 3 inches long, with two 3/8-inch galvanized eyebolts.

PART 3 – EXECUTION

3.1. EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1) Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2) Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3) Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4) Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2. PREPARATION OF LANDSCAPE AREAS

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.
- E. Remove all weeds from the proposed landscape beds by doing the following:
 - 1) Mow weeds to a height of 3" or less.
 - 2) Apply a total weed killer as recommended by the manufacturer.
 - 3) Wait a minimum of 5 days and reapply the total weed killer to areas that were not affected by the first application.

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- 4) After all weeds are dead, remove all dead foliage and lightly till the ground to a depth of 2".

3.3. PLANTING AREA ESTABLISHMENT

- A. Loosen sub-grade of planting areas to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1) Apply fertilizer directly to sub-grade before loosening.
 - 2) Thoroughly blend planting soil off-site before spreading.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - 3) Spread planting soil to a depth of 4 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or sub-grade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil over loosened sub-grade. Mix thoroughly into top 2 inches of sub-grade. Spread remainder of planting soil.
- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4. EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
 - 1) Excavate and install per planting details.
 - 2) Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 - 3) If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
 - 4) Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate sub-grades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 - 5) Maintain supervision of excavations during working hours.

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- 6) Keep excavations covered or otherwise protected when unattended by Installer's personnel.
 - 7) If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Subsoil and topsoil removed from excavations may be used as planting soil.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
- 1) Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5. TREE, SHRUB, AND VINE PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
- 1) Use planting soil for backfill.
 - 2) After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - 3) Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 - 4) Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set container-grown stock plumb and in center of planting pit or trench with root flare at same elevation as adjacent finish grades.
- 1) Use planting soil for backfill.
 - 2) Carefully remove root ball from container without damaging root ball or plant.
 - 3) Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

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- 4) Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6. MECHANIZED TREE SPADE PLANTING

- A. Trees may be planted with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than the manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.
- B. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.
- C. Cut exposed roots cleanly during transplanting operations.
- D. Use the same tree spade to excavate the planting hole as was used to extract and transport the tree.
- E. Plant trees as shown on Drawings, following procedures in "Tree, Shrub, and Vine Planting" Article.
- F. Where possible, orient the tree in the same direction as in its original location.
- G. Provide hand excavation and amended soils around the relocated tree per the drawing details.

3.7. TREE STABILIZATION

- A. Install trunk stabilization as follows unless otherwise indicated:
 - 1) Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
 - 2) Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
 - 3) Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Staking and Guying: Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated. Securely attach no fewer than three guys to stakes 30 inches long, driven to grade.
 - 1) Site-Fabricated Staking-and-Guying Method:
 - a. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - b. Paint turnbuckles with luminescent white paint.

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3.8. GROUND COVER AND PERENNIAL PLANTING

- A. Set out and space ground cover and plants other than trees and shrubs as indicated in even rows with triangular spacing.
- B. Use planting soil for backfill.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9. PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1) Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.
 - 2) Apply a weed prevention application of the herbicide "Preen" or approved equal to the finished planting bed.

3.10. PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- B. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.11. CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

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- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting

END OF SECTION 321930

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SECTION 32 9447 - LANDSCAPE MAINTENANCE

PART 1 - GENERAL

1.1.RELATED DOCUMENTS

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

1.2. SUMMARY

- A. This section includes landscape maintenance, complete as specified during progress of the work, after installation, and for a period 60 days from the date of Substantial Completion and up to Final Acceptance.
- B. Landscape maintenance work consists of providing all labor, materials, equipment, and incidental supplies necessary to perform described work.
- C. Related Sections include the following:
 - 1) Section 32 9115 Landscape Soil Preparation
 - 2) Section 32 9200 Turf
 - 3) Section 32 9300 Plant Material & Accessories

1.3. DEFINITIONS

- A. Final Acceptance Date: The date of the Owner issues the Letter of Final Acceptance.
- B. **Maintenance Manual: A collection of documents gathered by the contractor for the Owner's records including but not limited to landscape schedules, records, permits, and conditions of planting at Final Acceptance.**
- C. **Maintenance Period: The length of time determined that the contractor shall be responsible for care and maintenance of the turf lawn following installation.**
- D. Substantial Completion Date: The date on which the Letter of Substantial Completion is issued.

1.4. SUBMITTALS

- A. Quality Control Submittals:
 - 1) Schedule of maintenance operations and monthly status report including list of equipment, materials proposed for the job, and watering schedule .
 - 2) Licenses, permits, and insurance required by the City of Cape Girardeau, the State and/or Federal government pertaining to maintenance work.
 - 3) Documentation of existing planting .
 - 4) Monthly record of all herbicides, insecticides, and disease control chemicals used for the project.

- 5) Written application recommendation by a licensed agricultural pest control advisor for all weed, pest and disease controls restricted by the Director of Agriculture proposed for this work.
- B. Project Close-out Submittal: Prepare a landscape maintenance manual in the form of a single 3-ring binder containing an indexed collection of documents to include the following:
- 1) All plant material and accessories schedules, including final plant installation schedule showing substitutions made.
 - 2) Records and permits required as listed above.
 - 3) Documentation of accepted condition of planting at Final Acceptance.

1.5. QUALITY

A. Qualifications:

- 1) Experience: The landscape contractor or maintenance subcontractor shall have a full-time employee assigned to the job as foreman for the duration of the contract. He/she shall have a minimum of (5) years experience in landscape maintenance supervision, with experience or training in turf management, entomology, pest control, soils, fertilizers and plant identification.
- 2) Labor Force: The landscape maintenance labor force shall be thoroughly familiar with, and trained in, the work to be accomplished and shall perform the tasks in a competent, efficient manner acceptable to the Owner.

B. Requirements:

- 1) Supervision: The foreman shall directly supervise the work force at all times. Notify Owner of all changes in supervision.
- 2) Identification: Provide proper identification at all times for landscape maintenance firm's vehicles and labor force. Be uniformly dressed in a manner satisfactory to the Owner.
- 3) Post-installation Conference: As part of the Substantial Completion walk-through and prior to the start of the maintenance period, the following shall discuss and review, at a minimum, the following maintenance items. Attendees shall include owner's representative, general contractor (construction manager), landscape sub-contractor's foremen for both installation and maintenance and the Landscape Architect. Agenda items:
 - a. Review progress of the plant and turf installation as a whole and/or by phase.
 - b. Availability of water for continued plant and turf maintenance.
 - c. A written schedule of preferred fertilizers and/or pesticides and their use.
 - d. Clear maintenance direction and protocol for the maintenance contractor going forward.

- C. The contractor shall be liable for any damage to the grounds, building or equipment caused by the activities and or negligence of its employees.

1.6. PROJECT/SITE CONDITIONS

- A. Site Visit: At the beginning of the maintenance period, visit and walk the site with the Owner's representative to clarify scope of work and understand existing project/site conditions.
- B. Documentation of Conditions: Document general condition of existing trees, shrubs, vines, groundcovers and lawn recording all plant materials which are healthy, thriving , damaged, dead or dying.

1.7. SEQUENCING AND SCHEDULING

- A. Perform all maintenance during hours mutually agreed upon between Owner and Contractor.
- B. Work force shall be present at the project site a minimum of once per week and as often as necessary to perform maintenance in accordance with the approved maintenance schedule.

1.8. WARRANTY

- A. For specific requirements, refer to the following sections:
 - 1) Section 32 9200 - Turf
 - 2) Section 32 9300 - Plant Material & Accessories

PART 2 - PRODUCTS

2.1. MATERIALS

- A. All materials and equipment shall be provided by the contractor, unless otherwise specified below.
- B. Water: Clean, potable, and fresh, as available from Owner.
- C. Fertilizers:
 - 1) Tightly-compressed, slow-release and long-lasting complete fertilizer tablets bearing manufacturer's label of guaranteed analysis of chemicals present.
 - 2) Balanced, once-a-season application, controlled-release fertilizers with a blend of coated prills which supply controlled-release Nitrogen, Phosphorus, and Potassium, and uncoated, rapid soluble prills containing Nitrogen and Phosphorus.
- D. Herbicides, Insecticides and Fungicides:
 - 1) Best quality materials with original manufacturer's containers, properly labeled with guaranteed analysis.
 - 2) Use non-staining materials.
- E. Annuals/Perennials: Nursery-grown pots, full, healthy plants just ready to bloom, and of matching size and species.
- F. Lawn Seed for Re-seeding: Match seed mix from Specification Section 32 9200 "Turf".

G. Mulch: Match mulch from Specification Section 32 9300 "Plant Material & Accessories".

H. Replacement tree guys, stakes, ties, and wires: Match approved materials from Drawings.

2.2. EQUIPMENT

A. Use only the proper tool for each job. Maintain all tools in sharp, properly functioning condition. Clean and sterilize pruning tools prior to usage.

B. Take all measures to prevent introduction of insect or disease-laden materials onto the site. See Section 32 9300 "Plant Material & Accessories".

PART 3 - EXECUTION

3.1. ESTABLISHING THE MAINTENANCE PERIOD

A. Preliminary Review: As soon as letter of substantial Completion is issued, hold a preliminary review to determine condition of the work.

B. Date of Review: Notify Landscape Architect at least six (6) working days prior to anticipated date of review.

C. Beginning of the Maintenance Period: The date on which the Landscape Architect issues a letter of Substantial Completion to the contractor.

3.2. PREPARATION

A. Protection

- 1) Protect all new planting areas from damage of all kinds from beginning of work until sufficiently established or until Final Acceptance.
- 2) Provide temporary protection fences, barriers, and signs as required for protection.
- 3) Notify the Owner 24 hours in advance of any chemical application procedures. Identify the exact locations being treated and the chemicals to be used. Furnish to Owner for approval, MSDS sheets for all chemicals to be used prior to application. Areas being treated shall be flagged or marked per state and local requirements.
- 4) Do not mow, walk, or use any piece of equipment on turf areas when frost is present.
- 5) Do not mow any turf areas if they are saturated with water or standing water is present.

B. Replacements:

- 1) Immediately treat or replace all plants which became damaged or injured as a result of Contractor's operations or negligence, as directed by Landscape Architect, at no cost to Owner.
- 2) Replacement shall match size, condition, and variety of plant replaced.

3.3. PLANTING

A. Watering Basins:

- 1) Maintain all watering basins around plants so that enough water can be applied to establish moisture through major root zones.
- 2) For supplemental hand watering of watering basins, use a water wand to break the water force. Do not permit use of "jet" type water equipment. Do not permit crown rots to become exposed to air through dislodging of soil and mulch.
- 3) Maintain originally called for depth of mulch to reduce evaporation and frequency of watering.

B. Re-setting: Reset plants to proper grades and upright position.

C. Weed Control:

- 1) All areas between plants, including watering basins, shall be weed free at all times.
- 2) Use only recommended and legally approved herbicides to control weed growth.
- 3) Avoid frequent soil cultivation that destroys shallow roots and breaks the seal of pre-emergent herbicides.

D. Pruning:

- 1) Prune trees to select and develop permanent scaffold branches that are smaller in diameter than the trunk or branch to which they are attached, and which have vertical spacing of 18" to 48" and radial orientation so as not to overlay one another.
- 2) Prune trees to eliminate diseased or damaged growth, and narrow V-shaped branch forks that lack strength. Reduce topping and wind damage by thinning out crowns.
- 3) Prune trees to maintain growth within space limitation, maintaining a natural appearance and balancing crown with roots.
- 4) No stripping of lower branches ("raising up") of young trees will be permitted.
- 5) Retain lower branches in a "tipped back" or pinched condition to promote caliper trunk growth (tapered trunk). Do not cut back to fewer than six buds or leaves on such branches. Only cut lower branches flush with the trunk after the tree is able to stand erect without staking or other support.
- 6) Thin out and shape evergreen trees when necessary to prevent wind and storm damage.
- 7) Do primary pruning of trees during the dormant season. Do not permit any pruning of trees prone to excessive "bleeding" during growth season.
- 8) Prune damaged trees or those that constitute health or safety hazards at any time of year as required.
- 9) Make all cuts clean and close to the trunk, without cutting into the branch collar. "Stubbing" will not be permitted. Cut smaller branches flush with trunk or lateral branch. Make larger cuts (1" diameter or larger) parallel to shoulder rings, with the top edge of the cut at the trunk or lateral branch.

- 10) Branches too heavy to handle shall be pre-cut in three stages to prevent splitting or peeling of bark. Make the first two cuts 18" or more from the trunk to removed the branch. Make the third cut at the trunk to remove the resulting stub.
- 11) Do not prune or clip shrubs into balled or boxed forms unless specifically called for by design.
- 12) Clip shrubs to be hedged when branches project 2" beyond limit of clipped hedge shown on the drawings.
- 13) Take extreme care to avoid transmitting disease from one infected plants to another. Properly sterilize pruning tool before going from one infected plant to all other plants.

E. Staking and Guying of Trees:

- 1) Inspect stakes and guys at least once a month to check for rubbing that causes bark wounds.
- 2) Repair and replace staking and guying as shown in the drawings, and as specified.

F. Maintenance of Existing Plantings to Remain:

- 1) Generals: Conform to all applicable paragraphs regarding pruning, watering, spraying, and fertilizing of new plant materials as specified in this section.
- 2) Symptoms: Be alert to symptoms of construction damage to existing plantings as evidenced by wilting, unseasonal or early flowering or loss of leaves, and insect or disease infestation due to declining vigor.
- 3) Notification: Submit in writing of evidences of declining vigor immediately upon discerning the problem. Take appropriate interim measures to mitigate the severity of the problem as specified in this section.
- 4) Proposal: Submit written proposal and cost estimate for the correction of all conditions before proceeding with permanent correction work.

3.4. GROUNDCOVERS

A. Watering:

- 1) Check for moisture penetration throughout the root zone at least twice a month.
- 2) Water as frequently as necessary to maintain healthy growth of plants.

B. Weed Control:

- 1) Control weeds, preferably with pre-emergent herbicides and with selective systemic herbicides.
- 2) Minimize hoeing of weeds in order to avoid plant damage.

C. Fertilization:

- 1) Recently installed plant materials: Verify with Owner actual completion date of planting installation and rate of prior application of fertilizers.
- 2) New plant materials: Place one (1) 5-gram tablet (20-10-5; N-P-K) beside the root ball about an inch from root tips.
- 3) Established plant materials: Do not use complete fertilizers unless soil test shows specific nutrient deficiencies.

D. Mowing and Edging:

- 1) Trim edge of groundcovers to keep in bounds of planting beds.
- 2) Trip top growth of groundcovers as necessary to achieve an overall even appearance.
- 3) Groundcovers which lend to mowing shall be mowed to specified height above finished grade in order to renew growth, improve density and attractiveness.

E. Replacements:

- 1) Replace dead and missing plants after obtaining Owner's agreement to pay for replacement, and if not covered under Special Warranty by the installation contractor.
- 2) Damages due to Contractor's negligence shall be paid for without charge to Owner.

3.5. ANNUALS AND PERENNIALS

A. Watering:

- 1) Hand-water all pre-cast pots and planters without an automatic irrigation system.
- 2) Species, sizes of plants, container sizes and orientation shall dictate frequency of watering. Submit to Owner a watering schedule for different seasonal requirements.

B. Weed control: All planters and planting beds with annuals and perennials shall be weed-free at all times.

C. Pruning:

- 1) Limit pruning to removal of damaged or dead twigs and foliage.
- 2) Remove spent flowers on a weekly basis.
- 3) Perennial foliage and ornamental grasses shall remain in place through winter and cut back by the end of March.

D. Replacement:

- 1) Replace annuals when materials exhibit a "spent" condition.
- 2) Thoroughly cultivate soil after removal of "spent" or dead plants prior to planting new materials.

E. Fertilization: Incorporate slow release fertilizers into the planting soil per manufacturer's current specifications, and rake smooth prior to planting.

3.6. TURF

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf.
 - 1) Maintenance contractor's foreman should be familiar with the Maintenance Manual's requirements.
 - 2) Fill in as necessary soil subsidence that may occur because of settling, rutting, or other processes. Replace materials and turf damaged or lost in disturbed areas.
 - 3) In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
- B. Watering: Install and maintain temporary above surface piping, hoses, and turf-watering equipment to convey water from sources.
 - 1) Water at such frequency as weather conditions require, to keep turf uniformly moist to a depth of 4 inches during establishment.
 - 2) Once turf is established, water lawn at a minimum rate of 1 inch per week or as required to maintain proper soil moisture.
 - 3) Water turf with combination of temporary overhead watering systems or tools.
 - 4) Keep temporary watering system equipment off walkways and sport courts.
 - 5) Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
 - 6) Watering shall be done during early mornings.
- C. Weed Control
 - 1) Control broadleaf weeds with selective herbicides.
 - 2) In areas where crabgrass has infested the lawn, apply a selective post-emergent herbicide as soon as possible, and prior to flowering.
 - 3) Apply pre-emergent herbicides such as Dacthal, Balan, or Betasan prior to crabgrass germination.
 - 4) Do not irrigate for 48 hours after application of herbicidal sprays.
 - 5) Coordinate application of herbicides with thatch control and reseeding schedule as described below.
- D. Mowing and Edging:
 - 1) Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height in initial mowing and 40% in all subsequent mowings.
 - 2) Do not delay mowing until grass blades bend over and become matted.

- 3) Do not mow when grass is wet.
- 4) Schedule mowings to maintain the following minimum grass height: 3 inches.
- 5) Trim edges at least twice a month or as needed for neat appearance. Vacuum clippings.

E. Reseeding of Lawn Areas: Match existing seed mix of adjacent areas.

F. Renovating of Existing Lawns:

- 1) Thatch Control: Maintain thatch layer at 1/2 in. depth or less. Verticut as required.
 - a. Three weeks before verticutting lawn, apply nitrate fertilizers.
 - b. Perform verticutting operations preferably in the Fall, but otherwise in the Spring. Remove all debris from verticutting. Overseed as needed.
 - c. Overseeding must not be followed by application of pre-emergent herbicides for at least four to six weeks. Normally this means that lawns invaded by weeds shall be renovated and over seeded in the Fall, and treated for weed control in the following late winter.
- 2) Aeration:
 - a. Do not perform aeration work during season of active weed germination.
 - b. Verify compacted areas to improve water penetration when needed, using a piston-driven aerifier with hollow tines. Rake up and removed all resulting soil cores. Fertilize and irrigate immediately after clean up of cores.

G. Fertilizers:

- 1) Recently seeded and sodded lawn areas: Verify with Owner previous applications of fertilizer(s).
- 2) Established lawn areas: apply a slow release (3 to 5 months) fertilizer (12-8-8; N-P-K) once in spring and again in the fall at the following rates:

Program	100 sq. ft.	Acre
Optimum	15 lbs.	650 lbs.
Medium	12 lbs.	500 lbs.
Low	8 lbs.	350 lbs.

- 3) Apply fertilizer when grass is dry and preferably after mowing. Do not apply during hot weather or when grass is under stress. Water immediately after application.
- 4) Apply only nitrogen unless a soil test shows a specific nutrient deficiency.
- 5) If soil pH gets below 6.0, then a basic fertilizer such as calcium nitrate may be preferable to an acidic fertilizer. Follow the soil chemist's recommendation when deficiencies appear.

3.7. INSECTS, PESTS, AND DISEASE CONTROL

- A. Inspection: Inspect all plant materials for signs of stress, damage and potential trouble from the following:
 - 1) Presence of insects, moles, gophers, ground squirrels, snails, and slugs in planting areas.
 - 2) Discolored or blotching leaves or needles.
 - 3) Unusually light green or yellowish green color inconsistent with normal green color of leaves.
- B. Personnel: Only licensed, qualified, trained personnel shall perform spraying for insect, pest and disease control.
- C. Application: Spray with extreme care to avoid all hazards to any person or pet in the area or adjacent areas.

3.8. TERMINATION OF THE MAINTENANCE PERIOD

- A. Final Acceptance Procedure
 - 1) Work will be accepted by the Owner and Landscape Architect upon satisfactory completion of all work including maintenance period's corrective or replacement work under the Warranty Period.
 - 2) Submit a written request to Landscape Architect for review for Final Acceptance at least fifteen (15) working days prior to anticipated Final Review date, which is at the end of the Maintenance Period.
- B. Corrective Work:
 - 1) Work requiring corrective action or replacement shall be performed within ten (10) calendar days after the Final Review.
 - 2) Perform corrective work and materials replacement in accordance with the Drawings and Specifications, and shall be made by the Contractor at no cost to the Owner.
 - 3) After corrective work is completed, the Contractor shall again request a Final Review for Final Acceptance is received in writing.
- C. Conditions for Acceptance of Work at End of Maintenance Period:
 - 1) Each plant and all lawn areas shall be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.
 - 2) Replace all plants and correct all turf areas not meeting these conditions. An additional Warranty Period equal in length to the original shall be commenced for all such plants and turf areas.
- D. Final Acceptance Date: The date on which the Landscape Architect issues a Letter of Final Acceptance. Upon Final Acceptance, the Owner will assume responsibility for maintenance of the work.

3.9. CLEANING

- A. Dispose of all pruned materials, vacuum all lawn clipping and leaves, sweep all walkways and rake smooth all mulched areas.
- B. Collect and remove all trash that has blown onto the site.
- C. Remove from the site all containers and evidence of maintenance activities.

3.10. CLOSE OUT

- A. Landscape Maintenance Record: Submit binder to Owner with all documentation and records required and utilized during the maintenance period.
- B. Keys and Identification: Return all keys and identification materials supplied by Owner for the purpose of site access.

END OF SECTION

SECTION 33 0561 - CONCRETE MANHOLES

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Modular precast concrete manhole sections with tongue-and-groove joints covers, anchorage, and accessories.

1.2. REFERENCE STANDARDS

- A. ASTM C478 - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2015a.
- B. ASTM C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections (Metric); 2015a.
- C. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2008, with Editorial Revision (2016).
- D. ASTM C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals (Metric); 2008b (Reapproved 2013).

1.3. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.
- C. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 (ASTM C478M), with resilient connectors complying with ASTM C923 (ASTM C923M).

2.2. CONFIGURATION

PART 3 EXECUTION

3.1. MANHOLES

- A. Place concrete base pad, trowel top surface level.
- B. Place manhole sections plumb and level, trim to correct elevations, anchor to base pad.
- C. Cut and fit for pipe.
- D. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.
- E. Coordinate with other sections of work to provide correct size, shape, and location.

END OF SECTION

Concrete Manholes		33 0561-1
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SECTION 33 4211 - STORMWATER GRAVITY PIPING

PART 1 GENERAL

1.1. SECTION INCLUDES

- A. Storm drainage piping, fittings, and accessories.
- B. Connection of drainage system to municipal sewers.
- C. Catch basins, Trench drains, Plant area drains, Paved area drainage, Site surface drainage, Detention tank, and Detention basin.

1.2. RELATED REQUIREMENTS

- A. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
- B. Section 31 2323 - Fill: Bedding and backfilling.

1.3. DEFINITIONS

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.4. REFERENCE STANDARDS

- A. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2003 (Reapproved 2016).
- B. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2016.
- C. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2016.
- D. ASTM C425 - Standard Specification for Compression Joints for Vitrified Clay Pipe and Fittings; 2004 (Reapproved 2013).
- E. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2012 (Reapproved 2017).
- F. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2011 (Reapproved 2017).
- G. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.
- H. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.

1.5. SUBMITTALS

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Product Data: Provide data indicating pipe, pipe accessories.
- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

D. Project Record Documents:

- 1) Record location of pipe runs, connections, catch basins, cleanouts, and invert elevations.

1.6. REGULATORY REQUIREMENTS

- A. Conform to applicable code for materials and installation of the Work of this section.

PART 2 PRODUCTS

2.1. SEWER PIPE MATERIALS

- A. Vitrified Clay Pipe Joint Device: ASTM C425 compression gasket joint.
- B. Concrete Pipe: Reinforced, ASTM C76 (ASTM C76M), Class II with Wall type A; mesh reinforcement; inside nominal diameter of shown on drawings inches, bell and spigot end joints.
- C. Reinforced Concrete Pipe Joint Device: ASTM C443 (ASTM C443M) rubber compression gasket joint.
- D. Plastic Pipe: ASTM D2729, Poly Vinyl Chloride (PVC) material; inside nominal diameter of shown on drawings inches, bell and spigot style solvent sealed joint end.

2.2. PIPE ACCESSORIES

- A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
- B. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Storm Sewer Service" in large letters.
- C. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover, and tamper proof fasteners.
- 1) Configuration: Angular.
 - 2) Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.
 - 3) Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets, and rubber coupling.

2.3. BEDDING AND COVER MATERIALS

- A. Bedding: As specified in Section 31 2316.13.
- B. Cover: As specified in Section 31 2316.13.

PART 3 EXECUTION

3.1. TRENCHING

- A. See Section 31 2316.13 - Trenching for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

3.2. INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
 - 1) Plastic Pipe: Also comply with ASTM D2321.
- B. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- C. Connect to building storm drainage system, foundation drainage system, and utility/municipal sewer system.
- D. Install continuous trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.

END OF SECTION