

# PROJECT MANUAL

*Outdoor Pavilion  
Missouri Veterans Home  
Cape Girardeau, Missouri*

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

Date Issued: October 22, 2024

Project No.: U2415-01  
FAI No: 29-043

STATE *of* MISSOURI

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OFFICE *of* ADMINISTRATION  
Facilities Management, Design and Construction

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**SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS**

**PROJECT NUMBER: (#U2415-01) Outdoor Pavilion  
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:**

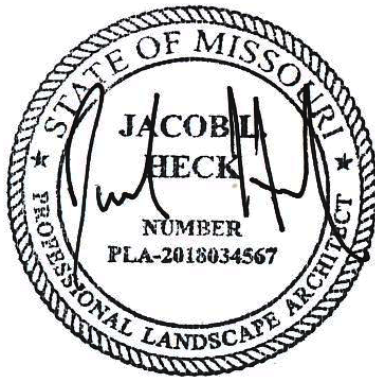
1. Farnsworth Group, Inc.
2. Missouri State Certificate of Authority 001321. Engineering.
3. Stephen Stumpf
4. License # 2020000089
5. Responsible for Divisions 31-33 Sections except where indicated as prepared by other design professionals of record.



SEALED DATE: 10/22/2024  
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.

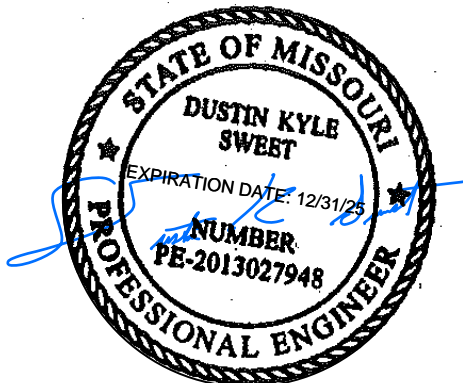


SEALED DATE: 10/22/2024

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.

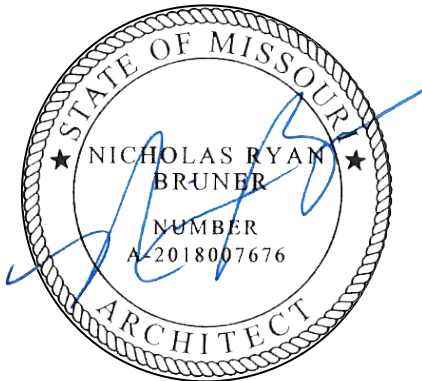


SEALED DATE: 10/21/2024

Expiration Date: 12/31/2025

D. Architect:

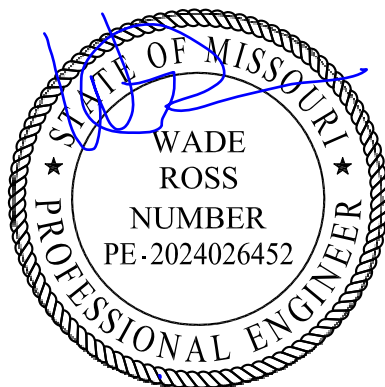
1. Farnsworth Group, Inc.
2. Missouri State Certificate of Authority 000744. Architecture
3. Nicholas Ryan Bruner
4. License # 2018007676
5. Responsible for Divisions 01-12 Sections except where indicated as prepared by other design professionals of record.



SEALED DATE: 10/22/2024  
Expiration Date: 12/31/2024

E. Mechanical, and Plumbing,

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.



10.22.2024



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.



10/22/2024

Expiration Date: 12/31/2024

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## SECTION 000115 - LIST OF DRAWINGS

### 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 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:

<u>SHEET#</u>	<u>TITLE</u>	<u>DATE</u>
ALL DRAWINGS DATE 10-22-2024		
<b><u>GENERAL</u></b>		
G-001	COVER	10-22-2024
G-002	GENERAL INFORMATION	10-22-2024
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C-001	CIVIL GENERAL NOTES	10-22-2024
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**ELECTRICAL**

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**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. Outdoor Pavilion  
Missouri Veterans Home  
Cape Girardeau, Missouri  
**Project No.: U2415-01**

### 3.0 BIDS WILL BE RECEIVED:

- A. Until: 1:30 PM, June 3, 2025
- B. **Only electronic bids sent to [FMDCBids@oa.mo.gov](mailto:FMDCBids@oa.mo.gov) shall be accepted:** (See Instructions to Bidders for further detail)

### 4.0 DESCRIPTION:

- A. Scope: The project consists of construction of a new outdoor pavilion.
- B. MBE/WBE/SDVE Goals: MBE 0%, WBE 0%, 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: 1:30 PM, May, 14, 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](mailto:jschafer-rich@F-W.com)
- B. Project Manager: Sandra Walther, 573-257-7322, email: [sandra.walther@oa.mo.gov](mailto: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.

## **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](mailto: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](mailto: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](mailto: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](mailto: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:** Outdoor Pavilion  
Missouri Veterans Home  
Cape Girardeau, Missouri

**Project Number:** U2415-01

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 **160 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 \$700** 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:** If this Project is financed in whole or in part from Federal funds (as indicated in the Instructions to Bidders or other bid or contract documents for this Project), then this contract shall be subject to all applicable federal labor statutes, rules and regulations, including provisions of the Davis-Bacon Act, 40 U.S.C. §3141 et seq., and the “Federal Labor Standards Provisions,” as further set forth in Section 007333 – Supplementary General Conditions for Federally Funded/Assisted Construction Projects, which is incorporated into the contract by reference. Where the Missouri Prevailing Wage Law and the Davis-Bacon Act require payment of different wages for work performed under this contract, the Contractor and all Subcontractors shall pay the greater of the wages required under either law, on a classification-by-classification basis.

#### 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)
- ix. Affidavit for Affirmative Action (Section 005414), if applicable
- 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**

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**REASON FOR SUBSTITUTION**

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

IF YES, EXPLAIN

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**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:

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

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☐ 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"/> <b>FINAL</b>	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

# GENERAL CONDITIONS

## INDEX

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- 1.4. Nondiscrimination in Employment
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- 1.8. Communications
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- 1.10. Assignment of Contract
- 1.11. Indemnification
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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
-------------	--

\$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](mailto: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](mailto: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](mailto: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](mailto: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 5 complete sets of drawings and specifications at no charge.
- B. The Owner will furnish the Contractor with approximately 5 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.

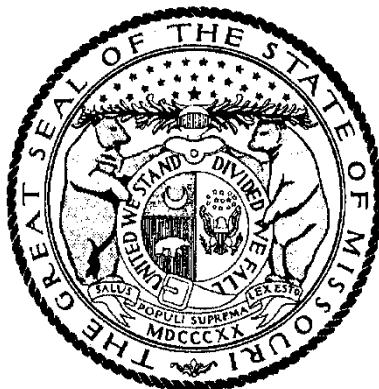
### **5.0 SAFETY REQUIREMENTS**

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

# 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 **Construction of a new outdoor pavilion.**
  - 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 **10-22-2024** were prepared for the Project by **Farnsworth Group, 20 Allen Avenue, Suite 200, St. Louis, MO 63119.**
- C. **The Work includes but not limited to construction of a new pre-engineered heavy timber frame outdoor pavilion to include concrete foundations, masonry wall restrooms with adhered stone veneer and outdoor kitchenette.**
- D. The Work will be constructed under a single prime contract.

#### 1.3 WORK SEQUENCE

- A.. The Work will be conducted in one (1) phase.
  - B.1. The following phasing schedule is the preliminary phasing schedule. Contractor to provide detailed schedule as described in Section 01 3200
  - C2. Phases Core 1
- Total Duration of Construction Work Days: 160 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.

## **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. Owner furnished items to be determined.
  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 (10) Ten “bad weather” days.
- B. Provide (0) zero Facility Interruption days.

**END OF SECTION 012100**



## **SECTION 012600 – CONTRACT MODIFICATION PROCEDURES**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 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 013115 "Project Management Communications" for administrative requirements for communications.
  - 3. Division 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
  - 4. 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](mailto: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 location<sup>1</sup> 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 system<sup>2</sup> 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

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

<sup>2</sup> 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.

<b>SPEC SECTION</b>	<b>TITLE</b>	<b>CATEGORY</b>
013200	<b>Schedules-Bar Chart</b>	Construction Schedule
013200	<b>Schedules-Bar Chart</b>	Schedule of Values
013200	<b>Schedules-Bar Chart</b>	List of Subcontractors
013200	<b>Schedules-Bar Chart</b>	Major Material Suppliers
032000	<b>Concrete Forming and Accessories</b>	Product Data
032000	<b>Concrete Reinforcing</b>	Shop Drawings
032000	<b>Concrete Reinforcing</b>	Certification
033000	<b>Cast-in-place concrete</b>	Product Data
033000	<b>Cast-in-place concrete</b>	Test Report
042000	<b>Unit Masonry</b>	Sample
042000	<b>Unit Masonry</b>	Product Data
042000	<b>Unit Masonry</b>	Shop Drawings
044313	<b>Stone Masonry Veneer</b>	Shop Drawings
044313	<b>Stone Masonry Veneer</b>	Product Data
044313	<b>Stone Masonry Veneer</b>	Sample
044313	<b>Stone Masonry Veneer</b>	Mock up
061000	<b>Rough Carpentry</b>	Product Data
061323	<b>Heavy Timber Trusses</b>	Shop Drawings

061323	<b>Heavy Timber Trusses</b>	Product Data
061323	<b>Heavy Timber Trusses</b>	Certification
073113	<b>Asphalt Shingles</b>	Shop Drawings
073113	<b>Asphalt Shingles</b>	Product Data
073113	<b>Asphalt Shingles</b>	Sample
073113	<b>Asphalt Shingles</b>	Manufacturer Instructions
073113	<b>Asphalt Shingles</b>	Warranty
074646	<b>Fiber-Cement Siding</b>	Product Data
074646	<b>Fiber-Cement Siding</b>	Sample
074646	<b>Fiber-Cement Siding</b>	Warranty
076200	<b>Sheet Metal Flashing and Trim</b>	Shop Drawings
076200	<b>Sheet Metal Flashing and Trim</b>	Product Data
076200	<b>Sheet Metal Flashing and Trim</b>	Sample
079200	<b>Joint Sealants</b>	Product Data
079200	<b>Joint Sealants</b>	Sample
081113	<b>Hollow Metal Doors and Frames</b>	Shop Drawings
081113	<b>Hollow Metal Doors and Frames</b>	Product Data
081113	<b>Hollow Metal Doors and Frames</b>	Manufacturer Instructions
081113	<b>Hollow Metal Doors and Frames</b>	Warranty
083100	<b>Access Doors and Panels</b>	Product Data
083100	<b>Access Doors and Panels</b>	Manufacturer Instructions
087100	<b>Door Hardware</b>	Shop Drawings
087100	<b>Door Hardware</b>	Product Data
087100	<b>Door Hardware</b>	Manufacturer Instructions
087100	<b>Door Hardware</b>	Operation / Maintenance Manual
087100	<b>Door Hardware</b>	Warranty
089100	<b>Louvers</b>	Shop Drawings
089100	<b>Louvers</b>	Product Data
089100	<b>Louvers</b>	Test Report
089100	<b>Louvers</b>	Sample
092116	<b>Gypsum Board Assemblies</b>	Shop Drawings
092116	<b>Gypsum Board Assemblies</b>	Product Data
099113	<b>Exterior Painting</b>	Product Data
099113	<b>Exterior Painting</b>	Sample
099123	<b>Interior Painting</b>	Product Data
099123	<b>Interior Painting</b>	Sample
101400	<b>Signage</b>	Product Data
101400	<b>Signage</b>	Sample
101400	<b>Signage</b>	Shop Drawings
102800	<b>Toilet, Bath and Laundry Accessories</b>	Product Data
102800	<b>Toilet, Bath and Laundry Accessories</b>	Sample

102800	<b>Toilet, Bath and Laundry Accessories</b>	Manufacturer Instructions
102800	<b>Toilet, Bath and Laundry Accessories</b>	Warranty
108113	<b>Bird Control Devices</b>	Product Data
108113	<b>Bird Control Devices</b>	Sample
123100	<b>Manufactured Metal Casework</b>	Shop Drawings
123100	<b>Manufactured Metal Casework</b>	Product Data
123100	<b>Manufactured Metal Casework</b>	Operation / Maintenance Manual
123100	<b>Manufactured Metal Casework</b>	Manufactures Instruction
123600	<b>Countertops</b>	Shop Drawings
123600	<b>Countertops</b>	Product Data
123600	<b>Countertops</b>	Sample
123600	<b>Countertops</b>	Manufacturer Instructions
123600	<b>Countertops</b>	Maintenance Data
123600	<b>Countertops</b>	Warranty
210548	<b>Vibration and Seismic Controls for Fire Suppression Piping and Equipment</b>	Shop Drawings
210548	<b>Vibration and Seismic Controls for Fire Suppression Piping and Equipment</b>	Product Data
210548	<b>Vibration and Seismic Controls for Fire Suppression Piping and Equipment</b>	Manufacturer Instructions
220517	<b>Sleeves and Sleeve Seals for Plumbing Piping</b>	Product Data
220523	<b>General Duty Valves for Plumbing Piping</b>	Product Data
220529	<b>Hangers and Supports for Plumbing Piping and Equipment</b>	Product Data
220548	<b>Vibration and Seismic Controls for Plumbing Piping and Equipment</b>	Shop Drawings
220548	<b>Vibration and Seismic Controls for Plumbing Piping and Equipment</b>	Product Data
220548	<b>Vibration and Seismic Controls for Plumbing Piping and Equipment</b>	Manufacturer Instructions
220553	<b>Identification for Plumbing Piping and Equipment</b>	Product Data
220719	<b>Plumbing Piping Insulation</b>	Product Data
221005	<b>Plumbing Piping</b>	Product Data
221006	<b>Plumbing Piping Specialties</b>	Product Data
223000	<b>Plumbing Equipment</b>	Product Data
223000	<b>Plumbing Equipment</b>	Manufacturer Instructions
223000	<b>Plumbing Equipment</b>	Warranty
224000	<b>Plumbing Fixtures</b>	Product Data
230516	<b>Expansion Fittings and Loops for HVAC Piping</b>	Product Data
230517	<b>Sleeves and Sleeve Seals for HVAC Piping</b>	Product Data

230519	<b>Meters and Gauges for HVAC Piping</b>	Product Data
230523	<b>General-Duty Valves for HVAC Piping</b>	Product Data
230529	<b>Hangers and Supports for HVAC Piping and Equipment</b>	Product Data
230529	<b>Hangers and Supports for HVAC Piping and Equipment</b>	Manufacturer Instructions
230548	<b>Vibration and Seismic Controls for HVAC Piping and Equipment</b>	Product Data
230548	<b>Vibration and Seismic Controls for HVAC Piping and Equipment</b>	Manufacturer Instructions
230553	<b>Identification for HVAC Piping and Equipment</b>	Product Data
230553	<b>Identification for HVAC Piping and Equipment</b>	Manufacturer Instructions
230593	<b>Testing, Adjusting, and Balancing for HVAC</b>	Test Report
230713	<b>Duct Insulation</b>	Product Data
230719	<b>HVAC Piping Insulation</b>	Product Data
230913	<b>Instrumentation and Control Devices for HVAC - Schneider Electric</b>	Shop Drawings
230913	<b>Instrumentation and Control Devices for HVAC - Schneider Electric</b>	Product Data
230913	<b>Instrumentation and Control Devices for HVAC - Schneider Electric</b>	Wiring Diagrams
230913	<b>Instrumentation and Control Devices for HVAC - Schneider Electric</b>	Operation / Maintenance Manual
233100	<b>HVAC Ducts and Casings</b>	Product Data
233100	<b>HVAC Ducts and Casings</b>	Manufactures Instruction
233300	<b>Air Duct Accessories</b>	Product Data
233300	<b>Air Duct Accessories</b>	Manufacturer Instructions
233423	<b>HVAC Power Ventilators</b>	Shop Drawings
233423	<b>HVAC Power Ventilators</b>	Product Data
233423	<b>HVAC Power Ventilators</b>	Manufacturer Instructions
233423	<b>HVAC Power Ventilators</b>	Wiring Diagrams
233423	<b>HVAC Power Ventilators</b>	Maintenance Data
233423	<b>HVAC Power Ventilators</b>	Operation / Maintenance Manual
233700	<b>Air Outlets and Inlets</b>	Product Data
233700	<b>Air Outlets and Inlets</b>	Manufacturer Instructions
238200	<b>Convection Heating and Cooling Units</b>	Shop Drawings
238200	<b>Convection Heating and Cooling Units</b>	Manufactures Instruction
238200	<b>Convection Heating and Cooling Units</b>	Operation / Maintenance Manual
260010	<b>Basic Electrical Requirements</b>	Product Data
260519	<b>Low-Voltage Electrical Power Conductors and Cables</b>	Product Data
260526	<b>Grounding and Bonding for Electrical Systems</b>	Product Data
260529	<b>Hangers and Supports for Electrical Systems</b>	Product Data
260533	<b>Conduit For Electrical Systems</b>	Product Data

260533	<b>Boxes</b>	Product Data
260553	<b>Identification for Electrical Systems</b>	Product Data
262416	<b>Panel Boards</b>	Shop Drawings
262416	<b>Panel Boards</b>	Product Data
262416	<b>Panel Boards</b>	Manufacturer Instructions
262416	<b>Panel Boards</b>	Wiring Diagrams
262416	<b>Panel Boards</b>	Maintenance Data
262416	<b>Panel Boards</b>	Operation / Maintenance Manual
262726	<b>Wiring Devices</b>	Product Data
265100	<b>Interior Lighting</b>	Shop Drawings
265100	<b>Interior Lighting</b>	Product Data
265100	<b>Interior Lighting</b>	Manufacturer Instructions
265100	<b>Interior Lighting</b>	Wiring Diagrams
265100	<b>Interior Lighting</b>	Maintenance Data
265100	<b>Interior Lighting</b>	Operation / Maintenance Manual
265100	<b>Interior Lighting</b>	Warranty
265600	<b>Exterior Lighting</b>	Shop Drawings
265600	<b>Exterior Lighting</b>	Product Data
265600	<b>Exterior Lighting</b>	Manufacturer Instructions
265600	<b>Exterior Lighting</b>	Wiring Diagrams
265600	<b>Exterior Lighting</b>	Maintenance Data
265600	<b>Exterior Lighting</b>	Operation / Maintenance Manual
265600	<b>Exterior Lighting</b>	Warranty
312316	<b>Excavation</b>	Test Report
312316	<b>Trenching</b>	Test Report
312323	<b>Fill</b>	Product Data
312323	<b>Fill</b>	Test Report
321123	<b>Aggregate Base Courses</b>	Product Data
321313	<b>Concrete Paving</b>	Product Data
321313	<b>Concrete Paving</b>	Test Report
323119	<b>Decorative Metal Fences and Gates</b>	Product Data
323119	<b>Decorative Metal Fences and Gates</b>	Shop Drawings
321713	<b>Parking Bumpers</b>	Product Data
329115	<b>Landscape Soil Preparation</b>	Product Data
329115	<b>Landscape Soil Preparation</b>	Sample
329115	<b>Landscape Soil Preparation</b>	Test Report
329200	<b>Turf</b>	Product Data
329200	<b>Turf</b>	Certification
329300	<b>Plant Material and Accessories</b>	Product Data
329300	<b>Plant Material and Accessories</b>	Warranty

331416	Site Water Utility Distribution Piping	Product Data
331416	Site Water Utility Distribution Piping	Manufactures Certification
333113	Site Sanitary Sewerage Gravity Piping	Product Data

**END OF SECTION 013300**

## **SECTION 013513.28 - SITE SECURITY AND HEALTH REQUIREMENTS (VETERANS, STATE FAIR, MONG)**

### **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](mailto: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](mailto: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](mailto: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.

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. Contractor 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.

#### 1.3. REFERENCE STANDARDS

- A. 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.

2.3. PRODUCT OPTIONS

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

2.4. MAINTENANCE MATERIALS

- A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
- B. Deliver 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/](http://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.

#### 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 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.

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- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable Contractor personnel 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.

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- E. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
- 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.

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- C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

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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 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.

#### **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.

## 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 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 and light pole bases.
- G. Concrete curing and sealing.

#### **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 C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- W. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
- X. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2013.
- Y. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2015.
- Z. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2011.
- AA. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting; 2015.
- BB. 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).
- CC. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.
- DD. 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.

2.5. 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](http://www.euclidchemical.com/#sle).
- b. Kaufman Products Inc; SureBond: [www.kaufmanproducts.net/#sle](http://www.kaufmanproducts.net/#sle).
- c. Kaufman Products Inc; SureWeld: [www.kaufmanproducts.net/#sle](http://www.kaufmanproducts.net/#sle).
- d. SpecChem, LLC; Strong Bond Acrylic Bonder: [www.specchemllc.com/#sle](http://www.specchemllc.com/#sle).
- e. W. R. Meadows, Inc; ACRY-LOK-: [www.wrmeadows.com/#sle](http://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](http://www.nomaco.com/#sle).
- b. W. R. Meadows, Inc; Deck-O-Foam Joint Filler with pre-scored top strip: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
- c. King Packaged Materials Company; Sakrete concrete expansion joint: [www.king-products.com](http://www.king-products.com)

2.6. CURING MATERIALS

- A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.

1) Manufacturers:

- a. Dayton Superior Corporation; AquaFilm Concentrate J74: [www.daytonsuperior.com/#sle](http://www.daytonsuperior.com/#sle).
- b. Euclid Chemical Company ; EUCOBAR: [www.euclidchemical.com/#sle](http://www.euclidchemical.com/#sle).

- c. Kaufman Products Inc; VaporAid: [www.kaufmanproducts.net/#sle](http://www.kaufmanproducts.net/#sle).
  - d. SpecChem, LLC; SpecFilm Concentrate or SpecFilm: [www.specchemllc.com/#sle](http://www.specchemllc.com/#sle).
  - e. W. R. Meadows, Inc; Evapre or Evapre-RTU: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
- B. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.
- 1) Application: Use at exterior pavilion slab. Apply two coats
  - 2) Vehicle: Solvent-based.
  - 3) Solids by Mass: 25 percent, minimum.
  - 4) VOC Content: OTC compliant.
  - 5) Manufacturers:
    - a. Euclid Chemical Company; SUPER DIAMOND CLEAR 350: [www.euclidchemical.com/#sle](http://www.euclidchemical.com/#sle).
    - b. Kaufman Products Inc; Krystal 25 OTC, or Krystal 25 Emulsion: [www.kaufmanproducts.net/#sle](http://www.kaufmanproducts.net/#sle).
    - c. Surface Koatings, Inc; 2500 LV UV 350: [www.surfkoat.com/#sle](http://www.surfkoat.com/#sle).
    - d. W. R. Meadows, Inc; CS-309-25 OTC: [www.wrmeadows.com/#sle](http://www.wrmeadows.com/#sle).
- C. Moisture-Retaining Sheet: ASTM C171.
- 1) White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.
- D. Polyethylene Film: ASTM D2103, 4 mil, 0.004 inch thick, clear.
- E. Water: Potable, not detrimental to concrete.

## 2.7. 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.

2.8. 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, <>.

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 04 2000 - UNIT MASONRY

### PART 1 GENERAL

#### 1.1. SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. 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 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 C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- K. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.

- L. ASTM C476 - Standard Specification for Grout for Masonry; 2018.
- M. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2017.
- N. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- O. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2016.
- P. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.
- Q. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
- R. 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. 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. 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.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Mortar Aggregate: ASTM C144.
- D. Grout Aggregate: ASTM C404.
- E. 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](http://www.daviscolors.com/#sle).
    - b. Lambert Corporation; <>: [www.lambertusa.com](http://www.lambertusa.com).
    - c. Solomon Colors, Inc; <>: [www.solomoncolors.com/#sle](http://www.solomoncolors.com/#sle).
- F. Water: Clean and potable.
- G. 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.
- H. 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](http://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.

### 2.3. REINFORCEMENT AND ANCHORAGE

#### A. Manufacturers:

- 1) Blok-Lok Limited; <>: [www.blok-lok.com](http://www.blok-lok.com).
- 2) Hohmann & Barnard, Inc; Truss Mighty Lok 170-ML: [www.h-b.com/#sle](http://www.h-b.com/#sle).
- 3) WIRE-BOND; <>[www.wirebond.com/#sle](http://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.

#### 2.4. 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](http://www.blok-lok.com).
  - b. Hohmann & Barnard, Inc; <>: [www.h-b.com/sle](http://www.h-b.com/sle).
  - c. WIRE-BOND; <>: [www.wirebond.com/#sle](http://www.wirebond.com/#sle).

B. 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.

3.5. PLACING AND BONDING

- A. Lay hollow masonry units with face shell bedding on head and bed joints.
- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar and mortar smears as work progresses.
- D. Interlock intersections and external corners, except for units laid in stack bond.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- G. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, or cavity insulation vapor barrier adhesive is applied.
- H. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- I. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.6. 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.



3.7. LINTELS

- A. 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.
- B. Maintain minimum 8 inch bearing on each side of opening.

3.8. 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.

3.9. 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.

3.10. 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.

3.11. 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 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.

3.12. 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.

3.13. CLEANING

A. Clean soiled surfaces with cleaning solution.

B. Use non-metallic tools in cleaning operations.

3.14. 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. Adhered cut stone veneer at exterior CMU walls.
- B. Metal anchors and accessories.
- C. Accessories for adhered veneer.
- D. 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 6200 - Sheet Metal Flashing and Trim: Flashings.
- D. 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 C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- D. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster; 2018a.
- E. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering; 2006 (Reapproved 2013).
- F. ASTM C1242 - Standard Guide for Selection, Design, and Installation of Dimension Stone Attachment Systems; 2018a.
- G. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2016.
- H. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.
- I. ASTM E2556/E2556M - Standard Specification for Vapor Permeable Flexible Sheet Water-Resistive Barriers Intended for Mechanical Attachment; 2010 (Reapproved 2016).
- J. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. 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 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.

B. 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. Basis of Design Manufacture

- 1) For Exterior Adhered Applications; Earthworks Harvest Mix 3”-9” Snapped – Thin Adhered Stone types.
- B. 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](http://www.info@semcostone.com); Rockport Tumbled Dimensional (Alternate to Earthworks Harvest Mix)
  - 2) Edwards Stone.Multi-Dimensional. (Alternate to Earthworks Harvest Mix).

### 2.2. 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.

### 2.3. 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](http://www.ardexamericas.com/#sle).
  - b. Custom Building Products: [www.custombuildingproducts.com/#sle](http://www.custombuildingproducts.com/#sle).
  - c. LATICRETE International, Inc: LATICRETE MVIS Hi-Bond Veneer Mortar  
[www.laticrete.com/#sle](http://www.laticrete.com/#sle).

C. Mixing: Use mechanical batch mixer and comply with referenced standards.

2.4. MORTAR

A. Setting Mortar: ASTM C270, Type S, using the Proportion Method .

2.5. 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: 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. Bonding Compound: Provide type recommended for bonding scratch coat to solid surfaces, complying with ASTM C932.
- G. Cleaning Solution: Type that will not harm stone, joint materials, or adjacent surfaces.

2.6. LATH / BACKER BOARD

- A. 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.

2.7. 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.

2.8. 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 outside corners.

### 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 GENERAL

- A. Cut stone at site to produce clean faces.
- B. Size stone units to fit opening dimensions and perimeter conditions.
- C. Wet absorptive stone in preparation for placement to minimize moisture suction from mortar.
- D. Arrange stone pattern to provide color uniformity and minimize visual variations , and provide a uniform blend of stone unit sizes.
- E. Fill dowel holes in stone units with mortar.
- F. Arrange stone coursing in ashlar bond with consistent joint width.
- G. Set stone in full mortar setting bed to fully support stone over bearing surface. Use setting buttons or shims to maintain correct joint width.

3.5. 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.

3.6. 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.

### 3.7. 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.

### 3.8. 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.

### 3.9. 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](http://www.premier-stoneworks.com/#sle).
- 3) Caliber Cast Stone; [www.calibercaststone.com/](http://www.calibercaststone.com/)
- 4) Continental Cast Stone. [www.continentalcaststone.com](http://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 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 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](http://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](http://www.bc.com/#sle).
  - b. Weyerhaeuser Company: [www.weyerhaeuser.com/#sle](http://www.weyerhaeuser.com/#sle).
  - c. Pacific Woodtech formerly Louisiana-Pacific Corp.: [www.pwtewp.com](http://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](http://www.buildgp.com/#sle).
    - b. Huber Engineered Woods, LLC; AdvanTech Flooring with AdvanTech Subfloor Adhesive: [www.huberwood.com/#sle](http://www.huberwood.com/#sle).
    - c. Weyerhaeuser Company: [www.weyerhaeuser.com/#sle](http://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](http://www.huberwood.com/#sle).
  - b. Georgia-Pacific LLC; DryGuard Enhanced OSB sheathing: [www.buildgp.com/#sle](http://www.buildgp.com/#sle).
  - c. Weyerhaeuser Company: [www.weyerhaeuser.com/#sle](http://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](http://www.huberwood.com/#sle).
    - b. Georgia-Pacific LLC; Blue Ribbon OSB wall sheathing: [www.buildgp.com/#sle](http://www.buildgp.com/#sle).
    - c. Weyerhaeuser Company; [www.weyerhaeuser.com/#sle](http://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](http://www.titebond.com/#sle).
  - b. Huber Engineered Woods, LLC; AdvanTech Subfloor Adhesive: [www.huberwood.com/#sle](http://www.huberwood.com/#sle).
  - c. Liquid Nails, a brand of PPG Architectural Coatings; LN-950 Polyurethane Adhesive (Low VOC): [www.liquidnails.com/#sle](http://www.liquidnails.com/#sle).

## 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](http://www.wolmanizedwood.com/#sle).
  - b. Hoover Treated Wood Products, Inc; <: [www.frtw.com/#sle](http://www.frtw.com/#sle).
  - c. Koppers, Inc; <: [www.koppersperformancechemicals.com/#sle](http://www.koppersperformancechemicals.com/#sle).
  - d. Viance, LLC; D-Blaze: [www.treatedwood.com/#sle](http://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](http://www.wolmanizedwood.com/#sle).
  - b. Koppers Performance Chemicals, Inc;  
<>: [www.koppersperformancechemicals.com/#sle](http://www.koppersperformancechemicals.com/#sle).
  - c. Viance, LLC; Preserve ACQ: [www.treatedwood.com/#sle](http://www.treatedwood.com/#sle).
  - d. Substitutions: See Section 01 6000 - Product Requirements.
- 2) Preservative Pressure Treatment of Lumber Above Grade: AWP A U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
  - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
  - b. Treat lumber in contact with roofing 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 - Construction Waste Management and Disposal.
  - 1) Comply with applicable regulations.
  - 2) Do not burn scrap on project site.
  - 3) Do not burn scraps that have been pressure treated.
  - 4) Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

## SECTION 06 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 06 1000 - Rough Carpentry:

#### 1.3. PRICE AND PAYMENT PROCEDURES

- A. Bid to include timber frame entry canopy.
  - 1) Basis of Design Pavilion; Vermont Timber Works; Similar to Cadwalader Picnic Pavilion.
    - a. Vermont Timber Works, Inc.  
36 Fairbanks Road  
North Springfield, VT 05150  
(802) 886-1917

#### 1.4. 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.

1.5. 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 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. Shop Drawings to be signed and sealed by a licensed Structural Engineer in the State of Missouri.
- 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 signed and sealed by a Structural Engineer liscensed in the State of Missouri.
- G. Manufacturer's Qualification Statement.

1.6. 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.

1.7. 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.

1.8. 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. REGULATORY REQUIREMENTS

- A. Comply with applicable codes for loading, seismic zoning, and other governing load criteria.

2.2. 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

2.3. 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 Frame Members 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 Tounge and Groove species fir larch select structural center match stained to match heavy timber.

2.4. 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.

## 2.5. 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.

2.6. 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. All expose wood timber frame elements to be treated with stain treatment.
- 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 07 3113 - ASPHALT SHINGLES**

### **PART 1 GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Asphalt shingle roofing.
- B. Flexible sheet membranes for, underlayment, and valley protection.
- C. Associated metal flashings and accessories.

#### **1.2. RELATED REQUIREMENTS**

- A. Section 06 1323 – Heavy Timber Framing: Roof decking.
- 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](http://www.gaf.com/#sle).
  - 2) IKO Industries Inc; Cambridge IR with ArmourZone: [www.iko.com/#sle](http://www.iko.com/#sle).
  - 3) Owens Corning Corp; Duration: [www.owenscorning.com/#sle](http://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](http://www.atlasroofing.com/#sle).
  - b. GAF: Storm Guard Film -Surfaced Leak Barrier. [www.gaf.com/#sle](http://www.gaf.com/#sle).
  - c. Owens Corning Corp; WeatherLock Flex: [www.owenscorning.com/#sle](http://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](http://www.atlasroofing.com/#sle).



- b. GAF: Storm Guard Film -Deck-Armor. [www.gaf.com/#sle](http://www.gaf.com/#sle).
  - c. Owens Corning Corp; Pro Armor: [www.owenscorning.com/#sle](http://www.owenscorning.com/#sle).
  - d. System Components Corporation, Inc; ProTex: [www.systemcomponents.net/#sle](http://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 wide centered on valley.
- 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 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...

#### **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](http://www.allurausa.com/#sle).
  - b. James Hardie Building Products, Inc: [www.jameshardie.com/#sle](http://www.jameshardie.com/#sle).
  - c. Nichiha USA, Inc: [www.nichiha.com/#sle](http://www.nichiha.com/#sle).

2.2. ACCESSORIES

- A. Trim: Same material and texture as siding.
- B. Fiber Cement Siding Metal Trim: Extruded aluminum alloy 6063-T5 temper.
- C. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.
- D. 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 and counterflashings.
- B. Sealants for joints within sheet metal fabrications.

#### **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. Pre-Finished Aluminum: ASTM B209 (ASTM B209M); 0.032-inch thick minimum; plain finish shop pre-coated with fluoropolymer coating.
  - 1) Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
  - 2) 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. ACCESSORIES

- A. Fasteners: Stainless 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.

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.

3.4. SCHEDULE

- A. Flashings Associated with Shingle Roofing, including , Valley, Hip, Ridge, Eave, Drip Edge, Gable Edge,:

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 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](http://www.bostik-us.com).
  - 2) DAP; [www.dap.com](http://www.dap.com).
  - 3) Dow Chemical Company; <>: [consumer.dow.com/en-us/industry/ind-building-construction.html/#sle](http://consumer.dow.com/en-us/industry/ind-building-construction.html/#sle).
  - 4) Pecora Corporation; <>: [www.pecora.com](http://www.pecora.com).
  - 5) Sherwin-Williams Company; <>: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
  - 6) Sika Corporation; <>: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).

- 7) Tremco Commercial Sealants & Waterproofing; <>: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
- 8) W.R. Meadows, Inc; <>: [www.wrmeadows.com](http://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](http://www.bostik-us.com).
- 2) Dow Chemical Company; <>: [consumer.dow.com/en-us/industry/ind-building-construction.html/#sle](http://consumer.dow.com/en-us/industry/ind-building-construction.html/#sle).
- 3) Pecora Corporation; <>: [www.pecora.com](http://www.pecora.com).
- 4) QUIKRETE Companies; <>: [www.quikrete.com/#sle](http://www.quikrete.com/#sle).
- 5) Sherwin-Williams Company; <>: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
- 6) Sika Corporation; <>: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
- 7) Tremco Commercial Sealants & Waterproofing; <>: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
- 8) W.R. Meadows, Inc; <>: [www.wrmeadows.com](http://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](http://consumer.dow.com/en-us/industry/ind-building-construction.html/#sle).
    - b. Sika Corporation; Sikasil WS-295: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - c. Tremco Commercial Sealants & Waterproofing; Spectrem 3: [www.tremcosealants.com/#sle](http://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](http://www.pecora.com).
    - b. Sika Corporation; Sikasil GP: [www.usa-sika.com/#sle](http://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](http://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](http://www.sherwin-williams.com/#sle).
    - b. Pecora Corporation; DynaTred: [www.pecora.com](http://www.pecora.com).
    - c. Tremco Commercial Sealants and Waterproofing; Dymonic FC: [www.tremcosealants.com/#sle](http://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](http://www.pecora.com).
  - b. Sika Corporation; Sikaflex-15 LM: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
  - c. Tremco Commercial Sealants & Waterproofing; Dymeric 240 FC: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
  - d. W. R. Meadows, Inc; POURTHANE NS: [www.wrmeadows.com/#sle](http://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](http://www.sherwin-williams.com/#sle).
  - b. Tremco Commercial Sealants & Waterproofing; Butyl Sealant: [www.tremcosealants.com/#sle](http://www.tremcosealants.com/#sle).
  - c. DAP Products Inc; Butyl-Flex Sealant: [www.dapspecline.com/#sle](http://www.dapspecline.com/#sle).
  - d. Pecora Corporation; BC-158: [www.pecora.com](http://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](http://www.quikrete.com/#sle).
    - b. Sherwin-Williams Company; Stampede 1SL Polyurethane Sealant: [www.sherwin-williams.com/#sle](http://www.sherwin-williams.com/#sle).
    - c. Sika Corporation; Sikaflex-1c SL: [www.usa-sika.com/#sle](http://www.usa-sika.com/#sle).
    - d. Tremco Commercial Sealants & Waterproofing; Vulkem 45 SSL: [www.tremcosealants.com/#sle](http://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](http://www.nomaco.com/#sle).
    - b. Backer Rod Manufacturing, Inc. Titan Foam: [www.backerrod.com](http://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 08 1113 - HOLLOW METAL DOORS AND FRAMES**

### **PART 1 GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Non-fire-rated hollow metal doors and frames.

#### **1.2. RELATED REQUIREMENTS**

- A. Section 09 9113 - Exterior Painting: Field painting.

#### **1.3. ABBREVIATIONS AND ACRONYMS**

- A. ANSI: American National Standards Institute.
- B. ASCE: American Society of Civil Engineers.
- C. HMMA: Hollow Metal Manufacturers Association.
- D. NAAMM: National Association of Architectural Metal Manufacturers.
- E. NFPA: National Fire Protection Association.
- F. SDI: Steel Door Institute.
- G. UL: Underwriters Laboratories.

#### **1.4. REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- C. ANSI/SDI A250.6 - 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 252 - Standard Methods of Fire Tests of Door Assemblies; 2018.
- T. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.
- U. UL (DIR) - Online Certifications Directory; Current Edition.
- V. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.5. 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.

1.6. QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.

- B. Maintain at project site copies of reference standards relating to installation of products specified.

1.7. DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

1.8. PROJECT CONDITIONS

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

1.9. COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to the Project site in time for installation.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Hollow Metal Doors and Frames:

- 1) Ceco Door, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
- 2) Curries, an Assa Abloy Group company: [www.assaabloydss.com/#sle](http://www.assaabloydss.com/#sle).
- 3) Steelcraft, an Allegion brand; <>: [www.allegion.com/#sle](http://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.

#### 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 A60/ZF180 coating.
  - 2) Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
  - 3) Weatherstripping: Separate, see Section 08 7100.
- D. 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.
- E. 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.
- F. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
- G. 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.
- H. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- I. 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. Louvers: Roll formed steel with overlapping frame; finish same as door components ; factory-installed.
- 1) Style: Sightproof inverted V blade.
  - 2) Louver Free Area: 55 percent.
  - 3) Size: 14" x 14".
  - 4) Include aluminum insect screen
  - 5) Fasteners: Exposed or concealed fasteners.
  - 6) Manufacturers:
    - a. Substitutions: See Section 01 6000 - Product Requirements.
- 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 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](http://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](http://www.activarcpg.com/#sle).
- 3) Babcock-Davis; <>: [www.babcockdavis.com/#sle](http://www.babcockdavis.com/#sle).
- 4) Cendrex, Inc: [www.cendrex.com/#sle](http://www.cendrex.com/#sle).
- 5) Karp Associates, Inc; <>: [www.karpinc.com](http://www.karpinc.com).
- 6) Milcor, Inc; <>: [www.milcorinc.com](http://www.milcorinc.com).
- 7) Nystrom, Inc; <>: [www.nystrom.com/#sle](http://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 087100 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
  - 2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section "Hollow Metal Doors and Frames".
- 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.
  - F. 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.
- 1.4 QUALITY ASSURANCE
- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
  - B. 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. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through the Norton Preferred Installer (NPI) program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.

- F. 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.
- G. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.
  - 4. Installation of permanent keys, cylinder cores and software.
  - 5. Address and requirements for delivery of keys.
- I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
  - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  - 3. Review sequence of operation narratives for each unique access controlled opening.
  - 4. Review and finalize construction schedule and verify availability of materials.
  - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- J. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

#### 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- 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.

#### 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 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. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to ASSA ABLOY ACCENTRA. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded ASSA ABLOY ACCENTRA.
- D. 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 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
  - 1. Manufacturers:.
    - a. Hager Companies (HA).
    - b. Pemko (PE).
    - c. Select Hinges (SL).

## 2.4 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.
6. Manufacturers:
  - a. Burns Manufacturing (BU).
  - b. Rockwood (RO).
  - c. Trimco (TC).

## 2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
  1. Manufacturers:
    - a. Match Existing, Field Verify.
- 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. Small Format Interchangeable Cores: Provide small format interchangeable cores (SFIC) 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.

## 2.6 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.

## 2.7 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. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - D100 Series.
    - b. Corbin Russwin Hardware (RU) - DL3000 Series.
    - c. Sargent Manufacturing (SA) - 480 Series.

## 2.8 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.

2.9 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
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 (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.

1. Heavy duty surface mounted door closers shall have a 30-year warranty.
2. Manufacturers:
  - a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - 4400 Series.
  - b. Corbin Russwin Hardware (RU) - DC6000 Series.
  - c. Norton Rixson (NO) - 7500 Series.

C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

- a. ASSA ABLOY ACCENTRA, formerly known as Yale (YA) - Unitrol Series.
- b. Corbin Russwin Hardware (RU) - Unitrol Series.
- c. Norton Rixson (NO) - Unitrol Series.

2.10 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.

2.11 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).

## 2.12 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).

## 2.13 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).

## 2.14 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.

## 2.15 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. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

### 3.4 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. PE - Pemko
4. RO - Rockwood
5. YA - ASSA ABLOY ACCENTRA, formerly known as Yale
6. SA - SARGENT
7. RF - Rixson
8. NO - Norton
11. OT - Other

**Hardware Sets**

**Set: 1.0**

Doors: P003

3	Hinge (heavy weight)	T4A3386 (NRP and Size as Required)	US32D	MK	087100
1	Storeroom or Closet Lock	AU 5405LN 497 1220	626	YA	087100
1	Core	1220 CGMK	626	YA	087100
1	Surface Closer	UNI4400	689	YA	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Gasketing	303AS (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	2009APK x Length Required x MSES25SS		PE	087100

**Set: 2.0**

Doors: P001, P002

3	Hinge (heavy weight)	T4A3386 (NRP and Size as Required)	US32D	MK	087100
1	Deadbolt (Classroom)	D161 1220	626	YA	087100
1	Privacy Set	AU 5402LN 497	626	YA	087100
1	Core	1220 CGMK	626	YA	087100
1	Surface Closer	UNI4400	689	YA	087100
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1	Gasketing	303AS (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	2009APK x Length Required x MSES25SS		PE	087100

END OF SECTION 087100

## SECTION 08 9100 - LOUVERS

### PART 1 GENERAL

#### 1.1. SECTION INCLUDES

- A. Louvers, frames, and accessories.

#### 1.2. RELATED REQUIREMENTS

- A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.
- B. 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](http://www.airolite.com/#sle).
- 2) Construction Specialties, Inc; Drainable Louver: [www.c-sgroup.com/#sle](http://www.c-sgroup.com/#sle).
- 3) Industrial Louvers, Inc; 4-inch deep fixed and Drainable  
: [www.industriallouvers.com/#sle](http://www.industriallouvers.com/#sle).
- 4) Pottorff; EFD 435: [www.pottorff.com/#sle](http://www.pottorff.com/#sle).
- 5) Ruskin Company; Fixed Drainable Model EFD-437: [www.ruskin.com/#sle](http://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 2116 - GYPSUM BOARD ASSEMBLIES

### PART 1 GENERAL

#### 1.1. SECTION INCLUDES

- A. Gypsum wallboard.
- B. Joint treatment and accessories.

#### 1.2. RELATED REQUIREMENTS

- A. Section 06 1000 - Rough Carpentry: Wood blocking and framing product and execution requirements.

#### 1.3. REFERENCE STANDARDS

- A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2017a.
- E. 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.
- F. 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.
- G. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- H. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- I. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- J. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

#### 1.4. SUBMITTALS

- A. See Section 01 3300 - Submittals for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

#### 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.

### 2.2. BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

- 1) American Gypsum Company; : [www.americangypsum.com](http://www.americangypsum.com).
- 2) CertainTeed Corporation; : [www.certainteed.com](http://www.certainteed.com).
- 3) Georgia-Pacific Gypsum; : [www.gpgypsum.com](http://www.gpgypsum.com).
- 4) National Gypsum Company; : [www.nationalgypsum.com/#sle](http://www.nationalgypsum.com/#sle).
- 5) USG Corporation; : [www.usg.com](http://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 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. Exterior Soffit Board: Exterior gypsum soffit board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

- 1) Application: Ceilings and soffits in protected exterior areas, unless otherwise indicated.
- 2) Types: Regular, in locations indicated.
- 3) Regular Type Thickness: 1/2 inch.
- 4) Edges: Tapered.
- 5) Products:
  - a. American Gypsum Company; Exterior Soffit Gypsum Wallboard.
  - b. Continental Building Products; Soffitboard.
  - c. Georgia-Pacific Gypsum; ToughRock Soffit Board.

2.3. ACCESSORIES

- A. 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](http://www.titebond.com/#sle).
- b. Liquid Nails, a brand of PPG Architectural Coatings; AS-825 Acoustical Sound Sealant: [www.liquidnails.com/#sle](http://www.liquidnails.com/#sle).
- c. Specified Technologies Inc; Smoke N Sound Acoustical Sealant: [www.stifirestop.com/#sle](http://www.stifirestop.com/#sle).
- B. 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](http://www.phillipsmfg.com/#sle).
- c. Trim-tex, Inc: [www.trim-tex.com/#sle](http://www.trim-tex.com/#sle).
- C. 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.
- D. 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.
- E. 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. ACOUSTIC ACCESSORIES INSTALLATION

- A. 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.

### 3.3. 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. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.
- D. Exterior Soffits: Install exterior soffit board perpendicular to framing, with staggered end joints over framing members or other solid backing.
- E. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
  - 1) Single-Layer Applications: Screw attachment.

### 3.4. 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.

3.5. 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 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](http://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](http://www.benjaminmoore.com).
  - b. PPG Paints: [www.ppgpaints.com/#sle](http://www.ppgpaints.com/#sle).
  - c. Behr Process Corporation: [www.behr.com/#sle](http://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.
- C. Section 09 9600 - High-Performance Coatings.

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](http://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](http://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 1400 - SIGNAGE

### PART 1 GENERAL

#### 1.1. SECTION INCLUDES

- A. Room and door signs.

#### 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, include the drawing room number on schedule.
  - 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](http://www.asisignage.com).
- C. Other acceptable manufacturers:
  - 1) Cosco Industries; [www.coscoarchitecturalsigns.com/#sle](http://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) 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.

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.
- 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'; Restroom Sign.
  - 2) Total Thickness: 1/8 inch.

2.5. 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 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](http://www.ajw.com).
  - 2) American Specialties, Inc; <>: [www.americanspecialties.com](http://www.americanspecialties.com).
  - 3) Bradley Corporation; <>: [www.bradleycorp.com](http://www.bradleycorp.com).
  - 4) Georgia-Pacific Professional; <>: [www.blue-connect.com](http://www.blue-connect.com).
- B. Under-Lavatory Pipe Supply Covers:
  - 1) Plumberex Specialty Products, Inc; Pro-Extreme: [www.plumberex.com/#sle](http://www.plumberex.com/#sle).
  - 2) IPS Corporation; Trubro Lav Guard 2 Undersink Pipe Covers:  
[www.ipscorp.com/plumbing/truebro](http://www.ipscorp.com/plumbing/truebro)
  - 3) Keeney Manufacturing Company; [www.keeneymfg.com](http://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](http://www.bobrick.com)
    - b. American Specialties, Inc. Model 7305-S.
    - c. Bradley Corporation; Model 5084: [www.bradleycorp.com](http://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](http://www.bobrick.com).
  - b. American Specialties, Inc. Model 0210.
  - c. Bradley Corporation; Model 250-15: [www.bradleycorp.com](http://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](http://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](http://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](http://www.bobrick.com).
    - b. American Specialties, Inc.; Model 0620-2436.
    - c. Bradley Corporation; Model 781-2436: [www.bradleycorp.com](http://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](http://www.bobrick.com).
- b. American Specialties, Inc.; Series 3700
- c. Bradley Corporation; Model 832: [www.bradleycorp.com](http://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](http://www.plumberex.com/#sle).
- b. IPS Corporation; Trubro Lav Guard 2 Undersink Pipe Covers: [www.ipscorp.com/plumbing/truebro](http://www.ipscorp.com/plumbing/truebro)
- c. Keeney Manufacturing Company; [www.keeneymfg.com](http://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 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 04 4313 - Stone Masonry Veneer: Placement of rough-in frame for cabinets.

#### 1.3. REFERENCE STANDARDS

- A. FM (AG) - FM Approval Guide; current edition.
- B. NFPA 10 - Standard for Portable Fire Extinguishers; 2017.
- C. 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](http://www.ansul.com/#sle).
  - 2) Amerex
  - 3) Kidde, a unit of United Technologies Corp; <>: [www.kidde.com/#sle](http://www.kidde.com/#sle).

- 4) Nystrom, Inc; <>: [www.nystrom.com/#sle](http://www.nystrom.com/#sle).

B. Fire Extinguisher Cabinets and Accessories:

- 1) Activar Construction Products Group - JL Industries; <>: [www.activarcpg.com/#sle](http://www.activarcpg.com/#sle).
- 2) Ansul, a Tyco Business; <>: [www.ansul.com/#sle](http://www.ansul.com/#sle).
- 3) Kidde, a unit of United Technologies Corp; <>: [www.kidde.com/#sle](http://www.kidde.com/#sle).
- 4) Larsen's Manufacturing Co; <>: [www.larsensmfg.com/#sle](http://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. ACCESSORIES

- A. Extinguisher Brackets: Formed steel, chrome-plated.
- B. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

3.2. INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 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 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 or Bird·B·Gone® 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 manufacturer's ColorCoat 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 3100 - MANUFACTURED METAL CASEWORK**

### **PART 1 GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Manufactured standard casework, with cabinet hardware.
- B. Mobile cabinets.
- C. Countertops.

#### **1.2. RELATED REQUIREMENTS**

- A. Section 06 1000 - Rough Carpentry: Blocking and nailers for anchoring casework.
- B. Section 07 9200 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

#### **1.3. REFERENCE STANDARDS**

- A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.
- B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless-Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- C. 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.
- D. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- F. BHMA A156.9 - American National Standard for Cabinet Hardware; 2015.

#### **1.4. SUBMITTALS**

- A. See Section 01 3300 - Submittals, for submittal procedures.
- B. Product Data: Component dimensions, configurations, construction details, joint details, and attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.
- C. Shop Drawings: Indicate casework types, sizes, locations, using large scale plans, elevations, cross sections. Include rough-in and anchors, placement dimensions and tolerances, clearances required, and keying information.
- D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.
- E. Manufacturer's Installation Instructions: Indicate special installation requirements.

1.5. QUALITY REQUIREMENTS

- A. Manufacturer 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. Protect items provided by this section during handling and installation, including finished surfaces and hardware items. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.
- B. Accept casework on site. Inspect on arrival for damage.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. Metal Casework:
- 1) Danver Stainless Outdoor Kitchens. 1 Grand Street, Wallingford, CT 06492; phone: 203-269-2300; danver.com
  - 2) New Age Products. www.newageproducts.com
  - 3) Stainless Steel Kitchens, Inc.: www.stainlesssteelkitchen.com

2.2. Fabrication

- A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.
- B. Casework: Die-formed metal sheet; each unit self-contained and not dependent on adjacent units or building structure for rigidity; factory-fabricated, factory-assembled, and factory-finished.
- 1) Style: Flush overlay - square edge.
  - 2) Primary Cabinet Material: Stainless steel.
  - 3) Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with the following front-to-back dimensions:
    - a. Base Cabinets: 24 inches.
  - 4) Steel Sheet Metal:
    - a. Gables, Front and Back Panels, Gusset Plates, Aprons, and Rails: 18 gage, 0.0478 inch minimum thickness.
    - b. Drawers, Cabinet Floors, Shelves, Filler Panels and Drawer Dividers: 20 gage, 0.0359 inch minimum thickness.
    - c. Backing Sheet to Door and Door Fronts: 22 gage, 0.0299 inch minimum thickness.

- 5) Structural Performance: Provide components that safely support the following minimum loads, without deformation or damage:
  - a. Base Units: 500 pounds per linear foot across the cabinet ends.
  - b. Suspended Units: 300 pounds, minimum, static load.
  - c. Tables: 300 pounds on four legs.
  - d. Drawers: 125 pounds.
  - e. Hanging Upper Cases: 300 pounds.
  - f. Shelves: 100 pounds.
- 6) Corners and Joints: Without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
- 7) Edges and Seams: Smooth. Form counter tops, shelves, and drain boards from continuous sheets.
- 8) Shelf Edges: Turned down 3/4 inch on each side and returned 3/4 inch front and back.
- 9) Ends: Close open ends with matching construction.
- 10) Welding: Electric spot welded; joints ground smooth and flush.
- 11) Drawers and Doors: Fabricate drawer and door fronts of sandwiched sheets of sheet steel welded together and reinforced for hardware.
  - a. Fill with sound-deadening core.
- 12) Fittings and Fixture Locations: Cut and drill countertops, backs, and other casework components for service outlets and fixtures.
- 13) Access Panels: Where indicated, for maintenance of utility service fixtures and fittings and mechanical and electrical components.
- 14) Removable back panels on all base cabinets. Partial height back panels at sink cabinets.
- 15) Fixed panels at backs of open spaces between base cabinets and at ends of utility spaces not otherwise enclosed.
  - a. Cutouts for power receptacles where indicated on drawings.
- 16) Filler Panels: Flanged on both sides, of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.
- 17) Sloped Tops for Upper Cabinets: 20 gage, 0.0359 inch minimum, with closed ends, flanged to allow attachment to cabinet(s) below.
- 1) Cabinet underside reinforced with 14 gage, 0.0747 inch minimum steel channels to provide caster mounting points.

- 2) Four casters, each with a load rating of 165 pounds.
  - b. For cabinets with drawers, include a counterweight to prevent the cabinet from tipping when one drawer is opened.
- 1) Drawers rated at 50 pounds, maximum.
- 18) Separation: Use bituminous paint or non-conductive tape to coat metal surfaces in contact with cementitious materials, and to separate dissimilar metals.

### 2.3. CABINET HARDWARE

- A. Manufacturer's standard types, styles and finishes.
- B. Conform to BHMA A156.9 requirements.
  - 1) Acceptable base materials for plated finishes include brass, bronze, and steel.
- C. Locks: Provide locks on casework drawers and doors where indicated. Lock with 5 pin cylinder and 2 keys per lock.

### 2.4. MATERIALS

- A. Sheet Steel: High-strength low-alloy, cold rolled and leveled unfinished steel sheet, ASTM A1008/A1008M, Class 1 (matte) finish.
- B. Stainless Steel Sheet: ASTM A666 Type 304.
- C. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered using horizontal tempering and complying with ANSI Z97.1; 4 mm thick minimum; exposed edges ground, and cut or drilled to receive hardware; clear.
- D. Sealant For Use in Casework Construction: Manufacturer's recommended type.

### 2.5. FINISHES

- A. Metal: Degrease and phosphate etch followed by primer; minimum two coats electrostatic enamel; <> color as selected.
- B. Stainless Steel: No. 4 finish.
- C. Shop finish all components.

## PART 3 EXECUTION

### 3.1. EXAMINATION

- A. Verify adequacy of support framing and anchors.
- B. Verify that service connections are correctly located and of proper characteristics.

### 3.2. INSTALLATION

- A. Install casework, components and accessories in accordance with manufacturer's instructions.

- B. Large Components: Ensure that large components can be moved into final position without damage to other construction.
- C. Use anchoring devices to suit conditions and substrate materials encountered.
- D. Set casework items plumb and square, securely anchored to building structure, with no distortion.
  - 1) Base Cabinets: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 3/4 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
  - 2) Wall Cabinets: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
    - a. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 feet and 1/2 inch in 20 feet or more, and/or maximum variation from plumb exceeds 1/4 inch per story.
    - b. Maximum variation of finished gypsum board surface from true flatness exceeds 1/8 inch in 10 feet in any direction.
- E. Align cabinets to adjoining components.
- F. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:
  - 1) Variation of tops of Base Cabinets from Level: 1/16 inch in 10 feet.
  - 2) Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
  - 3) Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
  - 4) Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.
- G. Secure upper and floor cabinets to concealed reinforcement at gypsum board assemblies.
- H. Separate dissimilar metals to prevent galvanic action.
- I. Field weld joints in stainless steel work, without open seams. Grind smooth and polish to match adjacent surfaces.
- J. Field touch-up blemishes to original finish.

### 3.3. ADJUSTING

- A. Adjust operating parts, including doors, drawers, hardware, fixtures to function smoothly.

### 3.4. CLEANING

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

3.5. PROTECTION

- A. Do not permit finished casework to be exposed to continued construction activity.
- B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.

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 12 3100 - Manufactured Metal 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.

#### 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. Installation Instructions: Manufacturer's installation instructions and recommendations.
- G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.5. 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.

1.6. 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. 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](http://www.avonitesurfaces.com/#sle). "Right Size".
      - 2) Dupont; <>: [www.corian.com/#sle](http://www.corian.com/#sle).
      - 3) Formica Corporation; <>: [www.formica.com/#sle](http://www.formica.com/#sle).
      - 4) Wilsonart: [www.wilsonart.com/#sle](http://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.

2.2. 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.

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. 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 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 09 9113 - Exterior Painting: Preparation and painting of exterior piping systems.
- B. Section 09 9123 - Interior Painting: Preparation and painting of interior piping systems.
- C. 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. 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.

#### 1.5. 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:

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- 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.

CI. 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.

CII. 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 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.

## 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 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.

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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.

#### 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. 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:
  - 1) Shutoff: Ball.
- B. Domestic, Hot and Cold Water Valves:

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- 1) 2 NPS and Smaller:
  - a. Ball: Two piece, full port, bronze with brass trim.
  - b. Bronze Swing Check: Class 125, bronze disc.

## 2.2. GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
  - 1) Hand Lever: Quarter-turn valves 6 NPS and smaller.
- D. 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..

**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. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, metal channel (strut) framing systems, post-installed concrete and masonry anchors, post-installed concrete and masonry anchors, thermal insulated pipe supports, and thermal insulated pipe supports.
- B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

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.

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- 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. 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:

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- 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.
  - 4) Provide insulation shields between pipe hangers and pipe insulation.
- 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 0533 - HEAT TRACING FOR PLUMBING PIPING**

### **PART 1 GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Self-regulating parallel resistance electric heating cable.
- B. Cable outer jacket markings.
- C. Connection kits.

#### **1.2. RELATED REQUIREMENTS**

- A. Section 22 0719 - Plumbing Piping Insulation.
- B. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- D. Section 26 0533.13 - Conduit for Electrical Systems.
- E. Section 26 0533.16 - BOXES.

#### **1.3. REFERENCE STANDARDS**

- A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications; 2012.
- B. ITS (DIR) - Directory of Listed Products; current edition.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL (DIR) - Online Certifications Directory; Current Edition.

#### **1.4. ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with other trades to provide ground fault protection for electric heat tracing circuits as required by NFPA 70.
- B. Coordinate the work with other trades to provide circuit breaker ratings suitable for installed circuit lengths.

#### **1.5. SUBMITTALS**

- A. Product Data: Provide data for electric heat tracing.

#### **1.6. WARRANTY**

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide two year manufacturer warranty for cables, connection kits, accessories, and controls.

## PART 2 PRODUCTS

### 2.1. SELF-REGULATING PARALLEL RESISTANCE ELECTRIC HEATING CABLE

- A. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ).
- B. Factory Rating and Testing: Comply with IEEE 515.1.
- C. Heating Element:
  - 1) Provide pair of parallel No.16 tinned or nickel coated stranded copper bus wires embedded in cross linked conductive polymer core with varying heat output in response to temperature along its length.
  - 2) Terminations: Waterproof, factory assembled, non-heating leads with connector at one end and water-tight seal at opposite end.
  - 3) Capable of crossing over itself without overheating.
- D. Insulated Jacket: Flame retardant polyolefin.
- E. Cable Cover: Provide tinned copper and polyolefin outer jacket with UV inhibitor.
- F. Maximum Power-On Operating Temperature: 150 degrees F.
- G. Maximum Power-Off Exposure Temperature: 185 degrees F.

### 2.2. CABLE OUTER JACKET MARKINGS

- A. Name of manufacturer, trademark, or other recognized symbol of identification.
- B. Catalog number, reference number, or model.
- C. Month and year of manufacture, date coding, applicable serial number, or equivalent.
- D. Agency listing or approval.

### 2.3. CONNECTION KITS

- A. Provide power connection, splice/tee, and end seal kits compatible with the heating cable and without requiring cutting of the cable core to expose bus wires.
- B. Provide with NEMA 4X rating for prevention of corrosion and water ingress.

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 22 0529 - Hangers and Supports for Plumbing Piping and Equipment.
- D. 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. 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.
- B. 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.
- C. 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.

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.

#### 1.7. 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. 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

#### 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. 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.

#### 3.2. SCHEDULES

- A. Plumbing Systems:
  - 1) Domestic Hot Water Supply and Recirculation:
    - a. Glass Fiber Insulation:
      - 1) Pipe Size Range: 1 1/2 inch and larger.
        - (a) Thickness: 1 1/2 inch.
      - 2) Pipe Size Range: 1 1/4 inch and smaller.
        - (a) Thickness: 1 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 1/4 inch and smaller.
  - (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) Flanges, unions, and couplings.
  - 4) Pipe hangers and supports.

#### 1.2. REFERENCE STANDARDS

- A. ANSI Z223.1 - National Fuel Gas Code; 2016.
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2013.
- D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; 2016.
- E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; 2012.
- F. ASME B31.9 - Building Services Piping; 2014.
- G. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2017.
- H. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).
- I. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2016.
- J. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.
- K. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2013.
- L. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- M. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- N. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2014.
- O. ASTM D2239 - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter; 2012a.
- P. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2012.

- Q. ASTM D2609 - Standard Specification for Plastic Insert Fittings for Polyethylene (PE) Plastic Pipe; 2015.
- R. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2014.
- S. 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.
- T. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2016.
- U. 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).
- V. 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).
- W. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2009.
- X. NSF 61 - Drinking Water System Components - Health Effects; 2017.
- Y. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.3. SUBMITTALS

- A. 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 instructions.

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-Fit System (no substitutions).

2.6. 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.

2.7. 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.

### 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:
    - b. Maximum Hanger Spacing: 6.5 ft.
    - c. Hanger Rod Diameter: 3/8 inches.
    - d. Pipe Size: 1-1/2 inches to 2 inches:

- e. Maximum Hanger Spacing: 10 ft.
  - f. Hanger Rod Diameter: 3/8 inch.
- 2) Plastic Piping:
- a. All Sizes:
  - b. Maximum Hanger Spacing: 6 ft.
  - c. 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. 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. 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 drains associated with this project.

#### 2.3. CLEANOUTS

- A. Refer to plan schedules for cleanouts associated with this project.

#### 2.4. HYDRANTS

- A. Refer to plan schedules for sill cocks associated with this project.

#### 2.5. MIXING VALVES

- A. Refer to plan schedules for thermostatic mixing valves associated with 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.

#### 1.2. REFERENCE STANDARDS

- ##### A. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

#### 1.3. SUBMITTALS

##### A. 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 associated with this project.

### 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. 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. 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. TANK TYPE WATER CLOSETS

- A. Refer to plan schedules for tank type water closets associated with this project.

#### 2.3. LAVATORIES

- A. Refer to plan schedules for lavatories associated with this project.

#### 2.4. SINKS

- A. Refer to plan schedules for sinks associated with this project.

#### 2.5. ELECTRIC WATER COOLERS

- A. Refer to plan schedules for electric water coolers associated with 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 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. MFMA-4 - Metal Framing Standards Publication; 2004.

**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.
- 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.

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## 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](http://www.cooperindustries.com).
  - b. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
  - c. Unistrut, a brand of Atkore International Inc: [www.unistrut.com](http://www.unistrut.com).
- 2) Comply with MFMA-4.

#### C. Anchors and Fasteners:

- 1) Manufacturers - Mechanical Anchors and Powder-Actuated Fastening Systems:
  - a. Hilti, Inc: [www.us.hilti.com](http://www.us.hilti.com).
  - b. ITW Red Head, a division of Illinois Tool Works, Inc: [www.itwredhead.com](http://www.itwredhead.com).
  - c. Powers Fasteners, Inc: [www.powers.com](http://www.powers.com).
  - d. Simpson Strong-Tie Company Inc: [www.strongtie.com](http://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. Equipment Support and Attachment:
  - 1) Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2) Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

- 3) Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4) Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- G. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- H. Secure fasteners according to manufacturer's recommended torque settings.
- I. 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. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2002.
- C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- D. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.
- E. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- F. 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.

**1.4. SUBMITTALS**

- A. See Section 01 3300 - Submittals, for submittal procedures.

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- 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.

- 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](http://www.kineticsnoise.com).
- B. Mason Industries: [www.mason-ind.com/#sle](http://www.mason-ind.com/#sle).
- C. Vibration Eliminator Company, Inc: [www.veco-nyc.com](http://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.

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. 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.

#### C. 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. 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. Automatic Controls: Tags. Key to control schematic.
- B. Control Panels: Nameplates.
- C. Dampers: Ceiling tacks, where located above lay-in ceiling.
- D. Ductwork: Stencilled painting.
- E. Small-sized Equipment: Tags.
- F. Thermostats: Nameplates.

#### 2.2. NAMEPLATES

- A. Manufacturers:

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- 1) Advanced Graphic Engraving, LLC: [www.advancedgraphicengraving.com](http://www.advancedgraphicengraving.com).
- 2) Brimar Industries, Inc: [www.pipemarker.com](http://www.pipemarker.com).
- 3) Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/](http://www.kolbipipemarkers.com/).
- 4) Seton Identification Products, a Tricor Direct Company: [www.seton.com](http://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](http://www.advancedgraphicengraving.com).
- 2) Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
- 3) Brimar Industries, Inc: [www.pipemarker.com](http://www.pipemarker.com).
- 4) Kolbi Pipe Marker Co: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
- 5) Seton Identification Products, a Tricor Company: [www.seton.com](http://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.

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- 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. 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.

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.

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- 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

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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.

**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) Duct systems are clean of debris.
  - 5) Fans are rotating correctly.
  - 6) Fire and volume dampers are in place and open.
  - 7) Access doors are closed and duct end caps are in place.
  - 8) Air outlets are installed and connected.
  - 9) Duct system leakage is minimized.
- 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.

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- 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. SCOPE

- A. Test, adjust, and balance the following:
  - 1) Fans.
  - 2) Air Inlets and Outlets.

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3.7. 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. 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.

C. 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.

D. 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 0913 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC - SCHNEIDER ELECTRIC**

**PART 1 GENERAL**

**1.1. Section Includes**

- A. Temperature sensors.
- B. Current sensors.
- C. Current status switches.
- D. Occupancy sensors.

**1.2. Products Supplied but not Installed Under This Section**

- A. Electrical power meters.

**1.3. Reference Standards**

- A. ANSI C12.20 - American National Standard for Electricity Meters - 0.2 and 0.5 Accuracy Classes; 2015.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2014.
- C. UL 268A - Standard for Smoke Detectors for Duct Application; 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.

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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 - Construction Waste Management and Disposal 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](http://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. 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.

2.3. Current Sensors

- A. Provide current status switches for fan, pump, motor, and electrical load monitoring.

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- B. Split core or solid core type with digital or scaled analog output signal.

#### 2.4. 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.

#### 2.5. Occupancy Sensor

##### A. Room-Mounted Occupancy Sensor:

- 1) Off-white enclosure made of high-impact ABS plastic for standard electrical box mounting.
- 2)

### PART 3 EXECUTION

#### 3.1. Verification of Conditions

- A. Verify existing conditions before starting work.
- B. Verify that systems, ductwork, and spaces are ready to receive work.

3.2. Installation

- A. Install and terminate connections in accordance with manufacturer's written instructions.
- B. Products Supplied but Not Installed Under This Section: Hand off products to respective trades then coordinate and supervise respective installation.
- C. Provide wiring, cables, and tubing as required to interface installed products into onboard equipment controllers.

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 3300 - Air Duct Accessories.
- C. 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.
- F. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

### 3.2. CLEANING

- A. See Section 01 7400 - Construction Waste Management and Disposal, 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 23 0548 - Vibration and Seismic Controls for HVAC.
- B. 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](http://www.louvers-dampers.com).
  - 2) Nailor Industries, Inc: [www.nailor.com](http://www.nailor.com).
  - 3) Ruskin Company, a brand of Johnson Controls: [www.ruskin.com](http://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. 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.

#### 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](http://www.carnes.com).
- B. Greenheck Fan Corporation: [www.greenheck.com](http://www.greenheck.com).
- C. Loren Cook Company: [www.lorencook.com](http://www.lorencook.com).
- D. PennBarry, Division of Air System Components: [www.pennbarry.com](http://www.pennbarry.com).

E. Twin City Fan & Blower: [www.tcf.com](http://www.tcf.com).

2.2. INLINE CENTRIFUGAL FANS

A. Manufacturers:

- 1) Greenheck Fan Corporation; \_\_\_\_\_: [www.greenheck.com/#sle](http://www.greenheck.com/#sle).
- 2) Loren Cook Company; \_\_\_\_\_: [www.lorencook.com/#sle](http://www.lorencook.com/#sle).
- 3) Twin City Fan & Blower; BSI: [www.tcf.com/#sle](http://www.tcf.com/#sle).

B. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

C. 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. Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.

C. Provide backdraft dampers on outlet from ceiling exhauster fans and as indicated.

END OF SECTION

## SECTION 23 3700 - AIR OUTLETS AND INLETS

### PART 1 GENERAL

#### 1.1. SECTION INCLUDES

- A. Diffusers.
- B. Registers/grilles.
- C. Louvers.

#### 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. 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](http://www.americanlouver.com).
- B. Carnes, a division of Carnes Company Inc: [www.carnes.com](http://www.carnes.com).
- C. Price Industries: [www.price-hvac.com](http://www.price-hvac.com).
- D. Titus, a brand of Air Distribution Technologies: [www.titus-hvac.com](http://www.titus-hvac.com).
- E. Ruskin, Inc.; [www.ruskin.com](http://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 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: As indicated.
- E. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

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 8200 - CONVECTION HEATING AND COOLING UNITS

### PART 1 GENERAL

#### 1.1. SECTION INCLUDES

- A. Cabinet unit heaters.

#### 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.
- D. Manufacturer's Instructions: Indicate installation instructions and recommendations.
- 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.

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1.6. WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.1. ELECTRIC CABINET UNIT HEATERS

A. Manufacturers:

- 1) INDEECO (Industrial Engineering and Equipment Company): [www.indeeco.com](http://www.indeeco.com).
- 2) Marley Engineered Products: [www.marleymep.com](http://www.marleymep.com).
- 3) Trane, a brand of Ingersoll Rand: [www.trane.com](http://www.trane.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. Heating Elements: Provide finned tubular or resistance wire enclosed in steel sheath.

- D. Cabinet: Minimum 18 gage, 0.0478 inch thick steel front panel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet, and inlet grilles.

E. Finish:

- 1) Factory applied, painted finish.
- 2) Color: As selected from color chart.

- F. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.

- G. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.

H. Controls:

- 1) Thermostat.

- I. Filter: Easily removed, 1 inch thick glass fiber throw-away type, located to filter air before coil.

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. Cabinet Unit Heaters:

- 1) Install as indicated.

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- 2) Coordinate to ensure correct recess size for recessed units.

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 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. Plumbing piping.
  - c. Mechanical ductwork.
  - d. Air diffusers.

##### B. Discrepancies:

- 1) Examine Drawings and Specifications.
- 2) Report any discrepancies to the Architect and obtain written instructions before proceeding.

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- 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.

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.

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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) Contractor 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).

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- 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.

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- 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.
- 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.

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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. Support:

- 1) Anchor and secure all equipment to the building substrate and structure.

D. Clearances:

- 1) Install conduit and cables:
  - a. Straight and true.
  - b. Aligned with other work and with general lines of the building.
  - c. Concealed, where possible, in occupied spaces.
  - d. Out-of-the-way with maximum passageway and headroom remaining in each space.
- 2) Except as otherwise indicated, arrange electrical services and overhead equipment with a minimum of:
  - a. 7'6" headroom in storage spaces. Do not obstruct windows, doors or other openings.
- 3) Give the right-of-way to piping systems required to slope for drainage (over other service lines and ductwork).

3.3. PROTECTION OF WORK

- A. All conduit ends, panelboards, motor controls, disconnecting means, and equipment left unconnected shall be capped, plugged or otherwise properly protected to prevent damage or the intrusion of foreign matter.
- B. Any equipment or conduit system found to have been damaged or contaminated shall be replaced or cleaned to the Engineer's satisfaction.



3.4. ADJUSTING

- A. Adjust all equipment and system components as shown or as otherwise required to result in intended system operation.
- B. At completion of work, provide written certification that all systems are functioning properly without defects.

3.5. START-UP

- A. Assign a Start-Up Coordinator to this project.
- B. The Start-Up Coordinator shall develop detailed start-up procedures, equipment checkout procedure and data forms for recording compliance with contract document performance criteria, and will assist in developing schedules for checkout and Owner acceptance.
- C. The Start-Up Coordinator shall be responsible for maintaining documentation of Start-Up activities until final acceptance of the project.
- D. The documentation shall be kept current by the Start-Up Coordinator and shall be available for inspection at all times. At the time of acceptance of the project, the Start-Up Coordinator shall surrender 3 completed copies of the documentation to the Owner's representative.
  - 1) Coordinate with the mechanical installation the requirements for the startup of mechanical and plumbing systems:
    - a. All equipment, components, and systems have been set, started-up, and adjusted including checking the following: proper equipment electrical rotation, control connections, factory trained technician startup, etc.
    - b. All electric power connections, disconnects, fuses, circuit breakers, etc. are properly sized and installed.

3.6. TRAINING

- A. Refer to Division 1 sections of the specifications regarding requirements of Record Drawings, Operation and Maintenance Manual submittal and systems training.
  - 1) Demonstrate that each system operates properly.
  - 2) Explain the operation of each system to the Owner's Representative.
  - 3) Explain use of O&M manual in operating and maintaining systems.
  - 4) Date, time, and duration of training will be determined by Owner.
  - 5) Training agendas and schedules shall be developed and approved by Owner, Commissioning Authority, Engineer, and Architect prior to training.
  - 6) Document and turn over to owner the training sessions on DVD and placed in O&M Manuals. At the end of all sessions, compile all sessions on a single DVD and turn over to owner as part of the O & M manuals.

B. For specific systems requiring extended instruction, refer to individual Division 26 sections.

END OF SECTION

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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 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- B. 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.
- J. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2013.

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- 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.
- 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.

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- 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, 120 V circuits longer than 150 feet: 8 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.

- 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](http://www.cerrowire.com/#sle).
- b. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
- c. Southwire Company: [www.southwire.com/#sle](http://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](http://www.afcweb.com/#sle).
- 2) Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
- 3) Southwire Company: [www.southwire.com/#sle](http://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.

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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. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2. PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3. INSTALLATION

A. Circuiting Requirements:

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- 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.
- 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

## SECTION 26 0526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### PART 1 GENERAL

#### 1.1. SECTION INCLUDES

#### 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 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

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- 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.

## 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](http://www.altfab.com).
  - b. Burndy: [www.burndy.com](http://www.burndy.com).
  - c. Harger Lightning & Grounding: [www.harger.com](http://www.harger.com).
  - d. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
  - e. Substitutions: See Section 01 6000 - Product Requirements.

## PART 3 EXECUTION

### 3.1. EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

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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 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- B. Section 26 0533.16 - BOXES: Additional support and attachment requirements for boxes.
- C. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.
- D. 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.
  - 3) Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

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- 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:

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- 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](http://www.cooperindustries.com).
    - b. Erico International Corporation: [www.erico.com/#sle](http://www.erico.com/#sle).
    - c. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - d. Thomas & Betts Corporation: [www.tnb.com/#sle](http://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.

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- 1) Manufacturers:
  - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
  - b. Erico International Corporation: [www.erico.com/#sle](http://www.erico.com/#sle).
  - c. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  - d. Thomas & Betts Corporation: [www.tnb.com/#sle](http://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](http://www.cooperindustries.com/#sle).
    - b. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - c. Unistrut, a brand of Atkore International Inc: [www.unistrut.com/#sle](http://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](http://www.cooperindustries.com/#sle).
    - b. Erico International Corporation: [www.erico.com/#sle](http://www.erico.com/#sle).
    - c. PHP Systems/Design: [www.phpsd.com/#sle](http://www.phpsd.com/#sle).
    - d. Unistrut, a brand of Atkore International Inc: [www.unistrut.com/#sle](http://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](http://www.us.hilti.com/#sle).
  - b. ITW Red Head, a division of Illinois Tool Works, Inc: [www.itwredhead.com/#sle](http://www.itwredhead.com/#sle).
  - c. Powers Fasteners, Inc: [www.powers.com/#sle](http://www.powers.com/#sle).
  - d. Simpson Strong-Tie Company Inc: [www.strongtie.com/#sle](http://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](http://www.us.hilti.com/#sle).
  - b. ITW Ramset, a division of Illinois Tool Works, Inc: [www.ramset.com/#sle](http://www.ramset.com/#sle).
  - c. Powers Fasteners, Inc: [www.powers.com/#sle](http://www.powers.com/#sle).
  - d. Simpson Strong-Tie Company Inc: [www.strongtie.com/#sle](http://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.

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- 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.
- 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.

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- Q. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance with NFPA 70.

3.3. FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION



## **SECTION 26 0533.13 - CONDUIT FOR ELECTRICAL SYSTEMS**

### **PART 1 GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. 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 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
  - 1) Includes additional requirements for fittings for grounding and bonding.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.
- D. Section 26 0533.16 - BOXES.
- E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

#### **1.3. REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
- F. 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 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

##### C. Shop Drawings:

- 1) Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
- 2) Include proposed locations of roof penetrations and proposed methods for sealing.

D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2 inch (53 mm) trade size and larger.

1.6. QUALITY ASSURANCE

- A. 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](http://www.alliedeg.com/#sle).
- 2) Republic Conduit: [www.republic-conduit.com/#sle](http://www.republic-conduit.com/#sle).
- 3) Wheatland Tube Company: [www.wheatland.com/#sle](http://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](http://www.bptfittings.com/#sle).
  - b. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://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](http://www.alliedeg.com/#sle).
- 2) Republic Conduit: [www.republic-conduit.com/#sle](http://www.republic-conduit.com/#sle).

- 3) Wheatland Tube Company: [www.wheatland.com/#sle](http://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](http://www.bptfittings.com/#sle).
    - b. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://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](http://www.afcweb.com/#sle).
  - 2) Electri-Flex Company: [www.electriflex.com/#sle](http://www.electriflex.com/#sle).
  - 3) International Metal Hose: [www.metalhose.com/#sle](http://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](http://www.bptfittings.com/#sle).
    - b. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).

- c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://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](http://www.alliedeg.com/#sle).
- 2) Republic Conduit: [www.republic-conduit.com/#sle](http://www.republic-conduit.com/#sle).
- 3) Wheatland Tube Company: [www.wheatland.com/#sle](http://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](http://www.bptfittings.com/#sle).
  - b. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://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](http://www.cantexinc.com/#sle).
- 2) Carlon, a brand of Thomas & Betts Corporation: [www.carlon.com/#sle](http://www.carlon.com/#sle).
- 3) JM Eagle: [www.jmeagle.com/#sle](http://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.

II. 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.
- 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.

#### 1.2. RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0533.13 - Conduit for Electrical Systems:
  - 1) Conduit bodies and other fittings.
  - 2) Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 26 2726 - Wiring Devices:
  - 1) Wall plates.
  - 2) Additional requirements for locating boxes for wiring devices.

#### 1.3. REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2012.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
- E. NEMA 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 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- I. 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](http://www.cooperindustries.com).
  - b. Hubbell Incorporated; Bell Products: [www.hubbell-rtb.com](http://www.hubbell-rtb.com).
  - c. Hubbell Incorporated; RACO Products: [www.hubbell-rtb.com](http://www.hubbell-rtb.com).
  - d. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  - e. Thomas & Betts Corporation: [www.tnb.com](http://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](http://www.cooperindustries.com).
  - b. Hoffman, a brand of Pentair Technical Products: [www.hoffmanonline.com](http://www.hoffmanonline.com).
  - c. Hubbell Incorporated; Wiegmann Products: [www.hubbell-wiegmann.com](http://www.hubbell-wiegmann.com).
  - d. Substitutions: See Section 01 6000 - Product Requirements.

### PART 3 EXECUTION

#### 3.1. EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.2. INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:

- 1) Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
- 2) Unless dimensioned, box locations indicated are approximate.
- 3) Locate boxes as required for devices installed under other sections or by others.
  - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
- 4) Locate boxes so that wall plates do not span different building finishes.
- 5) Locate boxes so that wall plates do not cross masonry joints.
- 6) Install flush-mounted boxes on opposite sides of walls in different stud spaces, boxes shall not be installed back to back.
- 7) Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
- 8) 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. Install boxes as required to preserve insulation integrity.

M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.

N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

O. Install firestopping to preserve fire resistance rating of partitions and other elements.

P. Close unused box openings.

Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

R. Provide grounding and bonding in accordance with Section 26 0526.

S. 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 3000 - Administrative Requirements for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.6. QUALITY ASSURANCE

- A. 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:

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](http://www.bradyid.com).
  - b. Brother International Corporation: [www.brother-usa.com/#sle](http://www.brother-usa.com/#sle).
  - c. Panduit Corp: [www.panduit.com/#sle](http://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:
  - 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.

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](http://www.bradyid.com).
- 2) HellermannTyton: [www.hellermannntyton.com](http://www.hellermannntyton.com).
- 3) Panduit Corp: [www.panduit.com/#sle](http://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](http://www.bradyid.com).
  - 2) Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
  - 3) Seton Identification Products: [www.seton.com](http://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](http://www.bradyid.com).
- 2) Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
- 3) Seton Identification Products: [www.seton.com](http://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 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.

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](http://www.eaton.com).
- B. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).
- C. Siemens Industry, Inc: [www.usa.siemens.com](http://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. Outdoor Locations: NEMA 250 Type 4X, stainless steel.
  - 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. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.

- c. 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. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
- 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. 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.
- H. 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.
- I. Provide grounding and bonding in accordance with Section 26 0526.
- J. Install all field-installed branch devices, components, and accessories.
- K. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- L. Provide filler plates to cover unused spaces in panelboards.

- M. 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. 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.
- G. 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. Receptacles.
- C. Wall plates.

#### 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.

#### 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. Project Record Documents: Record actual installed locations of wiring devices.
- D. 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](http://www.hubbell-wiring.com).
- B. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com).

- C. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us](http://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.

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. Unless noted otherwise, do not use combination switch/receptacle devices.

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.

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](http://www.hubbell-wiring.com).
  - 2) Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
  - 3) Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://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. RECEPTACLES

- A. Manufacturers:
  - 1) Hubbell Incorporated: [www.hubbell-wiring.com](http://www.hubbell-wiring.com).
  - 2) Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
  - 3) Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
  - 4) Substitutions: See Section 01 6000 - Product Requirements.
- 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.
- 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.

## 2.7. WALL PLATES

### A. Manufacturers:

- 1) Hubbell Incorporated: [www.hubbell-wiring.com/#sle](http://www.hubbell-wiring.com/#sle).
- 2) Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
- 3) Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
- 4) Substitutions: See Section 01 6000 - Product Requirements.
- 5) Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
- 6) Size: Standard; \_\_\_\_\_.
- 7) Screws: Metal with slotted heads finished to match wall plate finish.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

D. 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.

## 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 branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- F. 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. 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 or wall switches are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  - 4) Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- L. 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.

- M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- N. 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 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 5100 - INTERIOR LIGHTING

### PART 1 GENERAL

#### 1.1. SECTION INCLUDES

- A. Interior luminaires.
- B. Drivers.
- C. 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 2726 - Wiring Devices: Manual wall switches and wall dimmers.
- D. 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) 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) Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean 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. Field quality control reports.
- G. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- H. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1) See Section 01 6000 - Product Requirements, for additional provisions.
  - 2) Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
- J. 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) 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 five year pro-rata warranty for batteries for emergency lighting 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. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. 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.
- E. 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.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. 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.

### 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).
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- G. Install accessories furnished with each luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.

#### 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.

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 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 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. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. 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.
- E. 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.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Provide luminaires listed and labeled as suitable for wet locations where indicated.



H. 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. 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.

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) Install canopies tight to mounting surface.
- 4) Unless otherwise indicated, support pendants from swivel hangers.

G. Install accessories furnished with each luminaire.

H. Bond products and metal accessories to branch circuit equipment grounding conductor.

I. 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 01 7400 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

#### **1.3. SUBMITTALS**

- A. See Section 01 3300 - Submittals, for submittal procedures

### **PART 2 PRODUCTS -- NOT USED**

#### **2.1. MATERIALS - Not Applicable**

### **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.

#### 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. REFERENCE STANDARDS

- A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

#### 1.4. 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.
- B. Underground Warning Tapes:
  - 1) See Section for 22 0553 underground warning tapes at underground plumbing lines.
  - 2) See Section for 26 0553 underground warning tapes at underground electrical lines.

### PART 3 EXECUTION

#### 3.1. EXAMINATION

- A. Verify that survey bench mark and intended elevations for the work are as indicated.

Excavation		31 2316-1
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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.

Excavation		31 2316-2
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- 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.
- B. Remove excess excavated material from site.

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/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 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/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)); 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.



- 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, and Duct Banks:
  - 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: as determined by independent testing agent.

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/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)); 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 Planting Areas Other Than Lawns :

- 1) Use general fill.
- 2) Compact to 95 percent of maximum dry density.

F. 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 2316.13 - Trenching: Compacted fill over utility trenches under base course.
- B. Section 31 2323 - Fill: Compacted fill under base course.
- C. 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 07 9200 - Joint Sealants: Sealing joints.
- D. 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.
- B. See Section 32 1123 for construction of base course for work of this Section.

### 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.
- B. Do not permit pedestrian traffic over pavement until 75 percent design strength of concrete has been achieved.

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. Mehlic 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 texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
  - 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 9115 Landscape Soil Preparation
  - 3) Section 32 9300 Plant Material & Accessories
  - 4) Section 32 9447 Landscape Maintenance

#### **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. See Section 32 9100 "Landscape Soil Preparation" and drawings for planting soil type(s) and location(s).
- 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.

- C. Refer to Section 32 9500 "Landscape Maintenance" for additional requirements.

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.
- 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".
- C. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

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- 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.

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.
- 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.

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- 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.
  - 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.

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- 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.
- 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.

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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 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. 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.
- 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.

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- 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.
  - 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.

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- 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.
  - 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.

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- 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.
  - 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.

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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.

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.

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- 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.
- 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) Monthly record of all herbicides, insecticides, and disease control chemicals used for the project.

- 4) 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 0110.58 - DISINFECTION OF WATER UTILITY PIPING SYSTEMS**

**PART 1 GENERAL**

**1.1. SECTION INCLUDES**

- A. Disinfection of site domestic water lines and site fire water lines specified in Section 33 1416.

**1.2. RELATED REQUIREMENTS**

- A. Section 33 1416 - Site Water Utility Distribution Piping.

**1.3. REFERENCE STANDARDS**

- A. AWWA B300 - Hypochlorites; 2010, Addendum 2011.
- B. AWWA B301 - Liquid Chlorine; 2010.
- C. AWWA B302 - Ammonium Sulfate; 2016.
- D. AWWA B303 - Sodium Chlorite; 2010.
- E. AWWA C651 - Disinfecting Water Mains; 2014.

**PART 2 PRODUCTS**

**2.1. DISINFECTION CHEMICALS**

- A. Chemicals: AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, and AWWA B303 Sodium Chlorite.

**PART 3 EXECUTION**

**3.1. DISINFECTION**

- A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.
- B. Provide and attach equipment required to perform the work.
- C. Inject treatment disinfectant into piping system.
- D. Maintain disinfectant in system for 24 hours.
- E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.
- F. Replace permanent system devices removed for disinfection.

END OF SECTION

Disinfection of Water Utility Piping Systems		33 0110.58-1
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## **SECTION 33 1416 - SITE WATER UTILITY DISTRIBUTION PIPING**

### **PART 1 GENERAL**

#### **1.1. SECTION INCLUDES**

- A. Water pipe for site conveyance lines.
- B. Pipe valves.
- C. Pipe and fittings for site water lines including domestic water lines and fire water lines.

#### **1.2. RELATED REQUIREMENTS**

- A. Section 31 2316 - Excavation: Excavating of trenches.
- B. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
- C. Section 31 2323 - Fill: Bedding and backfilling.
- D. Section 33 0110.58 - Disinfection of Water Utility Piping Systems: Disinfection of site service utility water piping.

#### **1.3. REFERENCE STANDARDS**

- A. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2018.
- B. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).
- C. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2017.
- D. ASTM D2467 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80; 2015.
- E. ASTM D3139 - Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals; 1998 (Reapproved 2011).
- F. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2017.
- G. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution; 2016.
- H. AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. (13 mm) Through 3 In. (76 mm), for Water Service; 2017.

#### **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.

- C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- D. Project Record Documents: Record actual locations of piping mains, valves, connections, thrust restraints, and invert elevations. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

## PART 2 PRODUCTS

### 2.1. WATER PIPE

- A. PVC Pipe: ASTM D1785 Schedule 40.
- B. PVC Pipe: AWWA C900 Class 100:
- C. Polyethylene Pipe: AWWA C901:
  - 1) Fittings: AWWA C901, molded or fabricated.
  - 2) Joints: Compression.
- D. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Water Service" in large letters.

### 2.2. VALVES

## PART 3 EXECUTION

### 3.1. PREPARATION

- A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare pipe connections to equipment with flanges or unions.

### 3.2. TRENCHING

- A. See the sections on excavation and fill for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

### 3.3. INSTALLATION - PIPE

- A. Maintain separation of water main from sewer piping in accordance with the plans and above referenced specifications.
- B. Route pipe in straight line.
- C. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- D. Slope water pipe and position drains at low points.

3.4. FIELD QUALITY CONTROL

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

END OF SECTION

## SECTION 33 3113 - SITE SANITARY SEWERAGE GRAVITY PIPING

### PART 1 GENERAL

#### 1.1. SECTION INCLUDES

- A. Sanitary sewerage drainage piping, fittings, and accessories.
- B. Connection of building sanitary drainage system to on site sewer system.

#### 1.2. RELATED REQUIREMENTS

- A. Section 31 2316 - Excavation: Excavating of trenches.
- B. Section 31 2316.13 - Trenching: Excavating, bedding, and backfilling.
- C. 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 D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2015, with Editorial Revision (2018).
- B. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2014.
- C. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
- D. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Material; 2014.

#### 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. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- E. Field Quality Control Submittals: Document results of field quality control testing.
- F. Project Record Documents:
  - 1) Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.

Site Sanitary Sewerage Gravity Piping		33 3113-1
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## PART 2 PRODUCTS

### 2.1. SEWER PIPE MATERIALS

- A. Provide products that comply with applicable code(s).
- B. Plastic Pipe: ASTM D2729, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 4 inches, bell and spigot style solvent sealed joint end.
- C. Plastic Pipe: ASTM D1785, Schedule 40, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of \_\_\_\_ inches, bell and spigot style solvent sealed joint end.
- D. Plastic Pipe: ASTM D3350, SDR 11, High Density Polyethylene (HDPE) material; inside nominal diameter of \_\_\_\_ inches, with cell classification of 335434C or better, thermal butt fusion joints and fittings in accordance with manufacturer's recommendations; pipe and fittings same material utilizing transition fittings when connecting to existing piping.
- E. 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.

### 2.2. PIPE ACCESSORIES

- A. Trace Wire: Magnetic detectable conductor, clear plastic covering, imprinted with "Sewer Service" in large letters.
- B. Casing Spacer: Polyethylene spacer designed to maintain pipe casing integrity.

### 2.3. BEDDING AND COVER MATERIALS

- A. Pipe Bedding Material: As specified in Section 31 2323.
- B. Pipe Cover Material: As specified in Section 31 2323.

## PART 3 EXECUTION

### 3.1. GENERAL

- A. Perform work in accordance with applicable code(s).

### 3.2. TRENCHING

- A. See Section 31 2316.13 for additional requirements.
- B. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.

### 3.3. 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.

Site Sanitary Sewerage Gravity Piping		33 3113-2
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- C. Connect to building sanitary sewer outlet and municipal sewer system , through installed sleeves.
- D. Install trace wire 6 inches above top of pipe; coordinate with Section 31 2316.13.

3.4. FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 01 4000.
- B. Infiltration Test: Test in accordance with ASTM F1417.

3.5. PROTECTION

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

# **APPENDIX 1**



**SCI ENGINEERING, INC.**  
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**Geotechnical Report**

**MISSOURI VETERANS HOME – ADDITIONS & RENOVATIONS  
CAPE GIRARDEAU, MISSOURI**

**September 2018**

**FARNSWORTH GROUP, INC.**  
Architect

**SCI No. 2004-0063.10, Task 100**





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CONSTRUCTION SERVICES

September 14, 2018

Mr. Daniel P. Gavin  
Architect Principal  
Farnsworth Group, Inc.  
20 Allen Avenue, Ste. 200  
St. Louis, Missouri 63119

RE: Geotechnical Report  
Missouri Veterans Home – Additions & Renovations  
Cape Girardeau, Missouri  
SCI No. 2004-0063.10, Task 100

Dear Mr. Gavin:

Attached is our *Geotechnical Report*, dated September 2018. It should be read in its entirety, and our recommendations applied to the design and construction of the project. Selected excerpts from the report are highlighted below:

- Existing fill was encountered to depths ranging from 1 to 22 feet in 4 of 5 borings. Documentation regarding the placement and compaction of the fill is not available. However, based on the estimated amount of time the fill has been in place, the results of laboratory testing, and the general performance of the existing building, the risk of supporting the foundations and floor slabs on the fill is judged to be low, with proper proofrolling and treatment.
- Expansive fat clay soils were encountered at shallow depths within the existing fill and native soils. Where the bearing soils consist of expansive clay soils, we recommend that they be removed to minimum depths of 2 feet beneath the bearing level of the footings and 3 feet beneath the bottom of the floor slab. We anticipate that remediation will be required for the majority of the floor slabs and footings.
- Shallow spread footing foundations can be sized for maximum net allowable bearing pressures of 2,000 pounds per square foot (psf) for continuous wall footings and 2,400 psf for isolated column footings.
- This site can be classified as a Seismic Site Class D. Seismic design parameters for the site are as follows:  $F_a = 1.05$ ,  $F_v = 1.61$ ,  $S_{DS} = 0.79$ , and  $S_{D1} = 0.42$ , indicating that a Seismic Design Category (SDC) D may be used with an Occupancy Category of I, II or III.

We appreciate the opportunity to be of service, and look forward to working with you during the construction phase of the project. If you have any questions or comments, please call.

I can be reached at 636-949-8200 or [cconnor@sciengineering.com](mailto:cconnor@sciengineering.com)

Respectfully,

**SCI ENGINEERING, INC.**



Curtis J. Connor, E.I.  
Staff Engineer



Shawna L. Erter, P.E.  
Vice President

CJC/SLE/hmm

Enclosure  
Geotechnical Report

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## **APPENDIX**

### Appendix A - Boring Log Legend and Nomenclature, Boring Logs



## **Geotechnical Report**

### **MISSOURI VETERANS HOME – ADDITIONS & RENOVATIONS CAPE GIRARDEAU, MISSOURI**

#### **1.0 INTRODUCTION**

At the request of Mr. Nicholas Bruner, AIA, NCARB of Farnsworth Group, Inc. (Farnsworth), SCI Engineering, Inc. (SCI) conducted a geotechnical exploration for the proposed site improvements. The purpose of our exploration was to characterize and evaluate the subsurface conditions, provide recommendations for foundations, and address other geotechnical aspects. Our services were provided in general accordance with our proposal, dated August 17, 2018, and authorized by Mr. Daniel P. Gavin of Farnsworth on the same date.

#### **2.0 SITE AND PROJECT DESCRIPTION**

SCI understands that site improvements are currently being planned for the Missouri Veterans Home located at 2400 Veterans Memorial Drive in Cape Girardeau, Missouri. The location of the site is shown on the *Vicinity and Topographic Map*, Figure 1. The footprints of the proposed building additions are planned to extend into areas currently occupied by open greenspace or concrete walkways. The existing site conditions are shown on the *Aerial Photograph*, Figure 2.

Original development and grading plans of existing building were not available at the time of this report; however, we anticipate that the existing single-story structure is slab-on-grade and is supported on shallow foundations bearing in soil. Based on observations made during our site visit, the foundations walls and pavements surrounding the facility generally appear to be performing satisfactorily. Some cracks were observed in the asphalt pavements north of the facility; however, as these cracks appeared minor, we anticipate they are likely due to the age of the pavement. We are not aware of any performance problems with the existing building.

Based on the undated plan prepared by Farnsworth, provided to SCI on August 14, 2018, 10 building additions, ranging in size from approximately 300 to 1,500 square feet (sf) are planned throughout the development. Additionally, an entry awning is planned on the north side of the existing building, while a stand-alone building, approximately 5,000 sf in footprint, is planned south of the existing building. We understand that the proposed structures will be single-story and slab-on-grade. Grading plans were not available at the time of this report; however, minimal grading, including maximum cuts and fills on the order of 3 feet or less, is anticipated. We anticipate the finished floor elevation (FFE) of the additions will match the FFE of the existing building. The proposed construction is shown on the *Aerial Site Map*, Figure 3.

Structural loads were not available at the time of this report; however, we anticipate the proposed structures will be lightly loaded, with maximum column loads of less than 150 kips and maximum wall loads of less than 5 kips per linear foot. If these loads will be exceeded, then SCI should be contacted to review our recommendations.

We have not reviewed, nor are we aware of, any previous studies on this specific site, by SCI or others, that would affect the preparation of this report.

### 3.0 SUBSURFACE CONDITIONS

Five borings (B-1 through B-5) were drilled at the approximate locations chosen by Farnsworth as shown on the *Aerial Site Map*. The borings were staked by SCI personnel using a Trimble handheld global positioning system (GPS). Approximate ground surface elevations at the boring locations were referenced from the existing building's FFE assumed to be at elevation (El). 100. Detailed information regarding the nature and thickness of the soils encountered, as well as the results of the field sampling and laboratory testing, are shown on the *Boring Logs* contained in Appendix A.

#### 3.1 Surficial Materials and Existing Fill Material

Existing fill was encountered to depths ranging from 1 to 22 feet in 4 of 5 borings as summarized in Table 3.1.

**Table 3.1 – Existing Fill Summary**

Boring	Approximate Surface Elevation	Existing Fill Depth (feet)	Approximate Bottom of Existing Fill Elevation (±)
B-1	98	5.5	92.5
B-2	99	1	98
B-3	99	17	82
B-4	95	NE	--
B-5	99	22	77

NE – Not Encountered

The existing fill material consisted of lean and fat clay with varying amounts of crushed rock and chert gravel. Standard Penetration Tests (SPTs) performed within the existing fill resulted in N-values ranging from 6 to 25 blows per foot (bpf), characterizing the material as medium stiff to very stiff in consistency. Moisture contents in the fill ranged from 10 to 29 percent. Documentation in regards to the placement of the existing fill was not available at the time of this report.

### **3.2 Native Soil Profile**

The native soils predominately consisted of fat clay (CH in accordance with the Unified Soil Classification System and ASTM D 2488-06) with varying amounts of sand and gravel. As an exception, lean clay (CL) was encountered beneath the existing fill in B-2 and B-5 and extended to depths of 5½ and 25 feet, respectively. Additionally, clayey gravel (GC) was encountered beneath the existing fill in B-1 and extended to a depth of 8 feet. SPTs performed within native clay soils generally resulted in N-values ranging from 6 to 24 bpf, classifying the soils as medium stiff to very stiff in consistency. Soils with higher percentages of gravel resulted in N-values ranging from 30 to 57 bpf classifying them as medium dense to very dense. Moisture contents in the native clays ranged from 13 to 27 percent.

### **3.3 Bedrock**

Documented geology, including the *2003 Geologic Map of Missouri*, published by the Missouri Department of Natural Resources (MDNR), indicates that bedrock at the site consists of the Decorah and Plattin Group formation. The Decorah Group formation is comprised of shale with thin limestone beds and is up to 40 feet thick. The Plattin Group formation is comprised of finely crystalline limestone with minor interbedded shale and is up to 450 feet thick.

### **3.4 Groundwater**

Groundwater was encountered in B-5 at a depth of 23 feet, approximate El. 76, during drilling. However, groundwater was not encountered in the remaining borings. In B-5, the groundwater appears to be perched near the interface of the existing fill and native soils. The groundwater level depends on seasonal and climatic variations, and may be present at different depths in the future. In addition, without extended periods of observation, accurate groundwater level measurements may not be possible, particularly in low permeability soils.

## **4.0 DESIGN RECOMMENDATIONS**

### **4.1 Existing Fill**

Existing fill was encountered to depths ranging from 1 to 22 feet in 4 of 5 borings. Documentation regarding the placement and compaction of the fill material is not available. As such, the engineering properties and performance of the existing fill cannot be predicted with certainty. There is some risk of settlement or other performance problems if the foundations or floor slabs are supported on the fill material. To eliminate this risk, all the existing fill would have to be excavated and either recompacted or replaced.

However, based on the estimated amount of time the fill has been in place, the results of laboratory testing, and the general performance of the existing building, the risk of supporting the foundations and floor slabs on the fill is judged to be low, with proper proofrolling and treatment.

We anticipate that isolated softer zones may be present in the existing fill between our widely-spaced borings. SCI personnel should check the fill at footing bearing elevation and at the floor slab subgrade. Any soft, or otherwise unsuitable fill should be selectively undercut and replaced with engineered fill in accordance with Sections 5.1 and 5.2. Where the fill consists of expansive soils within 2 feet below the bearing elevation of the footings or 3 feet below the floor slab it should be remediated as discussed in Section 4.2.

#### **4.2 Expansive Clay Remediation**

Expansive fat clay soils were encountered within the existing fill and native soils across the site. Fat clay soils are susceptible to excessive volume change with variations in moisture content, which can lead to movement of concrete slabs and foundations of lightly loaded structures, retaining walls or pavements. Where bearing soils consist of fat clay, we recommend they be remediated to minimum depths of 2 feet beneath the bottom standard shallow spread footings and 3 feet beneath the bearing elevation of floor slabs. **We anticipate that expansive soil remediation will be required for the majority of the additions' footings and floor slabs; however, the actual need for, and extents of, expansive soil remediation should be delineated by SCI personnel in the field during construction.**

The overexcavation of fat clay soils should extend at least 2 feet beyond the outside edge of the footings and building footprints to facilitate uniform compaction of the replacement materials, and may require additional widening at building corners to allow equipment access for proper compaction. The overexcavation should be backfilled with properly compacted low plastic soil or one-inch minus crushed limestone. As an alternate, the footing overexcavation may be backfilled with lean concrete. With this option, widening of the footing excavation is not required. If clean rock is used as backfill material, it must be drained to daylight or to a sump with a pump. The footings and floor slabs would then be constructed on the newly placed fill. Fat clay soils placed as new structural fill within 2 feet beneath the bearing level of shallow spread footings and 3 feet beneath the bottom of the floor slab will require remediation.

As an alternative to overexcavation and replacement, the fat clay may be remediated by the addition of lime in combination with a recompaction operation. If lime stabilization is performed, we recommend thoroughly mixing in "Code L" (a locally available calcium oxide by-product also known as lime kiln dust)

at a rate of 7 percent, or approximately 8 pounds of Code L per cubic foot of soil, to the depths and lateral limits described in the preceding paragraph. Water may need to be added during mixing to allow for proper hydration of the lime. Pulverizing and tilling equipment, such as “gators,” are preferred for mixing the lime into the soil. The treated soil should be placed in compacted lifts as discussed in the “Fill Materials and Compaction” section.

The method of treatment described above is based on generally accepted standards in the local engineering community; however, swell pressures and volume change potential greater than can be mitigated by this method may exist. Consequently, the owner should recognize that there is an inherent, but reduced risk that damage may occur, even after remedial treatment of the subgrade soil.

### **4.3 Shallow Foundations**

Shallow spread footing foundations bearing in native lean clay, suitable existing fill, remediated fat clay, or newly placed low plastic structural fill are appropriate for support of the proposed building additions. Based on the soils encountered during our exploration, shallow foundations can be sized for maximum net allowable bearing pressures of 2,000 pounds per square foot (psf) for continuous wall footings and 2,400 psf for isolated spread footings. A one-third increase in the net allowable bearing pressure may be used for transient loads, such as wind and earthquake.

We anticipate that some localized areas of inadequate bearing materials may be encountered during construction and, subsequently, require remediation to achieve these capacities. These areas may consist of, but are not limited to, zones of soft soils, extended depths of existing fill or areas of untreated fat clay. Therefore, we recommend that an allowance be made in the construction budget for selected footing overexcavations. If encountered, inadequate bearing materials should be undercut and replaced with engineered fill in accordance with Sections 5.1 and 5.2.

Special attention must be given to designing the foundations immediately adjacent to the existing structure. It is advisable to place the proposed foundations at the same level as those of the existing building. If the new footings bear at a different elevation, either the new or existing footing walls, whichever are deeper, should be structurally checked to evaluate whether they could accommodate the external stresses imposed by the shallower footings. In spite of these precautions, some minor settlement within the existing building adjacent to the addition should be expected. Accordingly, we recommend that construction joints be

provided and other measures be taken, as needed, between the existing building and the addition. Even so, small differential movements may occur and future leveling of the floor slab between the existing and new construction may be necessary.

Exterior footings and foundations in unheated areas of the buildings should be provided with at least 30 inches of soil cover for frost protection. Interior footings in heated areas can be located at nominal depths below the finished floor. For footings designed and constructed in accordance with our recommendations, total settlement should be less than 1-inch, and differential settlement between adjacent footings should be less than  $\frac{3}{4}$ -inch.

#### **4.4 Seismic Considerations**

Ground shaking at the foundation of structures and liquefaction of the soil under the foundation are the principle seismic hazards to be considered in design of earthquake-resistant structures. Liquefaction occurs when a rapid buildup in water pressure, caused by the ground motion, pushes sand particles apart, resulting in a loss of strength and later densification as the water pressure dissipates. This loss of strength can cause bearing capacity failure while the densification can cause excessive settlement. Potential earthquake damage can be mitigated by structural and/or geotechnical measures or procedures common to earthquake resistant design.

##### ***4.4.1 Design Earthquake***

According to International Building Code (2015 edition) (IBC 2015), structures such as those proposed for this project are required to be designed to a design earthquake with a 2 percent Probability of Exceedance (PE) over a 50-year exposure period (i.e. a 2,475-year design earthquake). The design earthquake has a Moment Magnitude ( $M_w$ ) of 7.7 and a Peak Ground Acceleration (PGA) of 0.31g, as determined from data provided by the IBC 2015 and the United States Geological Survey (USGS) National Seismic Hazard Mapping Project.

##### ***4.4.2 International Building Code Site Classification***

Based on procedures outlined in the IBC 2015, our geotechnical exploration for the subject site, including borings through predominantly medium stiff to stiff, near surface cohesive soil and the anticipated depth to bedrock, the site can be classified as Site Class D. Using the procedures outlined in Section 1613 of the IBC 2015, the calculated weighted average undrained shear strength ( $s_u$ ) is in excess of the 1,000 psf

required to be classified as Site Class D. Seismic design parameters for the site are as follows:  $F_a = 1.05$ ,  $F_v = 1.61$ ,  $S_{DS} = 0.79$ , and  $S_{D1} = 0.42$ , indicating that a Seismic Design Category (SDC) D may be used with an Occupancy Category of I, II or III.

#### **4.4.3 Liquefaction Potential Analysis**

The liquefaction potential analysis for the site was conducted using data from the field exploration and laboratory test results and the techniques outlined in the National Center for Earthquake Engineering (NCEER) Technical Report NCEER-97-0022. Based on our analyses, the soils at the project site have sufficient strength values to resist liquefaction and/or a plasticity index that make the threat of liquefaction minimal during the design earthquake. While the amount of the seismically induced settlement is dependent on the magnitude and distance from the seismic event, we estimate that the settlements from the design earthquake will be negligible and relatively uniform in nature so liquefaction mitigation techniques are not required.

#### **4.5 Floor Slabs**

It is SCI's understanding that the floor slab for the proposed additions will *not* support loads greater than "typical" floor slab loads (>125 psf). If sections of the floor slab will support loads greater than "typical" floor slab loads, underlying subgrade soils below these sections may need to be removed and replaced with compacted/engineered fill. If the proposed addition will include heavily loaded floor slab sections, SCI should be provided the opportunity to review the final design plans and specifications to determine if the underlying subsurface soils can adequately support the loads. **Proofrolling, as discussed in Section 5.1, should be accomplished to identify soft or unstable soils and unsuitable fill that should be removed from the floor slab area prior to fill placement and/or floor slab construction.** The following recommendations are based on "typical" floor slab loads.

We recommend that the floor slab be designed using a modulus of subgrade reaction (k) of 150 pounds per square inch per inch of deflection (pci) if bearing on native lean clay, remediated fat clay, suitable existing fill, or newly placed low plastic structural fill. The floor slab should be supported on a minimum 4-inch-thick layer of crushed stone. This will help to distribute concentrated loads and equalize moisture conditions beneath the slab.

It is generally preferable to maintain structural separation between the floor slab and the foundation walls and column pads using isolation joints. We also suggest that joints be placed in the floor slab on no more than 15-foot intervals in any direction. Such joints permit slight movements of the independent elements

and help reduce random cracking that might otherwise be caused by restraint of shrinkage, slight rotations, heave or settlement. Where occupied space or moisture sensitive floor coverings are planned, we recommend a 6-mil-thick polyethylene sheeting be placed immediately beneath the floor slab and above the crushed rock or gravel, to reduce the transfer of capillary moisture to the slab. However, without careful attention to curing of the floor slab, the polyethylene sheeting can cause excessive shrinkage cracking and "curling."

The precautions listed below should be followed for construction of slab-on-grade pads. These details will not reduce the amount of movement, but are intended to reduce potential damage should some settlement of the supporting subgrade take place. Some increase in moisture content is inevitable as a result of development and associated landscaping. However, extreme moisture content increases can be largely controlled by proper and responsible site drainage, building maintenance and irrigation practices.

- Cracking of slab-on-grade concrete is normal and should be expected. Cracking can occur not only as a result of heaving of the supporting soil, but also as a result of concrete curing stresses. The occurrence of concrete shrinkage cracking, and problems associated with concrete curing may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement, finishing, and curing, and by the placement of crack control joints at frequent intervals, particularly where re-entrant slab corners occur. The American Concrete Institute (ACI) recommends a maximum panel size (in feet) equal to approximately three times the thickness of the slab (in inches) in both directions. For example, joints are recommended at a maximum spacing of 12 feet based on having a 4-inch slab. SCI also recommends that the slab be independent of the foundation walls.
- Areas supporting slabs should be properly moisture conditioned and compacted. Backfill in all interior and exterior water and sewer line trenches should be carefully compacted to reduce the shear stress in the concrete extending over these areas.

Exterior slabs should be isolated from the building. These slabs should be reinforced to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

#### **4.6 Below-Grade Walls**

Below-grade walls required at this site may include minor retaining walls designed to accommodate surface grade changes around the proposed building additions and/or paved areas of the site. The maximum toe pressure for below-grade walls should not exceed the bearing pressure previously given for continuous strip footings. Retaining walls may be designed with an allowable coefficient of friction between the base of the concrete footing and the subgrade of 0.3 if bearing on native soils. This value includes a factor of safety (FS) of 1.5.



Below-grade walls should also be designed to withstand lateral earth pressures caused by the weight of the backfill, including slopes behind the walls and any surcharge, such as driving loads or adjacent floor loads. We recommend the equivalent fluid unit weights tabulated below for lateral earth pressures, in pounds per cubic foot (pcf), be used in the design of below-grade walls. If drainage will not be provided, an additional pressure equivalent to the hydrostatic pressure should be included in the design.

The indicated values assume that positive drainage is provided to prevent buildup of hydrostatic pressure. Expansive clay soils should not be used to backfill the wall excavations. Values for granular material should only be used if the granular backfill extends upwards and outwards the full height of the wall at a slope of 45 degrees or flatter from its base. In this case, exterior granular backfill should be capped with approximately 2 feet of cohesive soil to reduce the potential for surface water infiltration into the granular backfill. With clean granular backfill, filter fabric, such as Mirafi 140N, should be placed along the interface between the soil and granular backfill to reduce the potential for infiltration of the soil into the granular material.

**Table 4.1 - Recommended Lateral Earth Pressures**

Backfill Type	Equivalent Fluid Unit Weights	
	At-Rest Earth Pressures (pcf)	Active Earth Pressures (pcf)
Cohesive Soil	70	50
Granular Material (1-inch minus)	60	40
Free-Draining, Granular Material (1-inch clean)	50	30

At-rest earth pressures should be used for restrained or fixed-head walls that are restricted from rotation, such as basement walls connected to floor joists or beams. Active earth pressures should be used for free-head walls where the base remains fixed and deflection at the top of the wall of approximately 1-inch for each 10 feet of wall height is allowed, such as a retaining wall.

The above values are applicable when the surface of the backfill behind the wall is horizontal. Upward sloped or loaded backfill will result in increased values. In addition to lateral earth pressures, below-grade walls should be designed to resist any surcharge loads, including shallow building foundations and traffic. These surface loads can be modeled as uniform lateral loads, equivalent to one-half of the surface load, acting at the halfway point on the wall.

A passive soil resistance modeled by an equivalent fluid unit weight of 250 pcf may be used for native soil against the face of the exterior base or a key below the base of the wall. The upper 2 feet of soil backfilled against the exterior face of the walls and uncontrolled backfill soils should be ignored when calculating the lateral resistance. Lower passive pressure should be used if the ground surface slopes downward away from the face of the wall.

We recommend that all below-grade walls be provided with a drainage system. A minimum 4-inch diameter, perforated drainpipe should be used, and placed at foundation level. Granular drainage material, consisting of 1-inch clean crushed rock, classified as GP by ASTM D 2487-11, with less than 5 percent of the rock passing the No. 200 sieve, should be placed a minimum of 6 inches in all directions around the drainage pipe. Synthetic filter fabric, such as Mirafi 140N or equivalent, should encapsulate the drainpipe and granular drainage material. The pipe should be sloped to drain by gravity or through weepholes located on approximately 10-foot centers for above-grade retaining walls, or to a sump with a pump for below-grade walls where positive drainage by gravity cannot be achieved. Alternately, drainage can be provided directly through the weepholes without a drain pipe, provided that filter fabric is used or other measures are taken to prevent the granular backfill from migrating out through the weepholes. Any interior sumps must be isolated “watertight” from the interior subgrade to prevent the movement of moisture from the sump into the underlying soils.

If retaining walls exceeding 5 feet in total height are proposed, SCI should be retained to evaluate the walls global stability based on the subsurface soils encountered within our borings. When information is available regarding specific wall locations, configurations and heights, SCI should be retained to evaluate global stability, based on developed strength parameters for the subsurface soils and backfill. At your request, we can provide the global stability study, or we can work with your wall designer to provide coordinated internal and global stability studies. These services are beyond our current scope.

#### **4.7 Site Grading and Drainage**

Positive site drainage should be provided to reduce surface water infiltration around the perimeter of the additions and beneath the floor slab. All grades should be sloped away from the additions. Roof and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill of the additions.

Large trees and shrubs should be planted away from exterior footings as they may cause drying and shrinkage of the foundation soils and, with the passage of time, potentially detrimental settlement of the building floor slabs and foundations. A minimum distance of 20 feet or the mature tree’s dripline, whichever is greater, is suggested.

We recommend that all final slopes have a maximum inclination of (3H:1V), and that a crest of at least 10 feet in width or a distance equivalent to the total height of the slope, whichever is less, be provided around the building before the surface slopes down and away. We do not anticipate that additional slopes steeper or taller than 15 feet in total height will be required. However, if they are proposed, the slopes should be brought to our attention and individually addressed and evaluated by SCI on a case-by-case basis.

#### **4.8 Underground Utilities**

Underground utilities can provide a pathway for water to migrate below the floor slabs. Drain and utility pipes beneath floors should have tight joints to prevent leakage. If utility excavations are backfilled with free-draining granular materials, then cutoffs should be provided at the exterior walls to reduce the potential for water to migrate beneath the additions. Impermeable cutoffs may consist of a 3-foot-long “plug” of cohesive soil or bentonite soil mix, or a 1-foot-long plug of lean concrete. Soil may be used for the balance of the backfill.

Groundwater is not anticipated to influence the installation of deep utilities. In most situations, small amounts of groundwater seepage into the excavations can be handled by means of gravity ditching and a sump pump. If greater flows are experienced, SCI should be retained to provide additional consultation.

With the exception of individual service lines to the additions that intersect foundations perpendicularly, below-grade utilities should not be located within the stress influence zone of the building foundations. Accordingly, below-grade utilities should be located outside a zone extending 45 degrees downward and outward from the edge of the footings.

### **5.0 SITE DEVELOPMENT AND CONSTRUCTION CONSIDERATIONS**

#### **5.1 Site Preparation**

Within the construction area, existing structures and related below-grade components to be abandoned must be properly demolished and the debris removed from the site. Pavements and utilities, as well as their associated backfill, should be removed from below and at least 10 feet beyond the proposed addition's footprint. As an exception, deep utilities may be grouted in-place rather than being removed. However, the existing backfill associated with deep utilities should be removed and replaced or recompact. Outside this area, existing foundation walls and footings deeper than 3 feet below the proposed subgrade may be left in place. Excavations resulting from the removal of existing site improvements should be backfilled with properly compacted fill.

Areas to be cut or to receive fill should be stripped of any surface vegetation. The stripping's should be removed and stockpiled for later placement in landscaped or common ground areas, as appropriate. Topsoil can be reused as fill, if thoroughly mixed with other, acceptable, non-organic fill materials, as approved by SCI.

After stripping, the site should be proofrolled by systematically passing over the subgrade to achieve complete coverage with proper compaction or loaded construction equipment, and observing the subgrade for pockets of excessively soft, wet, or disturbed soil, or otherwise unacceptable materials. **In particular, soft areas within the existing fill to remain in place should be identified during this process.** Silt soils are susceptible to excessive pumping or rutting with disturbance such as that caused by construction traffic. Disturbed areas of silts soils should be undercut and replaced with properly compacted structural fill. Additional soft areas or otherwise unacceptable materials, if encountered, should be removed and replaced with structural fill or otherwise stabilized as approved by SCI prior to placing additional fill. If removal of soft or unacceptable soils is impractical due to their excessive depth, they should be stabilized or “bridged over” in a manner approved by SCI. “Bridging” of the soft soils can often be accomplished by working 2- to 4-inch clean crushed rock into the softer soils and then placing a geofabric, such as Mirafi HP270 or equivalent, prior to placing additional fill.

## **5.2 Fill Materials and Compaction**

Prior to fill placement and compaction, the upper 8 inches of the exposed subgrade should be scarified, moisture conditioned and recompacted. Structural fill should be placed in maximum 8-inch-thick loose lifts and mechanically compacted in accordance with Table 5.1, below. We recommend that any fill placed in building addition areas have a liquid limit (LL) less than 45 and a plasticity index (PI) less than 25. If higher plasticity soils are placed within 3 feet of the floor slab subgrade, or 2 feet of the bottom of the footings, then remediation will be required. Acceptable non-organic fill soils include materials designated CL, ML, CL-ML, SP, SW, GP, and GW by ASTM D 2487-11. Pavement broken to less than 4 inches in maximum dimension may be used as fill, if properly blended with acceptable soil and placed as approved by SCI.

**Table 5.1 - Typical Compaction Requirements for Fill**

Material Tested	Proctor Type	Minimum Percentage Dry Density
Structural Fill (Cohesive)	Modified (ASTM D 1557)	90
	Standard (ASTM D 698)	95
Structural Fill (Granular)	Modified	95
	Standard	98
Landscaped Areas (non-load bearing)	Modified	88
	Standard	92
Utility Trench Backfill	Modified	90
	Standard	95

Prior to compaction, the soil may require moisture adjustment. During warm weather, moisture reduction can generally be accomplished by disking or otherwise aerating the soil. When air drying is not feasible, a moisture reducing chemical additive, such as hydrated lime, could be incorporated into the soil. During dry weather, some addition of moisture may be required to facilitate compaction. This should also be done in a controlled manner using a tank truck with a spray bar. The moistened soil should be thoroughly blended with a disk or pulverizer to produce a uniform moisture content. If construction is performed during the winter season, fill materials should be carefully observed to see that no frozen soil is placed as fill or remains in the base materials upon which fill is placed.

Backfill for foundation walls may consist of lean clay, one-inch minus crushed limestone, or controlled low strength material (CLSM). We advise performing field density tests on at least every other lift to monitor compaction. As an alternate, we suggest using one-inch clean crushed limestone to provide improved drainage and to reduce lateral pressures on the walls. Due to a slight risk of migration of soil fines into the clean rock, a synthetic filter fabric, such as Mirafi 140N or equivalent, should be placed between the soil face of the excavation and the crushed limestone. If clean rock is used, it may be placed in 2-foot-thick lifts and tamped or tracked to achieve adequate densification. Exterior clean rock backfill should be capped with cohesive soil to reduce the potential for surface water infiltration.

Backfill placed next to walls should be compacted with hand operated equipment and not large self-propelled or machine operated equipment, which could result in potential overcompaction and higher lateral pressures. Compaction should be reduced within approximately one-foot of the walls, and the walls should be observed periodically for signs of movement. If movement is detected, it may be necessary to provide bracing and/or change backfill procedures.

In addition to the minimum density requirements listed above, the soil must be stable, i.e., not “pumping” or rutting excessively under construction traffic, prior to placing additional fill or constructing foundations, floor slab, or pavements. Field density tests should be performed on each lift of fill to document that proper compaction is achieved.

### **5.3 Shallow Foundation Excavations**

SCI should observe all footing and floor slab excavations for problem areas, such as soft zones, areas of untreated expansive soils, unsuitable existing fill or otherwise unsuitable material, prior to placing new fill or concrete. Overexcavation and replacement with structural fill should be performed where inadequate bearing materials are present in footing excavations.

**During construction, existing footings must not be undercut, i.e. no excavation should encroach within an area extending 45 degrees downward and outward from the outside edge of the existing foundations. If this is required, then SCI should be retained to provide specific recommendations to maintain support of the existing foundations and lateral support of the excavations.**

The base of all excavations should be clean, free of loose soil or uncompacted fill, relatively dry, and maintained near their optimum moisture content. Excavations should be protected from extreme temperatures, precipitation, and construction disturbances. To reduce the possibility of desiccation or saturation of the foundation soils, we recommend that the concrete be placed as soon as possible after excavations are made.

Groundwater is not anticipated to influence the construction of conventional shallow spread footings. In most situations, small amounts of groundwater seepage into the excavations can be handled by means of gravity ditching and a sump pump. If greater flows are experienced, SCI should be retained to provide additional consultation.

### **5.4 Subgrade Considerations**

Floor slab and pavement subgrades may be subjected to construction traffic and exposure to weather for an extended period and significant problems may be incurred. It may be necessary to proofroll the subgrade, in both cut and fill areas, and recompact the subgrade immediately prior to placing base rock for the floor slab or pavement. In addition, subgrades covered with base rock may be very slow to dry if precipitation occurs after placing the base rock. Therefore, we recommend that proofrolling and placement of the base

rock be done as close to the time of pouring the floor slab or paving as is practical. Proofroll passes should be limited, particularly on silty subgrades, to reduce the potential for pumping of moisture from deeper within the soil profile.

Special measures may be required to facilitate construction during wet or cold weather, or where excessive areas of soft soils are identified. These measures may include, but are not limited to, the addition of lime to the subgrade soils for drying purposes, or the removal of soft spongy soils and their replacement with crushed limestone. Soft areas should be selectively undercut and backfilled with properly compacted cohesive soil. A geotextile, such as Mirafi HP270, or geogrid, such as Tensar BX1100, or equivalents, may be used to help stabilize particularly soft areas. Where possible, the subgrade should be sloped to provide drainage.

## **5.5 Excavation Bracing Requirements**

In the *Federal Register*, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P". This document was issued to provide for the safety of workers entering excavations, including utility trenches, basements, footings, and others. All operations should be performed under the supervision of qualified site personnel in accordance with OSHA regulations.

## **5.6 Erosion Control and Land Disturbance Monitoring Program**

Appropriate erosion and sediment control measures, such as proper contouring during site grading activities, the installation of siltation fences, and/or inlet protection, should be used during construction to keep eroded materials from being carried onto adjacent properties or waterbodies. Depending on the length of time the subgrade is exposed and the amount of siltation that occurs, it may be necessary to periodically remove materials collected by the sediment control systems. Timely sodding and/or seeding of sloped surfaces will help reduce this potential problem.

SCI recommends following the procedures detailed in the Stormwater Pollution Prevention Plan (SWPPP). Any site disturbing more than one acre of ground must obtain a Land Disturbance Permit from the MDNR. As part of the permit compliance procedures, weekly and rain-event site observations must be performed to document the changing site conditions and maintenance of control measures.

## **6.0 CONSTRUCTION MONITORING PROGRAM**

The following list summarizes SCI's recommendations for a construction monitoring program. These services are recommended to provide quality assurance in assessing design assumptions and to document earth-related construction procedures for compliance with plans, specifications, and good engineering practice. SCI should be retained to:

- **Review final development and grading plans;**
- Participate in a formal preconstruction meeting with the Owner's Representative, Civil Engineer, and Contractor, prior to construction at the site;
- Observe site preparation activities prior to construction, including stripping and proofrolling;
- Conduct and document weekly and rain-event observations at the site, maintain and update on-site paperwork, and provide submittals required by the SWPPP and Land Disturbance Permit;
- Assess the suitability of potential fill materials, including both on-site and off-site sources;
- Monitor placement and compaction of structural fill and backfill;
- Observe foundation excavations and the floor slab subgrade to assess the impact of unsuitable existing fill and expansive fat clay and to recommend the extent of remedial measures;
- Observe footing excavations for adequacy of bearing materials;
- Observe the floor slab subgrade prior to placing base rock;
- Observe backfilling of below-grade utility excavations; and
- Provide quality assurance testing of structural concrete materials.

## **7.0 LIMITATIONS**

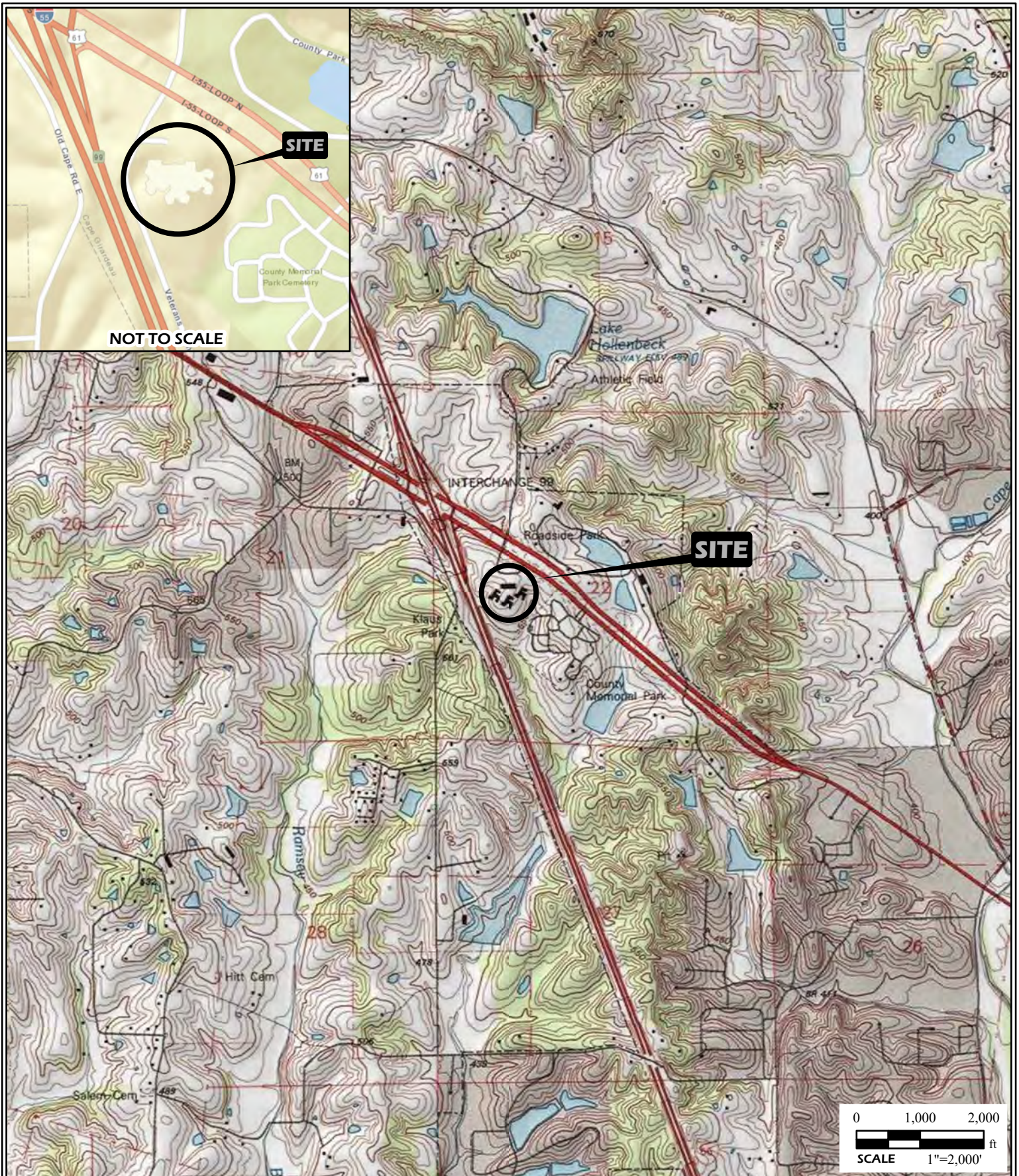
The recommendations provided herein are for the exclusive use of our client. It is imperative that SCI be contacted by any third-party interests to evaluate the applicability of this report relative to use by anyone other than our client. Our recommendations are specific only to the project described, and are not meant to supersede more stringent requirements of local ordinances. They are based on subsurface information obtained at five specific boring locations within the project area; our understanding of the project as presented in Section 2.0, "Site and Project Description"; and geotechnical engineering practice consistent with the standard of care. No other warranty is expressed or implied. SCI should be contacted if conditions encountered are not consistent with those described.



We should also be provided with a set of final development plans, once they are available, to review whether our recommendations have been understood and applied correctly, and to assess the need for additional exploration or analysis. Failure to provide these documents to SCI may nullify some or all of the recommendations provided herein. In addition, any changes in the planned project or changed site conditions may require revised or additional recommendations on our part.

The final part of our geotechnical service should consist of direct observation during construction, to observe that conditions actually encountered are consistent with those described in this report, and to assess the appropriateness of the analyses and recommendations contained herein. SCI cannot assume responsibility or liability for the adequacy of its recommendations without being retained to observe construction.





**PROJECT NAME**  
MISSOURI VETERANS HOME -  
ADDITIONS AND RENOVATIONS  
CAPE GIRARDEAU, MISSOURI

**VICINITY AND TOPOGRAPHIC MAP**

**DRAWN BY** RCV  
**CHECKED BY** CJC

**DATE**  
09/2018

**JOB NUMBER**  
2004-0063.10

**GENERAL NOTES/LEGEND**

USGS TOPOGRAPHIC MAP  
CAPE GIRARDEAU, QUADRANGLE  
DATED 1993  
5' CONTOURS


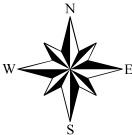
STREET MAP  
[HTTP://GOTO.ARCGISONLINE.COM/MAPS/WORLD\\_STREET\\_MAP](http://GOTO.ARCGISONLINE.COM/MAPS/WORLD_STREET_MAP)



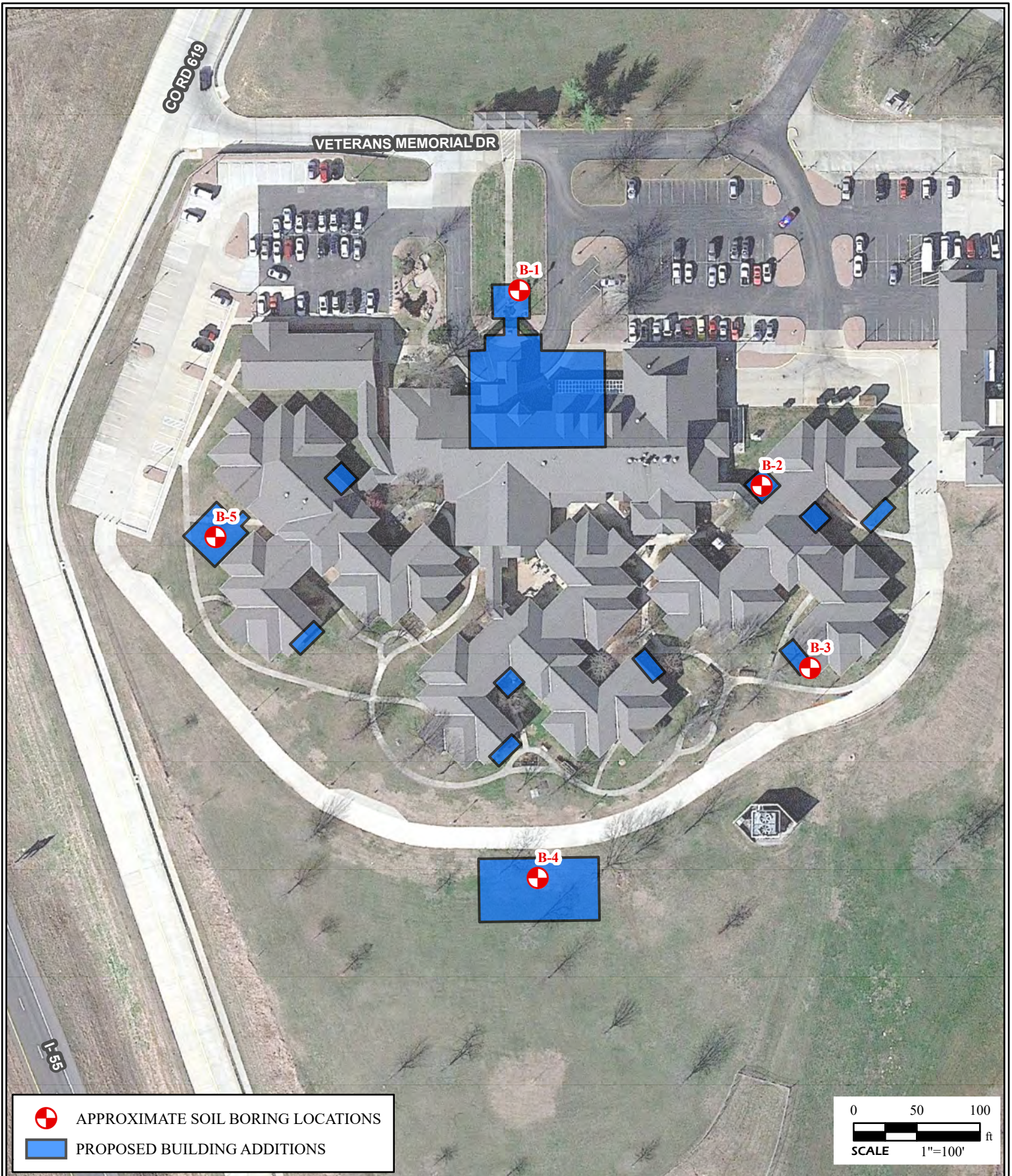
**FIGURE**  
**1**







	<b>PROJECT NAME</b> MISSOURI VETERANS HOME - ADDITIONS AND RENOVATIONS CAPE GIRARDEAU, MISSOURI			<b>GENERAL NOTES/LEGEND</b>  AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 03/2017.  DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.	  <b>FIGURE</b> 2
	AERIAL PHOTOGRAPH				
	<b>DRAWN BY</b>	RCV	<b>DATE</b>	<b>JOB NUMBER</b>	
	<b>CHECKED BY</b>	CJC	09/2018	2004-0063.10	





	<b>PROJECT NAME</b> MISSOURI VETERANS HOME - ADDITIONS AND RENOVATIONS CAPE GIRARDEAU, MISSOURI			<b>GENERAL NOTES/LEGEND</b>  AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, DATED 03/2017.  DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.	  <b>FIGURE</b> 3
	AERIAL SITE MAP				
	<b>DRAWN BY</b> RCV <b>CHECKED BY</b> CJC	<b>DATE</b> 09/2018	<b>JOB NUMBER</b> 2004-0063.10		



# **Appendix A**



**SCI ENGINEERING, INC.**  
130 Point West Boulevard  
St. Charles, Missouri 63301  
636-949-8200  
[www.sciengineering.com](http://www.sciengineering.com)

## BORING LOG LEGEND AND NOMENCLATURE

**Depth** is in feet below ground surface. **Elevation** is in feet mean sea level, site datum, or as otherwise noted.

### Sample Type

- SS** Split-spoon sample, disturbed, obtained by driving a 2-inch-O.D. split-spoon sampler (ASTM D 1586).  
**NX** Diamond core bit, nominal 2-inch-diameter rock sample (ASTM D 2113).  
**ST** Thin-walled (Shelby) tube sample, relatively undisturbed, obtained by pushing a 3-inch-diameter, tube (ASTM D 1587).  
**CS** Continuous sample tube system, relatively undisturbed, obtained by split-barrel sampler in conjunction with auger advancement.  
**SV** Shear vane, field test to determine strength of cohesive soil by pushing or driving a 2-inch-diameter vane, and then shearing by torquing soil in existing and remolded states (ASTM D 2573).  
**BS** Bag sample, disturbed, obtained from cuttings.

**Recovery** is expressed as a ratio of the length recovered to the total length pushed, driven, cored.

**Blows** Numbers indicate blows per 6 inches of split-spoon sampler penetration when driven with a 140-pound hammer falling freely 30 inches. The number of total blows obtained for the second and third 6-inch increments is the N value (Standard Penetration Test or SPT) in blows per foot (ASTM D 1586). Practical refusal is considered to be 50 or more blows without achieving 6 inches of penetration, and is expressed as a ratio of 50 to actual penetration, e.g., 50/2 (50 blows for 2 inches).

For analysis, the N value is used when obtained by a cathead and rope system. When obtained by an automatic hammer, the N value may be increased by a factor of 1.3.

**Vane Shear Strength** is expressed as the peak strength (existing state) / the residual strength (remolded state).

**Description** indicates soil constituents and other classification characteristics (ASTM D 2488) and the Unified Soil Classification (ASTM D 2487). Secondary soil constituents (expressed as a percentage) are described as follows:

Trace	<5
Few	5-15
With	>15-30

**Stratigraphic Breaks** may be observed or interpreted, and are indicated by a dashed line. Transition between described materials may be gradual.

### Laboratory Test Results

- Natural moisture content (ASTM D 2216) in percent.
- Dry density in pounds per cubic foot (pcf).
- Hand penetrometer value of apparently intact cohesive sample in kips per square foot (ksf).
- Unconfined compressive strength (ASTM D 2166) in kips per square foot (ksf).
- Liquid and Plastic Limits (ASTM D 4318) in percent.

**RQD (Rock Quality Designation)** is the ratio between the total length of core segments 4 inches or more in length and the total length of core drilled. RQD (expressed as a percentage) indicates insitu rock quality as follows:

Excellent	90 to 100
Good	75 to 90
Fair	50 to 75
Poor	25 to 50
Very Poor	0 to 25



# BORING LOG

PROJECT Missouri Veterans Home - Additions and Renovations

BORING NUMBER B-1

LOCATION Cape Girardeau, Missouri

SHEET 1 of 1

DRILLER Midwest Drilling, Inc.

HAMMER Auto

PROJECT NO. 2004-0063.10

EQUIPMENT CME-750 w/CFA

ELEV. 98± DATE DRILLED 08/23/18

DEPTH (ft)	SAMPLE				DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS						ELEVATION (ft)
	NUMBER	TYPE	RECOVERY (in/in)	BLOWS (per 6 in)				MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	
3	1	SS	14/18	3 4	FILL: Brown, fat clay, with crushed rock			13		>9.0				96
	2	SS	18/18	2 3	FILL: Brown, lean clay			24		2.5		39	20	93
6	3	SS	11/18	13 14 16	CLAYEY GRAVEL (GC): Fine chert gravel, with fine to coarse sand, clay is red, fat			11						
9	4	SS	15/18	7 8 11	GRAVELLY FAT CLAY (CH): Red and brown, gravel is fine to coarse chert, with fine to coarse sand			27		5.5				90
12					FAT CLAY (CH): Red, brown and gray, with medium to coarse sand, and fine chert gravel									87
15	5	SS	9/18	7 7 9	Becomes reddish-brown and tan, with fine to coarse sand and fine to coarse gravel			27		3.5				84
18	6	SS	18/18	4 5 7	Becomes brown and reddish-brown, trace fine to medium sand			26		2.5				81

Boring terminated at 20 feet.

## WATER LEVEL:

☒ NONE OBSERVED WHILE DRILLING  
 \_\_\_\_\_ ft WHILE DRILLING  
 \_\_\_\_\_ ft \_\_\_\_\_ HRS AFTER DRILLING  
 \_\_\_\_\_ ft \_\_\_\_\_ DAYS AFTER DRILLING

## REMARKS:



# BORING LOG

PROJECT Missouri Veterans Home - Additions and Renovations

BORING NUMBER B-2

LOCATION Cape Girardeau, Missouri

SHEET 1 of 1

DRILLER Midwest Drilling, Inc.

HAMMER Auto

PROJECT NO. 2004-0063.10

EQUIPMENT CME-750 w/CFA

ELEV. 99± DATE DRILLED 08/23/18

DEPTH (ft)	SAMPLE				DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS						ELEVATION (ft)
	NUMBER	TYPE	RECOVERY (in/in)	BLOWS (per 6 in)				MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	
					FILL: Brown and dark brown, fat clay									
3	1	SS	18/18	3 4	LEAN CLAY (CL): Brown, trace fine sand, trace fine chert gravel			23		1.5				96
6	2	SS	18/18	2 3				23		1.5				
					FAT CLAY (CH): Reddish-brown, with coarse sand, some fine sandstone gravel			21		6.0				93
9	3	SS	18/18	4 5				17		3.0				90
					SANDY FAT CLAY (CH): Brown, red and gray, sand is fine to coarse, some fine gravel			21		3.5				87
15	4	SS	18/18	4 7 10				17		3.0				84
18	5	SS	18/18	5 6 11				17		>9.0				81
					GRAVELLY FAT CLAY (CH): Reddish-brown, gravel is fine to coarse chert, with fine to coarse sand			17		>9.0				
	6	SS	18/18	8 11 13				17		>9.0				

Boring terminated at 20 feet.

## WATER LEVEL:

☒ NONE OBSERVED WHILE DRILLING  
 \_\_\_\_\_ ft WHILE DRILLING  
 \_\_\_\_\_ ft \_\_\_\_\_ HRS AFTER DRILLING  
 \_\_\_\_\_ ft \_\_\_\_\_ DAYS AFTER DRILLING

## REMARKS:





# BORING LOG

**PROJECT** Missouri Veterans Home - Additions and Renovations **BORING NUMBER** B-3  
**LOCATION** Cape Girardeau, Missouri **SHEET** 1 of 1  
**DRILLER** Midwest Drilling, Inc. **HAMMER** Auto **PROJECT NO.** 2004-0063.10  
**EQUIPMENT** CME-750 w/CFA **ELEV.** 99± **DATE DRILLED** 08/23/18

DEPTH (ft)	SAMPLE				DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS						ELEVATION (ft)
	NUMBER	TYPE	RECOVERY (in/in)	BLOWS (per 6 in)				MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	
3	1	SS	9/18	8 14 11	FILL: Brown, lean clay, trace fine to coarse chert gravel			12		>9.0				96
	2	SS	12/18	8 8 10	Becomes brown and gray, with fine to coarse chert gravel			12		>9.0		47	30	93
	3	SS	16/18	6 8 12	Becomes brown, no gravel			18		>9.0				90
9	4	SS	14/18	5 6 8				14		>9.0				87
15	5	SS	18/18	3 4 5	Becomes brown and gray			21		3.0				84
18					FAT CLAY (CH): Reddish-brown and brown, trace fine to coarse sand and chert gravel									81
	6	SS	18/18	4 6 7				23		4.5				

Boring terminated at 20 feet.

<b>WATER LEVEL:</b> _____ X _____ NONE OBSERVED WHILE DRILLING _____ ft _____ WHILE DRILLING _____ ft _____ HRS AFTER DRILLING _____ ft _____ DAYS AFTER DRILLING	<b>REMARKS:</b>    
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# BORING LOG

**PROJECT** Missouri Veterans Home - Additions and Renovations **BORING NUMBER** B-4  
**LOCATION** Cape Girardeau, Missouri **SHEET** 1 of 1  
**DRILLER** Midwest Drilling, Inc. **HAMMER** Auto **PROJECT NO.** 2004-0063.10  
**EQUIPMENT** CME-750 w/CFA **ELEV.** 95± **DATE DRILLED** 08/23/18

DEPTH (ft)	SAMPLE				DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS						ELEVATION (ft)
	NUMBER	TYPE	RECOVERY (in/in)	BLOWS (per 6 in)				MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	
3	1	ST	24/24		3" TOPSOIL FAT CLAY (CH): Brown, trace iron nodules									93
	2	SS	18/18	4 6			24	97			2.6			
6	3	SS	18/18	3 4			22			3.0				90
	4	SS	18/18	3 4			23			3.0				87
9	5	SS	18/18	3 4			24			2.0				84
	6	SS	18/18	14 25 32	GRAVELLY FAT CLAY (CH): Reddish-brown, with fine to coarse sand, gravel is fine chert		13			4.0				81
18	7	S2	18/18	4 6	SHALEY FAT CLAY (CH): Tan, gray and orange, with fine sand		16			7.5				78
	8	S2	18/18	4 6										

Boring terminated at 20 feet.

## WATER LEVEL:

X NONE OBSERVED WHILE DRILLING  
 \_\_\_\_\_ ft WHILE DRILLING  
 \_\_\_\_\_ ft \_\_\_\_\_ HRS AFTER DRILLING  
 \_\_\_\_\_ ft \_\_\_\_\_ DAYS AFTER DRILLING

## REMARKS:



# BORING LOG

PROJECT Missouri Veterans Home - Additions and Renovations

BORING NUMBER B-5

LOCATION Cape Girardeau, Missouri

SHEET 1 of 2

DRILLER Midwest Drilling, Inc.

HAMMER Auto

PROJECT NO. 2004-0063.10

EQUIPMENT CME-750 w/CFA

ELEV. 99± DATE DRILLED 08/23/18

DEPTH (ft)	SAMPLE				DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS						ELEVATION (ft)
	NUMBER	TYPE	RECOVERY (in/in)	BLOWS (per 6 in)				MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	
3	1	SS	7/18	4 5 3	FILL: Brown, lean clay, with crushed rock			10		>9.0				96
	2	ST	11/24		FILL: Brown, fat clay			20	107		4.8			
6	3	SS	8/18	4 5 6	FILL: Brown and gray, lean clay, trace roots, some crushed rock Becomes brown and gray, trace roots, some crushed rock			20		>9.0				93
	4	SS	16/18	3 5 5	No crushed rock			22		5.5				
15	5	SS	18/18	4 5 6	Becomes gray, trace organics			24		4.0				84
	6	SS	18/18	4 4 5	Becomes brown and gray, no organics			29		4.5				

## WATER LEVEL:

NONE OBSERVED WHILE DRILLING  
 23.0 ft WHILE DRILLING  
 ft HRS AFTER DRILLING  
 ft DAYS AFTER DRILLING

## REMARKS:



# BORING LOG

**PROJECT** Missouri Veterans Home - Additions and Renovations **BORING NUMBER** B-5  
**LOCATION** Cape Girardeau, Missouri **SHEET** 2 **of** 2  
**DRILLER** Midwest Drilling, Inc. **HAMMER** Auto **PROJECT NO.** 2004-0063.10  
**EQUIPMENT** CME-750 w/CFA **ELEV.** 99± **DATE DRILLED** 08/23/18

DEPTH (ft)	SAMPLE				DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS						ELEVATION (ft)
	NUMBER	TYPE	RECOVERY (in/in)	BLOWS (per 6 in)				MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	
21					FILL: Brown and gray, lean clay ( <i>Continued</i> )									78
24	7	SS	18/18	4 3 6	LEAN CLAY (CL): Brown and gray, trace fine sand and fine chert gravel			18		6.5				75
27					Boring terminated at 25 feet.									72
30														69
33														66
36														63
39														60

## WATER LEVEL:

NONE OBSERVED WHILE DRILLING  
 23.0 ft WHILE DRILLING  
 ft HRS AFTER DRILLING  
 ft DAYS AFTER DRILLING

## REMARKS:

# Important Information about Your Geotechnical Engineering Report

*Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.*

*While you cannot eliminate all such risks, you can manage them. The following information is provided to help.*

## **Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects**

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you — should apply the report for any purpose or project except the one originally contemplated.*

## **Read the Full Report**

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

## **A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors**

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,

- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

## **Subsurface Conditions Can Change**

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

## **Most Geotechnical Findings Are Professional Opinions**

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

## **A Report's Recommendations Are *Not* Final**

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final*, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual



subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

### **A Geotechnical Engineering Report Is Subject to Misinterpretation**

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

### **Do Not Redraw the Engineer's Logs**

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

### **Give Contractors a Complete Report and Guidance**

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time to perform additional study.* Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

### **Read Responsibility Provisions Closely**

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that

have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

### **Geoenvironmental Concerns Are Not Covered**

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

### **Obtain Professional Assistance To Deal with Mold**

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

### **Rely on Your ASFE-Member Geotechnical Engineer for Additional Assistance**

Membership in ASFE/THE BEST PEOPLE ON EARTH exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.



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