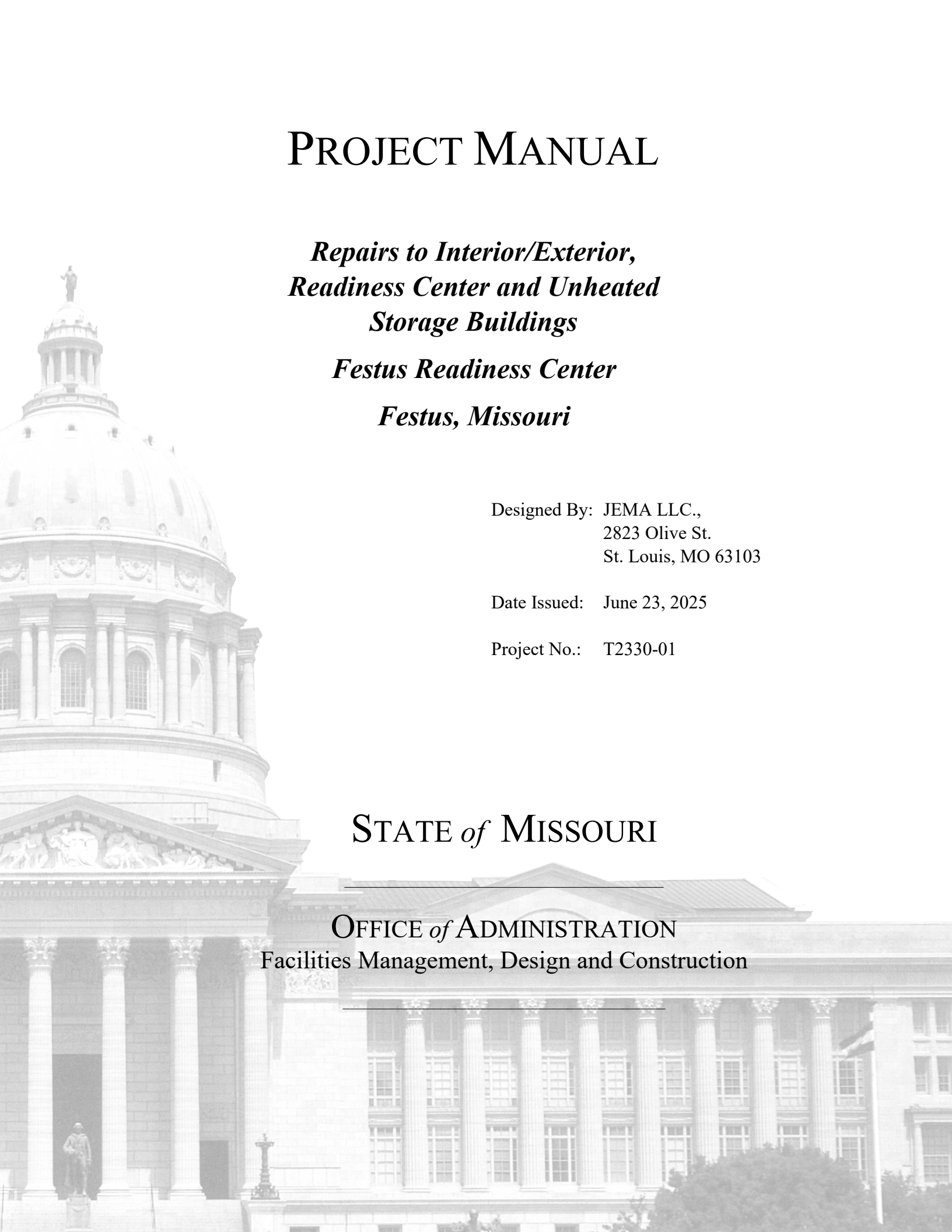




PROJECT MANUAL

*Repairs to Interior/Exterior,
Readiness Center and Unheated
Storage Buildings*

Festus Readiness Center

Festus, Missouri

Designed By: JEMA LLC.,
2823 Olive St.
St. Louis, MO 63103

Date Issued: June 23, 2025

Project No.: T2330-01

STATE *of* MISSOURI

OFFICE *of* ADMINISTRATION
Facilities Management, Design and Construction

**FESTUS READINESS CENTER –
PROJECT # T2330-01**

SITE# 6302

FACILITY # 56377

SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: T2330-01 "Festus Readiness Center"

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:

Architect

John E. Mueller, AIA
MO License #A-2010039774



MEP Engineer

William J. Alkemeyer
MO License # E-27483



06/23/2025

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NOTICE TO BIDDERS

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

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SECTION 000115 DRAWING LIST

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

FESTUS READINESS CENTER

G-001	COVER SHEET
A-00	CODE INFO + SITE PLAN
A-DP-01	1st + 2nd FLOOR DEMO PLAN
A-DP-02	1st FLOOR FLOORING DEMO PLAN
A-DP-03	2nd FLOOR FLOORING DEMO PLAN
A-FP-01	1st FLOOR PLAN
A-FP-02	2nd FLOOR PLAN
A-FP-03	1st FLOOR FINISHES PLAN
A-FP-04	2nd FLOOR FINISHES PLAN
A-RC-01	1st FLOOR REFLECTED CEILING PLAN
A-RC-02	2nd FLOOR REFLECTED CEILING PLAN
A-SH-06	SCHEDULES
M-1	MECH. HVAC PLAN
M-ALT	MECH. HVAC PLAN ALTERNATE
P-1	PLUMBING SANITARY PLAN
P-2	PLUMBING DOMESTIC WATER PLAN
P-3	PLUMBING SANITARY ISOMETRIC VIEW, DETAILS & FIXTURE SCHEDULE
E-1	1st FLOOR RESTROOM ELECTRICAL PLAN
E-2	ONE-LINE DIAGRAM AND SPECIFICATIONS

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. Repairs to Interior/Exterior, Readiness Center and Unheated Storage Buildings
Festus Readiness Center
Festus, Missouri
Project No.: T2330-01

3.0 BIDS WILL BE RECEIVED:

- A. Until: 1:30 PM, August 19, 2025
- B. **Only electronic bids sent to FMDCBids@oa.mo.gov shall be accepted:** (See Instructions to Bidders for further detail)

4.0 DESCRIPTION:

- A. Scope: The project includes renovation and reconfiguration of existing locker rooms and restrooms, new flooring throughout, ceiling tile replacement, roof insulation repairs, and exterior door replacement and repairs.
- B. MBE/WBE/SDVE Goals: MBE 10%, WBE 10%, and SDVE 3%. **NOTE: Only MBE/WBE firms certified by the State of Missouri Office of Equal Opportunity as of the date of bid opening, or SDVE(s) meeting the requirements of Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE participation goals for this project.**

5.0 PRE-BID MEETING:

- A. Place/Time: 11:00 AM, August 5, 2025, at Festus Readiness Center, 2740 Highway P, Festus, MO 63028
- 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: JEMA LLC., Kristin Kendrick AIA, 314-531-7400 ext. 25, email: kkendrick@jemastl.com
- B. Project Manager: Fred L. Decker Jr, 573-751-8521, email: Fred.Decker@oa.mo.gov

8.0 GENERAL INFORMATION:

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

SECTION 002113 – INSTRUCTIONS TO BIDDERS

1.0 - SPECIAL NOTICE TO BIDDERS

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

2.0 - BID DOCUMENTS

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

3.0 - BIDDERS' OBLIGATIONS

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

4.0 - INTERPRETATIONS

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

5.0 - BIDS AND BIDDING PROCEDURE

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

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

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

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

6.0 - SIGNING OF BIDS

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

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

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

7.0 - RECEIVING BID SUBMITTALS

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

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

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

9.0 - AWARD OF CONTRACT

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

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

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

10.0 - CONTRACT SECURITY

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

11.0 - LIST OF SUBCONTRACTORS

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

12.0 - WORKING DAYS

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

13.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

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

14.0 – ANTI-DISCRIMINATION AGAINST ISRAEL ACT CERTIFICATION:

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

15.0 – MBE/WBE/SDVE INSTRUCTIONS

A. Definitions:

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

B. MBE/WBE/SDVE General Requirements:

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

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

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

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

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

D. Certification of MBE/WBE/SDVE Subcontractors:

1. In order to be counted towards the goals, an MBE or WBE must be certified by the State of Missouri Office of Equal Opportunity and an SDVE must be certified by the State of Missouri, Office of Equal Opportunity or by the Federal U.S. Small Business Administration directory.
2. The Bidder may determine the certification status of a proposed MBE or WBE subcontractor or supplier by referring to the Office of Equal Opportunity (OEO)'s online MBE/WBE directory <https://apps1.mo.gov/MWBCertifiedFirms/>. The Bidder may determine the eligibility of a SDVE subcontractor or supplier by referring to the Office of Equal Opportunity online SDVE directory at <https://o eo.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: Repairs to Interior/Exterior,
Readiness Center and Unheated Storage Buildings
Festus Readiness Center
Festus, Missouri

Project Number: T2330-01

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

ARTICLE 3. LIQUIDATED DAMAGES

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

ARTICLE 4. CONTRACT SUM

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

Base Bid: \$

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

TOTAL CONTRACT AMOUNT: (\$CONTRACT AMOUNT)

UNIT PRICES: The Owner accepts the following Unit Prices:

For changing specified quantities of work from those indicated by the contract drawings and specifications, upon written instructions of Owner, the following unit prices shall prevail. The unit prices include all labor, overhead and profit, materials, equipment, appliances, bailing, shoring, shoring removal, etc., to cover the finished work of the several kinds of work called for. Only a single unit price shall be given and it shall apply for either MORE or LESS work than that shown on the drawings and called for in the specifications or included in the Base Bid. In the event of more or less units than so indicated or included, change orders may be issued for the increased or decreased 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)
 - e. Performance and Payment Bond, completed and executed by the Contractor and surety (Section 006113)
 - f. General Conditions (Section 007213)
 - g. Supplementary Conditions (Section 007300)
 - h. Supplementary General Conditions for Federally Funded/Assisted Construction Projects (Section 007333), if applicable
 - i. Wage Rate(s) (Section 007346)
2. Division 1 – General Requirements
3. All Drawings identified in the Project Manual
4. All Technical Specifications included in the Project Manual
5. Addenda, if applicable

ARTICLE 8 – CERTIFICATION

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

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

APPROVED:

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

Contractor's Authorized Signature

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

Corporate Secretary

SECTION 006113 - PERFORMANCE AND PAYMENT BOND FORM

KNOW ALL MEN BY THESE PRESENTS, THAT we _____

as principal, and _____

_____ as Surety, are held and firmly bound unto the

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

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

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

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

(Insert Project Title and Number)

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

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

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

AS APPLICABLE:

AN INDIVIDUAL

Name: _____

Signature: _____

A PARTNERSHIP

Name of Partner: _____

Signature of Partner: _____

Name of Partner: _____

Signature of Partner: _____

CORPORATION

Firm Name: _____

Signature of President: _____

SURETY

Surety Name: _____

Attorney-in-Fact: _____

Address of Attorney-in-Fact: _____

Telephone Number of Attorney-in-Fact: _____

Signature Attorney-in-Fact: _____

NOTE: Surety shall attach Power of Attorney



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

PROJECT NUMBER

PROJECT TITLE AND LOCATION

CHECK APPROPRIATE BOX

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

FROM: BIDDER/CONTRACTOR (PRINT COMPANY NAME)

TO: ARCHITECT/ENGINEER (PRINT COMPANY NAME)

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

SPECIFIED PRODUCT OR SYSTEM

SPECIFICATION SECTION NO.

SUPPORTING DATA

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

QUALITY COMPARISON

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

PREVIOUS INSTALLATIONS

PROJECT	ARCHITECT/ENGINEER
LOCATION	DATE INSTALLED

SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

REASON FOR SUBSTITUTION

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

IF YES, EXPLAIN

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

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

BIDDER/CONTRACTOR

DATE

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

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

☐ Substitution is not accepted.

ARCHITECT/ENGINEER

DATE



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



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 ☒ FINAL	DATE

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

ARTICLE:

1. General Provisions

- 1.1. Definitions
- 1.2. Drawings and Specifications
- 1.3. Compliance with Laws, Permits, Regulations and Inspections
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- 1.11. Indemnification
- 1.12. Disputes and Disagreements

2. Owner/Designer Responsibilities

3. Contractor Responsibilities

- 3.1. Acceptable Substitutions
- 3.2. Submittals
- 3.3. As-Built Drawings
- 3.4. Guaranty and Warranties
- 3.5. Operation and Maintenance Manuals
- 3.6. Other Contractor Responsibilities
- 3.7. Subcontracts

4. Changes in the Work

- 4.1. Changes in the Work
- 4.2. Changes in Completion Time

5. Construction and Completion

- 5.1. Construction Commencement
- 5.2. Project Construction
- 5.3. Project Completion
- 5.4. Payments

6. Bond and Insurance

6.1. Bond

6.2. Insurance

7. Termination or Suspension of Contract

7.1. For Site Conditions

7.2. For Cause

7.3. For Convenience

SECTION 007213 - GENERAL CONDITIONS

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

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

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

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

ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

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

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

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

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

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

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

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

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

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

ARTICLE 1.5 - ANTI-KICKBACK

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

ARTICLE 1.6 - PATENTS AND ROYALTIES

- A. The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liabilities of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article or appliance manufactured or used in the performance of this contract, including its use by the Owner, unless otherwise specifically stipulated in the contract documents.
- B. If the Contractor uses any design, device or materials covered by letters, patent or copyright, the Contractor shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, without exception, that the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract and shall indemnify the Owner for any cost, expense or damage it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

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

ARTICLE 1.8 - COMMUNICATIONS

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

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

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

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

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

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

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

ARTICLE 1.11 - INDEMNIFICATION

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

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

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

ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES

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

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

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

ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES

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

ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS

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

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

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

ARTICLE 3.2 -- SUBMITTALS

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

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

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

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

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

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

ARTICLE 3.3 – AS-BUILT DRAWINGS

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

ARTICLE 3.4 – GUARANTY AND WARRANTIES

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

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

B. Extended Warranty

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

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

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

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

ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES

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

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

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

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

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

ARTICLE 3.7 -- SUBCONTRACTS

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

ARTICLE 4 -- CHANGES IN THE WORK

4.1 CHANGES IN THE WORK

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

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

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

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

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

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

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

ARTICLE 4.2 – CHANGES IN COMPLETION TIME

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

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT

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

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

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

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

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

ARTICLE 5.2 -- PROJECT CONSTRUCTION

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

with the requirements outlined in Section 013200 – Schedules.

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

ARTICLE 5.3 -- PROJECT COMPLETION

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

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

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

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

DEFAULT AND BE GROUNDS FOR CONTRACT TERMINATION AND DEBARMENT.

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

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

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

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

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

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

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

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

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

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

ARTICLE 6 -- INSURANCE AND BONDS

ARTICLE 6.1 -- BOND

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

ARTICLE 6.2 – INSURANCE

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

B. Minimum Scope and Extent of Coverage

1. General Liability

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

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

2. Automobile Liability

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

3. Workers' Compensation and Employer's Liability

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

4. Builder's Risk or Installation Floater Insurance

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

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

C. Minimum Limits of Insurance

1. General Liability

Contractor

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

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

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

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

D. Deductibles and Self-Insured Retentions

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

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

E. Other Insurance Provisions and Requirements

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

1. General Liability

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

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

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

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

2. Automobile Insurance

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

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

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

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

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

3. Workers' Compensation/Employer's Liability

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

4. All Coverages

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

F. Insurer Qualifications and Acceptability

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

G. Verification of Insurance Coverage

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

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

ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

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

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

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

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

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

ARTICLE 7.3 -- FOR CONVENIENCE

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

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

B. Upon receipt of notification, the Contractor shall:

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

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

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

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

SECTION 007300 - SUPPLEMENTARY CONDITIONS

1.0 GENERAL:

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

2.0 CONTACTS:

Designer: Kristin Kendrick AIA
JEMA LLC.,
2823 Olive St.
St. Louis, MO 63103
Telephone: 314-531-7400 ext. 25
Email: kkendrick@jemastl.com

MONG Project Manager /
Construction Representative: Gary Rice
Missouri National Guard-CFMO Office
6819a North Boundary Road
Jefferson City, Missouri 65101
Telephone: 573-638-9740
Email: gary.d.rice18.nfg@army.mil

Project Manager: Fred L. Decker Jr
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: 573-751-8521
Email: Fred.Decker@oa.mo.gov

Contract Specialist: April Howser
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: 573-751-0053
Email: april.howser@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 3 complete sets of drawings and specifications at no charge.
- B. The Owner will furnish the Contractor with approximately 3 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.

6.0 ENVIRONMENTAL MANAGEMENT SYSTEM (eMS):

The Missouri Army National Guard (MOARNG) has implemented an Environmental Management System (eMS). One of the key components of the eMS is the establishment of an Environmental Policy that must be communicated to all persons working for or on behalf of the organization including all suppliers and contractors. This policy stresses commitment to compliance with accepted environmental practices, and meeting or exceeding applicable environmental requirements, legal and otherwise. This policy also stresses commitment to waste minimization, pollution prevention, and management of personnel, processes, real property, and materials in a manner to reduce environmental impacts. The policy is available upon request to all parties by contacting the Environmental Management Office at (573) 638-9514.

7.0 OFF-SITE BORROW & SPOIL DEPOSIT SITES FOR FEDERALLY FUNDED PROJECTS:

All Federally funded projects which involve off-site borrow and/or off-site spoil deposit sites will require written certification that the site(s) are in compliance with the National Environmental Protection Act and all related applicable Federal and State laws and regulations. If the need for off-site borrow and/or spoil sites is stipulated in the Contract Documents, the following applies:

- A. The Contractor is required to use only the designated site described in the Contract Documents. If another off-site area is proposed by the Contractor, the Contractor must provide written certification to the Division of Facilities Management, Design and Construction Project Representative that the proposed borrow or spoil site has been cleared of environmental concerns in accordance with all applicable Federal and State laws and regulations. These include but are not limited to the following: Clean Water Act; the Endangered Species Act; the National Historic Preservation Act (NHPA) (The site must have Section 106 Clearance); the Farmland Protection Act; Resource Conservation and Recovery Act; Comprehensive Environmental Response; Compensation and Liability Act; and RSMo Chapter 194, Section 194.400, Unmarked Human Burial Sites. Certifications shall include clearance letters and other evidence of coordination with the appropriate regulatory agencies. The Missouri Historic Preservation Office, PO Box 176 Jefferson City, MO 65102, may be contacted to provide assistance with the NHPA and cultural resource issues pertaining to the borrow and spoil site regulations. The Missouri State Historic Preservation Office can provide a list of qualified and certified archaeologists to assist in borrow and spoil site investigations.
- B. If project conditions require off-site borrow or off-site deposit of spoils, the Contractor will be required to provide written certification to the Division of Facilities Management, Design and Construction Project Representative that the proposed borrow or spoil site has been cleared of environmental concerns in accordance with all applicable Federal and State laws and regulations. These include but are not limited to the following: Clean Water Act; the Endangered Species Act; the National Historic Preservation Act (NHPA) (The site must have Section 106 Clearance); the Farmland Protection Act; Resource Conservation and Recovery Act; Comprehensive Environmental Response; Compensation and Liability Act; and RSMo Chapter 194, Section 194.400, Unmarked Human Burial Sites. Certifications shall include clearance letters and other evidence of coordination with the appropriate regulatory agencies. The Missouri Historic Preservation Office, PO Box 176 Jefferson City, MO 65102, may be contacted to provide assistance with the NHPA and cultural resource issues pertaining to the borrow and spoil site regulations. The Missouri State Historic Preservation Office can provide a list of qualified and certified archaeologists to assist in borrow and spoil site investigations.
- C. The Owner recognizes that additional time (beyond what is allowed in the Construction Contract) may be required in order to secure the aforementioned certifications and approvals. Should more time be required, the Owner will consider approval of a no-cost time extension contract change. The Contractor will be required to provide documentation that substantiates the need for the time extension.

SECTION 007333 – NATIONAL GUARD - SUPPLEMENTARY GENERAL CONDITIONS
FOR FEDERALLY FUNDED/ASSISTED CONSTRUCTION PROJECTS

1.0 Notice of Federal Funding

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

2.0 Definitions

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

3.0 Conflicting Terms or Conditions

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

4.0 No Obligation by Federal Government

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

5.0 Compliance with Federal Laws, Regulations and Executive Orders

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

6.0 Compliance with Civil Rights Provisions

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: *Provided*, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and sub-contractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

8.0 Prohibition of Segregated Facilities

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

9.0 Copeland "Anti-Kickback" Act

- (1) The Contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract. The Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled.

- (2) The Contractor or subcontractor shall insert in any subcontracts the clause above, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.
- (3) A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a Contractor and subcontractor as provided in 29 C.F.R. 5.12.

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

- (1) Overtime requirements. No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.
- (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1) of this section the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this section, in the sum of \$27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.
- (3) Withholding for unpaid wages and liquidated damages. The Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same prime Contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this section.
- (4) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this section.

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

- (1) A contract award (see 2 C.F.R. 180.220) must not be made to parties listed on the government-wide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 C.F.R. 180 that implement Executive Orders 12549 (3 C.F.R. pt. 1986 Comp., p. 189) and 12689 (3

C.F.R. pt. 1989 Comp., p. 235), “Debarment and Suspension.” SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

- (2) The contractor is required to verify that none of the contractor’s principals (defined at 2 C.F.R. 180.995) or its affiliates (defined at 2 C.F.R. 180.905) are excluded (defined at 2 C.F.R. 180.940) or disqualified (defined at 2 C.F.R. 180.935).
- (3) The contractor must comply with 2 C.F.R. pt. 180, subpart C and the regulations of the granting Federal Agency regarding suspension and debarment and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.
- (4) This certification is a material representation of fact relied upon by the Owner. If it is later determined that the Contractor did not comply with 2 C.F.R. pt. 180, subpart C in addition to remedies available to the Owner, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.
- (5) By submitting a bid, the bidder or proposer agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

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

- (1) Contractors that apply or bid for an award exceeding \$100,000 agree to file the required certification (set forth below), in compliance with 31 U.S.C. § 1352 (as amended).
- (2) Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352.
- (3) Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.

CERTIFICATION REGARDING LOBBYING

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

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

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

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

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

13.0 Procurement of Recovered Materials

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

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

14.0 Fair Labor Standards Act

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

15.0 Access to Records and Reports

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

16.0 Occupational Health and Safety Act

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 C.F.R. pt. 1910 with the same force and effect as if given in full text. The employer must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The employer retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (20 C.F.R. pt. 1910). The employer must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

17.0 Rights to Inventions

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

18.0 Energy Conservation

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

19.0 Clean Air Act and Federal Water Pollution Control Act

- (1) If the amount of the Contract exceeds \$150,000, the Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq. and the Federal Water Pollution Control Act, as amended, 33 U.S.C. § 1251 et seq.
- (2) The Contractor agrees to report each violation to the Owner, and understands and agrees that the Owner will, in turn, report each violation as required to assure notification to the Federal Agency and the appropriate Environmental Protection Agency Regional Office.
- (3) The Contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance.

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

- (1) This contract and employees working on this contract will be subject to the whistleblower rights and remedies in the pilot program on contractor employee whistleblower protections established at 41 U.S.C. § 4712 by section 828 of the National Defense Authorization Act for Fiscal Year 2013 (Pub. L. 112-239) and FAR 3.908.

- (2) The Contractor shall inform its employees in writing, in the predominant language of the workforce, of employee whistleblower rights and protections under 41 U.S.C. § 4712, as described in section 3.908 of the Federal Acquisition Regulation.
- (3) The Contractor shall insert the substance of this clause, including this paragraph (c), in all subcontracts over the simplified acquisition threshold.

21.0 Veteran's Preference

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

22.0 Drug Free Workplace Act

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

23.0 Access Requirements for Persons with Disabilities

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

24.0 Seismic Safety

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

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

The Owner is the recipient of an award of Federal financial assistance from a program for infrastructure for this project. Pursuant to the Build America, Buy America Act of the Infrastructure Investment and Jobs Act

("IIJA"), Pub. L. No. 117-58, none of the funds provided under the Federal award may be used unless the requirements of the domestic content procurement preference outlined below are met. Therefore, the Contractor shall ensure the following:

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

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

Waivers

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

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

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

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

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

Definitions

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

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

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

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

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

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

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

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

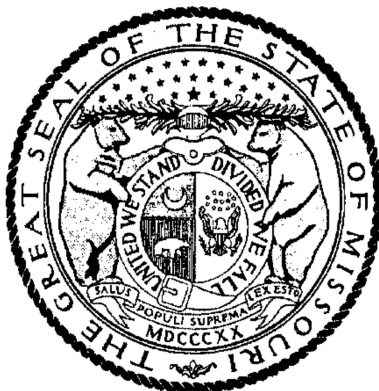
(ii) Telecommunications or video surveillance services provided by such entities or using such equipment.

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

Missouri

Division of Labor Standards

WAGE AND HOUR SECTION



MIKE KEHOE, Governor

Annual Wage Order No. 32

Section 050
JEFFERSON 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 _____

Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: _____ **March 10, 2025**

Last Date Objections May Be Filed: **April 9, 2025**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$66.24
Boilermaker	\$28.74*
Bricklayer-Stone Mason	\$59.41
Carpenter	\$64.36
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$59.34
Plasterer	
Communication Technician	\$28.74*
Electrician (Inside Wireman)	\$78.98
Electrician Outside Lineman	\$81.35
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$28.74*
Glazier	\$28.74*
Ironworker	\$73.17
Laborer	\$54.28
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$28.74*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$74.17
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$55.91
Plumber	\$81.10
Pipe Fitter	
Roofer	\$53.35
Sheet Metal Worker	\$77.43
Sprinkler Fitter	\$28.74*
Truck Driver	\$28.74*
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
JEFFERSON County

Section 050

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$68.17
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$81.35
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$54.78
General Laborer	
Skilled Laborer	
Operating Engineer	\$73.27
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$54.07
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 Repairs to Interior/Exterior of the Festus Readiness Center.
 - 1. Project Location: 2740 State Rd P, Festus, MO 63028-
 - 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 June 23, 2025 were prepared for the Project by JEMA Architects.
- C. The Work consists of Repairs to Interior/Exterior of the Festus Readiness Center.
 - 1. The Work includes renovation and reconfiguration of existing locker rooms and restrooms, new flooring throughout, ceiling tile replacement, roof insulation repairs, and exterior door replacement and repairs.
- D. The Work will be constructed under a single prime contract.

1.3 WORK UNDER OTHER CONTRACTS

- A. Separate Contract: The Owner has awarded a separate contract for performance of certain construction operations at the site. Those operations are scheduled to be substantially complete before work under this Contract begins. The separate contract includes the following:
 - 1. Contract: A separate contract has been awarded to **NONE/NOT APPLICABLE** to **NONE/NOT APPLICABLE**.
- B. Separate Contract: The Owner has awarded a separate contract for performance of certain construction operations at the site. Those operations will be conducted simultaneously with work under this contract. That Contract includes the following:
 - 1. Contract: A separate contract has been awarded to **NONE/NOT APPLICABLE** to **NONE/NOT APPLICABLE**
- C. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.4 FUTURE WORK

- A. Future Contract: The Owner has awarded a separate contract for additional work to be performed at the site following Substantial Completion. Completion of that work depends on successful completion of preparatory work under this Contract. The Contract for future work includes the following:
 - 1. Contract: A separate contract has been awarded to **NONE/NOT APPLICABLE** to **NONE/NOT APPLICABLE**.

1.5 WORK SEQUENCE

- A. The Work will be conducted in a single phase.
 - 1. Phase 1 is the entirety of the work.

1.6 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.
- C. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage cause by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

1.7 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.

1.8 OWNER-FURNISHED PRODUCTS

- A. The Owner will furnish toilet paper and dispensers, paper towels and dispensers, trash receptacles, locker room benches, lockers. The Work includes providing support systems to receive Owner's equipment, and mechanical and electrical connections.
 1. The Owner will arrange for and deliver necessary shop drawings, product data, and samples to the Contractor.
 2. The Owner will arrange and pay for delivery of Owner-furnished items according to the contractor's Construction Schedule.
 3. The Contractor is responsible for receiving, unloading and handling Owner furnished items at the site.
 4. Following delivery, the Contractor will inspect items delivered for damage. The Contractor shall not accept damaged items and shall notify the Owner of rejection of damaged items.
 5. If Owner-furnished items are damaged, defective, or missing, the Owner will arrange for replacement.
 6. The Owner will arrange for manufacturer's field services and for the delivery of manufacturer's warranties to the appropriate Contractor.
 7. The Contractor shall designate delivery dates of Owner-furnished items in the Contractor's Construction Schedule.
 8. The Contractor shall review shop drawings, product data and samples and return them to the Designer noting discrepancies or problems anticipated in use of the project.
 9. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements. The Contractor shall repair or replace items damaged as a result of his operations.

1.9 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 Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
 - 2. Weather allowances.
- C. Related Sections include the following:
 - 1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders 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 Change Order time extension will be executed for “bad weather” days, as defined above, encountered during the remainder of the Project.

1.4 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.

1.5 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- 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.

1.6 COORDINATION

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

1.7 LUMP-SUM ALLOWANCES

- A. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials [selected by Designer] under allowance shall be included as part of the Contract Sum and not part of the allowance.

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 five (5) “bad weather” days.
- B. 5% of ceiling tiles to be replaced throughout. See drawings A-RC-01 and A-RC-02, and specification section 095000 - acoustical tile ceilings.

END OF SECTION 012100

SECTION 012200 – UNIT PRICES

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.
- B. Quantities of Units to be included in the Base Bid are indicated in Section 004322 – Unit Prices.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Unit Prices.
- B. Related Sections include the following:
 - 1. Division 1 Section "Allowances" for procedures for using Unit Prices to adjust quantity allowances.
 - 2. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

- A. Unit Price is a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit Prices include all necessary material plus cost for delivery, installation, insurance, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of Unit Prices. Methods of measurement and payment for Unit Prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of Work in-place that involves use of established Unit Prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of Unit Prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each Unit Price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Unit Price No. 1:

1. Description: Acoustic Ceiling Tile according to Division 09 Section "Acoustical Tile Ceilings"
2. Unit of Measurement: Removal and Replacement per Square Ft.
3. Base Bid Quantity: 750 square feet, equating to approximately 5% of total ceiling area as noted Drawings A-RC-01 and A-RC-02.

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

- B. No additional time will be allowed for alternate work unless the number of work days is so stated on the bid form.

1.4 PROCEDURES

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. The following list price alternates are to be provided as separate line items costs for review and acceptance or rejection by the owner. Each price alternate is to include the complete cost or credit to the owner for the difference between the scope described in the base bid and the scope described in the alternate for the areas affected by the price alternate.

1. **Alternate #1:** *Replace (4) existing mechanical units as indicated on Drawing M-ALT.*
2. **Alternate #2:** *Provide an additional two-component urethane sealer top coat (4 coat total) for FL-02 flooring system. Refer to Division 09 Section "Epoxy Resinous Flooring".*
3. **Alternate #3:** *Replace doors and hardware for Doors #107, 108, 201, and 202. Refer to Door Schedule on Drawing A-SH-06.*
4. **Alternate #4:** *Replace VCT flooring throughout project, as indicated by FL-01 on Drawings A-FP-03 and A-FP-04.*

END OF SECTION 012300

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 REQUESTS FOR INFORMATION

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

- C. Responses from the Designer will not change any requirement of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change to the requirements of the Contract Document, the Contractor shall give written notice to the Designer requesting a Change Order for the work. Failure to give such written notice within ten (10) working days, shall waive the Contractor's right to seek additional time or cost under Article 4, "Changes in the Work" of the General Conditions.

1.4 MINOR CHANGES IN THE WORK

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

1.5 PROPOSAL REQUESTS

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

1.6 CHANGE ORDER PROCEDURES

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 013100 – COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 COORDINATION

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

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

1.4 SUBMITTALS

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

1.5 PROJECT MEETINGS

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013115 - PROJECT MANAGEMENT COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Project Management Communications: The Contractor shall use the Internet web-based project management communications tool, Trimble Unity Construct® (Formerly eBuilder) 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 Trimble Unity Construct® (Formerly eBuilder) as provided by "Trimble Unity Construct®" 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: Trimble Unity Construct® (Formerly eBuilder) 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/BIM files, processes or design information distributed in this system is intended only for the project specified herein.
- D. Purpose: The intent of using Trimble Unity Construct® (Formerly eBuilder) 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 Trimble Unity Construct (Formerly eBuilder) New Company/User Request Form located at the following web site: <https://oa.mo.gov/facilities/vendor-links/contractor-forms>. Completed forms shall be emailed to the following email address: OA.FMDCE-BuilderSupport@oa.mo.gov.
 - 2. Authorized users will be contacted directly and assigned a temporary user password.

3. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.
- F. Administrative Users: Administrative users have access and control of user licenses and all posted items. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!** Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).
- G. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using Trimble Unity Construct® (Formerly eBuilder) 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 Trimble Unity Construct® (Formerly eBuilder) web site by licensed users.
- a. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Subcontractors 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 Subcontractors 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 Subcontractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.
- I. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:
- 1. Providing suitable computer systems for each licensed user at the users normal work location¹ with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
 - 2. Each of the above referenced computer systems shall have the following minimum system² and software requirements:
 - a. Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)
 - 1) Operating System: Windows XP or newer
 - 2) Internet Browser: Internet Explorer 6.01SP2+ (Recommend IE7.0+)
 - 3) Minimum Recommend Connection Speed: 256K or above
 - 4) Processor Speed: 1 Gigahertz and above
 - 5) RAM: 512 mb
 - 6) Operating system and software shall be properly licensed.

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

² The minimum system herein will not be sufficient for many tasks and may not be able to process all documents and files stored in the Trimble Unity Construct® (Formerly eBuilder) Documents area.

- 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

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. See draft Submittal Registry attached at the end of this section.

SPEC SECTION	TITLE	CATEGORY
012100	Allowances	Lump Sum Schedule of Values for Allowances
012300	Alternates	Schedule of Values
013100	Coordination	Shop Drawings
013100	Coordination	List of Subcontractors, with names of key personnel
013200	Schedules - Bar Chart	Construction Schedule
013200	Schedules - Bar Chart	Submittal Schedule
013200	Schedules - Bar Chart	Inspection Schedule
013300	Submittals	Shop Drawings
013300	Submittals	Product Data
013300	Submittals	Sample

013300	Submittals	Operation / Maintenance Manual
013300	Submittals	Warranty
013513.28	Site Security and Health Requirements	Material Safety Data Sheet Submittal
013513.28	Site Security and Health Requirements	Schedule of Proposed Shut Downs
013513.28	Site Security and Health Requirements	List of Employees for background check
015000	Construction Facilities and Temporary Controls	Implementation and termination of temporary utilities.
017900	Demonstration and Training	Operation and Maintenance Data
024119	Selective Demolition	Qualification Data
024119	Selective Demolition	Landfill Records
031300	Rehabilitation of Cast in Place Concrete	Product Data
031300	Rehabilitation of Cast in Place Concrete	Test Report
031300	Rehabilitation of Cast in Place Concrete	Repair Record Documents
033000	Cast in Place Concrete	Product Data
033000	Cast in Place Concrete	Design Mixtures
033000	Cast in Place Concrete	Shop Drawings
042000	Unit Masonry	Product Data
054000	Cold Formed Metal Framing	Product Data
054000	Cold Formed Metal Framing	Shop Drawings
061000	Rough Carpentry	Product Data
061000	Rough Carpentry	Material Certificates
061000	Rough Carpentry	Evaluation Reports
072100	Thermal Insulation	Product Data
081113	Hollow Metal Doors and Frames	Product Data
081113	Hollow Metal Doors and Frames	Shop Drawings
081113	Hollow Metal Doors and Frames	Sample

087100	Door Hardware - Simple	Product Data
087100	Door Hardware - Simple	Sample
087100	Door Hardware - Simple	Shop Drawings
087100	Door Hardware - Simple	Shop Drawings
087100	Door Hardware - Simple	Operation / Maintenance Manual
087100	Door Hardware - Simple	Warranty
087100	Door Hardware - Simple	Shop Drawings
087100	Door Hardware - Simple	Certification
088300	Mirrors	Product Data
088300	Mirrors	Shop Drawings
092900	Gypsum Board	Product Data
095123	Acoustical Tile Ceilings	Product Data
095123	Acoustical Tile Ceilings	Sample
095123	Acoustical Tile Ceilings	Attic Stock
096513	Resilient Base and Accessories	Product Data
096513	Resilient Base and Accessories	Sample
096519	Vinyl Composition Tile	Product Data
096519	Vinyl Composition Tile	Sample
096519	Vinyl Composition Tile	Sustainable Design Submittal
096519	Vinyl Composition Tile	Operation / Maintenance Manual
096700	Epoxy Resinous Flooring	Sample
096700	Epoxy Resinous Flooring	Test Report
096700	Epoxy Resinous Flooring	Operation / Maintenance Manual
096700	Epoxy Resinous Flooring	Shop Drawings
096700	Epoxy Resinous Flooring	Mock up
099113	Exterior Painting	Product Data
099113	Exterior Painting	Drawdown Samples
099113	Exterior Painting	Product List by Item to be Painted
099113	Exterior Painting	Operation / Maintenance Manual
099123	Interior Painting	Product Data
099123	Interior Painting	Drawdown Samples
099123	Interior Painting	Product List by Item to be Painted
099123	Interior Painting	Operation / Maintenance Manual

099656	Epoxy Resinous Wall Coating	Product Data
099656	Epoxy Resinous Wall Coating	Operation / Maintenance Manual
099656	Epoxy Resinous Wall Coating	Mock up
099656	Epoxy Resinous Wall Coating	Sample
102113	Plastic Toilet Partitions	Product Data
102113	Plastic Toilet Partitions	Test Report
102113	Plastic Toilet Partitions	Shop Drawings
102113	Plastic Toilet Partitions	Sample
102113	Plastic Toilet Partitions	Warranty
102113	Plastic Toilet Partitions	Operation / Maintenance Manual
102813	Commercial Bath Accessories	Product Data
102813	Commercial Bath Accessories	Shop Drawings
220503	Common Work Results for Plumbing	As-Built Drawings
220523	General Duty Valves	Product Data
220529	Hangers and Supports for Plumbing Piping and Equipment	Product Data
220548	Vibration and Seismic Controls for Plumbing Piping and Equipment	Product Data
220548	Vibration and Seismic Controls for Plumbing Piping and Equipment	Shop Drawings
220719	Plumbing System Insulation	Product Data
220800	Plumbing Commissioning Specifications	Product Data
221116	Domestic Water Piping	Product Data
221119	Domestic Water Piping Specialties	Product Data
221123	Recirculation Domestic Water Pump	Product Data

221316	Sanitary, Waste and Vent Piping System	Product Data
221613	Natural Gas Piping Systems	Product Data
230501	Common Work Results for HVAC	As-Built Drawings
223000	Commercial Water Heaters	Product Data
223001	Point if Use Thermostatic Mixing Valves	Product Data
224000	Plumbing Fixtures	Product Data
230501	Common Work Results for HVAC	As-Built Drawings
230529	Hangers and supports for HVAC Piping and Ductwork	Product Data
230529	Hangers and supports for HVAC Piping and Ductwork	Shop Drawings
230548	Seismic Control for HVAC	Shop Drawings
230593	Testin, Adjusting and Balancing for HVAC	Certification
230713	Duct Insulation	Product Data
230713	Duct Insulation	Shop Drawings
230719	HVAC Piping Insulation	Product Data
230800	Commisioning of HVAC Systems	Product Data
230993	Sequence of Operations for HVAC Controls	Product Data
233113	Metal Ducts	Product Data
233113	Metal Ducts	Shop Drawings
233423	HVAC Power Ventilators	Product Data

223713	Diffusers, register and Louvers	Product Data
238126	Split System HVAC	Product Data
260501	Common Work Results for Electric	As-Built Drawings
260519	Low-Voltage Electrical Power Conductors and Cables	Product Data
260526	Grounding and Bonding for Electrical Systems	Product Data
260529	Hangers and Supports for Electrical Systems	Product Data
260533	Raceways and Boxes for Electrical Systems	Product Data
260537	J-Hook Pathways for Electrical Systems	Product Data
260543	Underground Ducts and Raceways for Electrical Systems	Product Data
260544	Sleeves and Sleeve Seals for Electrical Raceways and Cabling	Product Data
260548	Vibration and Seismic Controls for Electrical Systems	Shop Drawings
260553	Identification for Electrical Systems	Product Data
260800	Commissioning of Electrical Systems	Product Data
260919	Enclosed Contactors	Product Data
260923	Lighting Control Devices	Product Data
262726	Wiring Devices	Product Data

262813 Fuses

Product Data

262816.16 Enclosed Switches

Product Data

265100 Lighting

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 SUMMARY

- A. This Section includes general Institution rules.
- B. This Section includes requirements for environments that employees are domiciled in, or public participation in program activities in or adjacent to the Scope of Work area:
 - 1. The Contractor shall have the applicable measures specified below in-place any time demolition or construction activities occur in occupied or non-occupied project work areas.
 - 2. The Contractor shall complete all specified cleaning procedures and receive clearance from the Construction Representative prior to removing any barriers and other precautionary measures – even for areas that the employees or public do not occupy during construction.

1.3 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 badges

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 CONTRACTOR BACKGROUND AND ID BADGE PROCESS

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

- wever, if removed from the Rap Back programs, employees will be required to submit new fingerprints should the contractor be awarded another State contract.
8. Upon award of a Contract, the Contractor should contact FMDC at FMDCSecurity@oa.mo.gov to determine if its employees need to provide a new background check. If a Contractor's employee has previously submitted a fingerprint background check to FMDC as part of the Missouri and National Rap Back programs, the employee may not need to submit another fingerprint search for a period of three to six years, depending upon the circumstances. The Contractor understands and agrees that FMDC may require more frequent background checks without providing any explanation to the Contractor. The fact that an additional background check is requested by FMDC does not indicate that the employee has a criminal record.

3.4 DISRUPTION OF UTILITIES

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

3.5 PROTECTION OF PERSONS AND PROPERTY

A. SAFETY PRECAUTIONS AND PROGRAMS

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

biphenyl (PCB), or when it has been rendered harmless by written agreement of the Owner's Representative and the Contractor. "Rendered Harmless" shall mean that levels of such materials are less than any applicable exposure standards, including but limited to OSHA regulations.

B. SAFETY OF PERSONS AND PROPERTY

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

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

END OF SECTION 013513.28

SECTION 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 and temporary elevator 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
 - 10. Temporary toilet units
- D. Security and protection facilities include, but are not limited to, the 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”.
 - 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. 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. Provide the following:
 - 1. One (1) units for Contractor use.
 - 2. One (1) units for owner use only and shall be ADA accessible.
 - 3. An additional Six (6) units shall be made available to owner on drill weekends during the project. (1 weekend per month)
- J. 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 Change Order.
- B. Temporary Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
 - 1. Sterilization: Sterilize temporary water piping prior to use.
- C. 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.
- D. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
 - 1. Install electric power service underground, except where overhead service must be used.
 - 2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125V, AC 20ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
- E. 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.
- F. 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.

- G. Temporary Heating: Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.
 - 1. Heating Facilities: Except where the Owner authorizes use of the permanent system, provide vented, self-contained, LP gas or fuel-oil heaters with individual space thermostatic control.
 - 2. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.
- H. Temporary Heating and Cooling: The normal heating and/or cooling system of the building shall be maintained in operation during the construction. Should the Contractor find it necessary to interrupt the normal HVAC service to spaces, which have not been vacated for construction, such interruptions shall be pre-scheduled with the Construction Representative.
- I. Temporary Telephones: Provide temporary telephone service throughout the construction period for all personnel engaged in construction activities.
 - 1. Telephone Lines: Provide telephone lines for the following:
 - a. Where an office has more than two (2) occupants, install a telephone for each additional occupant or pair of occupants.
 - b. Provide a dedicated telephone for a fax machine in the field office.
 - c. Provide a separate line for the Owner's use.
 - 2. At each telephone, post a list of important telephone numbers.
- J. Temporary Telephones: The Owner will provide telephones within the facility. All construction personnel will be allowed access only to those specific telephones designated by the Construction Representative.
- K. 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.
- L. Temporary Toilets: Use of the Owner's existing toilet facilities will be permitted, so long as facilities are cleaned and maintained in a condition acceptable to the Owner. All construction personnel will be allowed access only to those specific facilities designed by the Construction Representative. At substantial completion, restore these facilities to the condition prevalent at the time of initial use.

- M. Temporary Toilets: The Owner will provide toilets and associated facilities within the building. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative.
- N. 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.
- O. Wash Facilities: The Owner will provide wash facilities within the building. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative.
- P. Drinking-Water Facilities: Provide drinking-water fountains where indicated, including paper cup supply.
- Q. 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).
- R. Drinking-Water Facilities: The Owner will provide drinking water facilities within the building. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative.
- S. 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. Furnish and equip office as follows:
 - 1. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase.
 - 2. Equip with a water cooler and private toilet complete with water closet, lavatory, and medicine cabinet unit with a mirror.

- 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. Available storage areas are shown on the drawings. 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. Storage Facilities: The Owner will provide storage onsite as designated by the Facility Representative or the Construction Representative. Areas for use by the Contractor for storage will be identified at the Pre-Bid Meeting.
- F. Storage Facilities: No areas for storage of building materials can be made available onsite except for on the roof. Loads shall not exceed the loading limits as stated on the drawings. Roofing materials must be craned onto the roof from dedicated parking spaces as arranged by the Contractor with the City; costs of all such arrangements shall be paid by the Contractor. The Contractor shall provide his own security as he finds necessary. Specific locations for storage and craning operations will be discussed at the Pre-Bid Meeting and the Pre-Construction Meeting.
- G. Storage Facilities: No areas for storage of building materials can be made available onsite. The Contractor shall provide for all storage offsite. All off-site storage locations shall be approved by the Construction Representative. The Contractor shall provide his own security as he finds necessary. The Construction Representative shall have access to the off-site storage at all times.
- H. 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.
- I. Construction Parking: Parking at the site will be provided in the areas designated at the Pre-Construction Meeting.

- J. Construction Parking: Contractors must be prepared to discuss their storage and parking needs at the Pre-Bid Meeting. Parking for construction personnel cannot be provided onsite. All parking will be offsite. The Contractor will have to park on the street, in city-owned lots, or in commercial lots. Under no circumstances will any vehicle be parked in a fire lane. Parking on lawns shall be prohibited.
- K. 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.
- L. 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 25SqFt (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.
- M. 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.
- N. 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.
- O. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.
- P. 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.

- Q. 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 are regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- R. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

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 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.
- C. 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.
- D. 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.
- E. 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.
- F. Covered Walkway: Erect a structurally adequate, protective covered walkway for passage of persons along the adjacent public street. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
1. Construct covered walkways using scaffold or shoring framing. Provide wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage. Extend the back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner and the Designer.
- 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 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 <once><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. 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 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. Preinstruction 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 024119 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled
- B. Related Sections:
 - 1. Divisions 01 through 33 Sections for NGBS requirements specific to the work of each of these Sections. Requirements may or may not include reference to NGBS.

1.2 DEFINITIONS

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

1.3 SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.
- B. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.
- C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.4 PREINSTALLATION MEETINGS

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

1.5 QUALITY ASSURANCE

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

1.6 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Hazardous Materials: Hazardous materials may be present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- F. Storage or sale of removed items or materials on-site is not permitted.
- G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

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

- d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
 - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
- 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction.
 - 2. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hiddenspace before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 5. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 6. Dispose of demolished items and materials promptly.

- B. Removed and Salvaged Items:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Owner.
 - 4. Transport items to Owner's storage area on-site designated by Owner.
 - 5. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

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

3.6 CLEANING

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

END OF SECTION 024119

031300 – REHABILITATION OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cleaning of existing concrete surface.
- B. Supply and installation of non-structural, non-metallic, cementitious repair and resurfacing materials for cast-in-place applications.

1.2 RELATED SECTIONS

- A. 033000 – Cast in Place Concrete

1.3 REFERENCES

- A. ASTM C109/C109 M - 13 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- B. ASTM C191 - 13 Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle

1.4 SUBMITTALS

- A. General: Submit samples and manufacturer's product data sheets, installation instructions, etc. in accordance with Division 01 General Requirements Submittal Section.
- B. Test Data: Submit qualified testing data that confirms compliance with specified performance requirements.
- C. Project Record Documents: Submit accurate records of locations of structural reinforcement repairs indicating type of repair and material(s) used.

1.5 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer:
 - a. Must have marketed rapid hardening, high strength cementitious materials in the United States for at least five years and must have completed projects of the same general scope and complexity.
 - b. Repair and resurfacing materials and complementary admixture or bonding agents materials must be manufactured by or approved for use by CTS Cement Manufacturing Corp. (800-929-3030, www.CTScement.com) and distributed by the same or an authorized CTS Cement dealer.

1.6 MOCK-UP(S)

- A. Horizontal Surface Repair: 4 sf total square area demonstrating each type of repair.
- B. All mock-ups must be approved by the Architect and Owner prior to proceeding with work. Mock-ups and samples must remain on site until project completion and final acceptance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver products in original, unopened, undamaged packaging with manufacturer's identification (i.e., brand logo, product name, weight of packaged unit, lot number).

- B. Storage: Store products in a dry location, covered, out of direct sunlight, off the ground, and protected from moisture. Maintain storage temperature required by the manufacturer. Keep materials dry until used. Store bulk sand in a well-drained area on a clean, solid surface. Cover sand to prevent contamination.
- C. Handling: Handle products in accordance with manufacturer's published recommendations.

1.8 SITE / ENVIRONMENTAL CONDITIONS

- A. Temperature: Maintain ambient and surface temperatures between 45°F (°C) and 90°F (32°C). Do not apply materials if ambient temperature falls below 45°F (7°C) within 24 hours of application. Protect from uneven and excessive evaporation during dry weather, windy conditions and strong blasts of dry air.
- B. Substrate: Prior to installation, the substrates must be properly cleaned and prepared to receive repair or resurfacing materials, then inspected for proper preparation and any surface contamination or other conditions that may adversely affect the performance of the materials. Substrate must be free of residual moisture.

1.9 COORDINATION AND SCHEDULING

- A. Coordinate installation of repair or resurfacing materials with all other trades to avoid impeding other construction.
- B. Sufficient manpower must be provided to ensure continuous application and timely finishing.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: CTS Cement Manufacturing Corp., 12442 Knott Street, Garden Grove, CA 92841 (800-929-3030, www.CTScement.com).
- B. Components: Obtain repair or resurfacing materials, complementary admixtures and bonding agents manufactured by CTS Cement from authorized distributors. No substitutions or additions of other materials are permitted without prior written permission from the manufacturer for this project.

2.2 MATERIALS

- A. Fast Setting, Cementitious Repair and Resurfacing Materials – General
 1. Rapid Set® TiltWallFixx: a pre-packaged, high-performance, multi-purpose, non-metallic, cementitious repair and resurfacing material for vertical and overhead concrete surfaces.
 2. Additives and admixture materials must be approved for use by CTS Cement Manufacturing Corp. prior to use. (800-929-3030, www.CTScement.com)
- B. Water: Clean, potable water free of deleterious amounts of silt and dissolved salts.

2.3 MATERIAL PROPERTIES

A. Fast Setting, Cementitious Repair Materials – General

1. Rapid Set[®] TiltWallFixx:
 - a. Minimum performance requirements:

Compressive Strength (ASTM C109)	28 Days	500 psi
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2.4 RELATED MATERIALS

- A. Admixtures: Do not add additional dry materials such as cement, sand, additives or admixtures. Mix only with water. All additives and admixture materials must be approved for use by CTS Cement Manufacturing Corp. prior to use. (800-929-3030, www.CTScement.com)
- B. Curing: Prevent rapid water loss from materials as directed in the manufacturer's product data by use of:
 1. Water Curing

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify project site conditions under provisions of Section 010000.
- B. Compliance: Comply with manufacturer's instructions for installation of repair and resurfacing materials.
- C. Coordinate installation with adjacent work to ensure proper sequencing of construction.
- D. Protect adjacent and surrounding surfaces not specified to receive materials with necessary means to ensure protection.
- E. Advise Contractor of discrepancies preventing proper installation of materials. Do not proceed with the work until unsatisfactory conditions are corrected.

3.2 CLEANING

- A. Protect surrounding area by providing enclosures, barricades and other temporary construction as required to protect adjacent work from damage.
- B. Clean concrete surfaces, cracks and voids of dirt or other contamination using the most appropriate method for proper preparation. Ensure methods are in compliance with material manufacturer's recommendations.
- C. Do not use any of the following cleaning methods unless approved by the Architect and the repair and resurfacing materials manufacturer:
 1. Brushes with wire bristles, grinding with abrasives, solvents, hydrochloric or muriatic acid, sodium hydroxide, caustic soda, or lye.
 2. Soap or detergent that is not non-ionic.
 3. Water washing pressure over 100 psi.

4. Steam-cleaning or steam-generated hot-water washing.
5. Alkaline cleaning agents.
6. Acidic cleaning agents.
7. Abrasive blasting.

3.3 PREPARATION

- A. Bonding surfaces must be clean, sound, and free from any materials that may inhibit bond such as oil, dirt, asphalt, sealing compounds, acids, wax and loose dust and debris. Substrate should be dry or saturated surface dry (SSD) with no standing water during application.

3.4 MIXING

- A. Organize installation personnel and equipment before mixing begins.
- B. Comply with manufacturer's printed instructions.
- C. Adjust water to achieve the desired consistency. Do not exceed manufacturer's recommendations of 9.5 quarts per 50 lb. bag. The use of a low-speed drill is recommended to achieve uniform consistency and proper mixing of product.
- D. All additives and admixture materials must be approved for use by CTS Cement Manufacturing Corp. prior to use. (800-929-3030, www.CTScement.com)
- E. Do not re-temper, add water, or remix after material stiffens. Material that stiffens before use must be discarded.

3.5 APPLICATION

- A. Typical working time is 60 minutes under moderate conditions at 70°F.
- B. Prime and paint in accordance with the paint manufacturer's recommendations.

3.6 CURING

- A. Comply with manufacturer's printed instructions for appropriate curing methods.

3.7 CLEAN-UP

- A. Remove and legally dispose of concrete repair and resurfacing debris material from job site.
- B. Clean excess material from surrounding areas and all tools immediately, before material cures. If materials have cured, remove using mechanical methods that will not damage the substrate.
- C. Clean adjacent surfaces as needed using materials and methods recommended by the manufacturer of the material being cleaned. Remove and replace work that cannot be cleaned to the satisfaction of the Project Designer/Owner.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Slabs-on-grade.
 - 2. Concrete toppings.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer, manufacturer, and testing agency.
- B. Welding certificates.

- C. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
 2. Admixtures.
 3. Form materials and form-release agents.
 4. Steel reinforcement and accessories.
 5. Fiber reinforcement.
 6. Waterstops.
 7. Curing compounds.
 8. Floor and slab treatments.
 9. Bonding agents.
 10. Adhesives.
 11. Vapor retarders.
 12. Semirigid joint filler.
 13. Joint-filler strips.
 14. Repair materials.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency

laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: n/a
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- F. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- G. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- H. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Epoxy-Coated Reinforcing Bars: ASTM A 615, Grade 60 deformed bars, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
1. Portland Cement: ASTM C 150, Type I, Type II, Type I/II, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Silica Fume: ASTM C 1240, amorphous silica.
- C. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Lightweight Aggregate: ASTM C 330 3/4-inch nominal maximum aggregate size.
- E. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 WATERSTOPS

- A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.7 LIQUID FLOOR TREATMENTS

- A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

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

- a. ChemMasters; Chemisil Plus.
- b. ChemTec Int'l; ChemTec One.
- c. Conspec by Dayton Superior; Intraseal.
- d. Curecrete Distribution Inc.; Ashford Formula.
- e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
- f. Edoco by Dayton Superior; Titan Hard.
- g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
- h. Kaufman Products, Inc.; SureHard.
- i. L&M Construction Chemicals, Inc.; Seal Hard.
- j. Meadows, W. R., Inc.; LIQUI-HARD.
- k. Metalcrete Industries; Floorsaver.
- l. Nox-Crete Products Group; Duro-Nox.
- m. Symons by Dayton Superior; Buff Hard.
- n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
- o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

- 1. Products: Retarders and curing compounds shall be compatible with sheet vinyl adhesives specified. Subject to compliance with requirements, provide one of the following:

- a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
- b. BASF Construction Chemicals - Building Systems; Confilm.
- c. ChemMasters; SprayFilm.
- d. Conspec by Dayton Superior; Aquafilm.
- e. Dayton Superior Corporation; Sure Film (J-74).
- f. Edoco by Dayton Superior; BurkeFilm.
- g. Euclid Chemical Company (The), an RPM company; Eucobar.
- h. Kaufman Products, Inc.; Vapor-Aid.

- i. Lambert Corporation; LAMBCO Skin.
 - j. L&M Construction Chemicals, Inc.; E-CON.
 - k. Meadows, W. R., Inc.; EVAPRE.
 - l. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group; MONOFILM.
 - n. Sika Corporation; SikaFilm.
 - o. SpecChem, LLC; Spec Film.
 - p. Symons by Dayton Superior; Finishing Aid.
 - q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
 - r. Unitex; PRO-FILM.
 - s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- 1. Products: Retarders and curing compounds shall be compatible with sheet vinyl adhesives specified. Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals - Building Systems; Kure 1315.
 - b. ChemMasters; Polyseal WB.
 - c. Conspec by Dayton Superior; Sealcure 1315 WB.
 - d. Edoco by Dayton Superior; Cureseal 1315 WB.
 - e. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
 - f. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
 - g. Lambert Corporation; UV Safe Seal.
 - h. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
 - i. Meadows, W. R., Inc.; Vocomp-30.
 - j. Metalcrete Industries; Metcure 30.
 - k. Right Pointe; Right Sheen WB30.
 - l. Symons by Dayton Superior; Cure & Seal 31 Percent E.
 - m. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.
 - 2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used,

by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
 2. Combined Fly Ash and Pozzolan: 25 percent.
 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
 5. Silica Fume: 10 percent.
 6. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
 7. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows: Reference Structural Drawings.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch for smooth-formed finished surfaces.
 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 12 inches and seal with manufacturer's recommended tape.

- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.
- C. Granular Course: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.
 - 1. Place and compact a 1/2-inch- thick layer of fine-graded granular material over granular fill.

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect / Engineer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of

weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

3.9 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot- (3.05-m-) long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:

- a. 1/4 inch.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- G. Slip-Resistive Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
 - 1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 - 2. After broadcasting and tamping, apply float finish.
 - 3. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive aggregate.

3.10 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.11 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least six month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.13 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner may retain a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. Contractor to coordinate his work with Owner's consultant.
- B. Inspections:
 1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes
 - 1. New Clay Facing Brick at infill/repair locations
 - 2. New Concrete Masonry Units at infill/repair locations
 - 3. Mortar.
 - 4. Reinforcement and Anchorage.
 - 5. Flashings.
 - 6. Accessories.
 - 7. Concealed lintel system.

1.3 REFERENCE STANDARDS

- A. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International; 2008.
- B. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International; 2008.
- C. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2005.
- D. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar; 2004.
- E. ASTM C 150 - Standard Specification for Portland Cement; 2007.
- F. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006.
- G. ASTM C 216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2007a.
- H. ASTM C 270 - Standard Specification for Mortar for Unit Masonry; 2007a.
- I. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2007.
- J. ASTM C 979 - Standard Specification for Pigments for Integrally Colored Concrete; 2005.

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. Product Data: Provide data for masonry units and masonry accessories.

1.6 QUALITY ASSURANCE

- A. Match existing adjacent brick areas. Use of reclaimed brick to match is allowed.
- B. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.
- C. Pre-installation Conference: Conduct conference at Project site.
 - 1. Conference to include but is not limited to the following;
 - a. Flashing
 - b. Wall penetrations
 - c. Cavity insulations

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 MATERIALS - GENERAL

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
 - a. Brick
 - a) At infill/repair locations, to match adjacent surrounding brick. Use of reclaimed brick is allowed.
 - b. Substitutions are permitted- See Section 012500 Substitution Procedures.

2.2 CLAY FACING BRICK

- A. Brick Size: Typical brick shall be modular brick with a face dimension of 2-1/4-inches high x 7-5/8-inches long. Brick unit depth shall be 3-5/8-inches except as noted.
- B. Facing Brick: ASTM C 216, Type FBS, Grade SW.
 - 1. Color and texture: As selected by Architect, to match adjacent brick areas in color and texture.
 - 2. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect. Provide special shapes for corners of tower- No mitered brick corners. Sawn brick permitted for mitered corners of inset panels below third floor windows.
 - 3. Shapes that allow for install on octagon bays with no mitering.
 - 4. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

2.3 CONCRETE MASONRY UNITS

- A. Block Size: CMU shall be modular block with a face dimension of 8-inches high x 16-inches long. Block unit depth shall be as indicated on the contract drawings.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- C. Field Applied Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.
 - 1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
 - 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ACM Chemistries; RainBloc.
 - 2. BASF Aktiengesellschaft; Rheopel Plus.
 - 3. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.

2.4 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I; color as required to produce approved color sample. Match adjacent areas of existing masonry in color, texture, joint style.
- B. Hydrated Lime: ASTM C 207, Type O.
- C. Mortar Aggregate: ASTM C 144.
- D. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C 979.
 - 1. Color(s): As selected by Architect from manufacturer's full range to match existing adjacent areas of masonry in color, texture, joint style.
 - 2. Manufacturers:
 - a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments: www.bayferrox.com/
 - b. Davis Colors: www.daviscolors.com.
 - c. Solomon Colors: www.solomoncolors.com.
 - d. Substitutions are permitted- See Section 012500 Substitution Procedures.
- E. Water: Clean and potable.
- F. Accelerating Admixture: Nonchloride type for use in cold weather.
 - 1. Acceptable product: Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
 - 2. Substitutions are permitted- See Section 012500 Substitution Procedures.

2.5 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers of Joint Reinforcement and Anchors:
 - 1. Dur-O-Wal: www.dur-o-wal.com.
 - 2. Hohmann & Barnard, Inc: www.h-b.com.
 - 3. Masonry Reinforcing Corporation of America: www.wirebond.com.
 - 4. Substitutions are permitted- See Section 012500 Substitution Procedures.
- B. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.
 - 1. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
 - 2. Vertical adjustment: Not less than 3-1/2 inches.
 - 3. Seismic Feature: Provide lip, hook, or clip on end of wire ties to engage or enclose not less than one continuous horizontal joint reinforcement wire of 0.1483 inch diameter.
 - 4. Acceptable Products:
 - a. Dayton Superior Corporation.

b. Hohmann & Barnard, Inc..

C. Concealed Lintel System:

1. Provide Halfen concealed lintel system at main entry element.
2. Contractors to provide signed / sealed engineering calculations for the stone, the Halfen system, and the system attachments to the structure.

2.6 FLASHINGS

A. Rubberized Asphalt Flashing: For flashing not exposed to the exterior, self-adhering polymer-modified asphalt sheet; 0.030 inch total thickness; with cross-linked polyethylene top and bottom surfaces. Coordinate use of this product with Architect.

1. Acceptable Manufacturers and Products:

- a. Advanced Building Products Inc.; Peel-N-Seal.
- b. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
- c. Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
- d. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
- e. Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
- f. Hohmann & Barnard, Inc.; Textroflash.
- g. Polyguard Products, Inc.; Polyguard 300.
- h. Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
- i. Williams Products, Inc.; Everlastic MF-40.
- j. Substitutions are permitted- See Section 012500 Substitution Procedures.

B. Asphalt-Coated Copper Flashing: 5-oz./sq. ft. copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry. Coordinate use of this product with Architect.

1. Products: Subject to compliance, provide one of the following:

- a. Advanced Building Products Inc.: Cop-R-Cote.
- b. Dayton Superior Corporation, Dur-O-Wal Division; Copper Coated Thru-Wall Flashing.
- c. Hohmann & Barnard, Inc.: H & B C-Coat Flashing.
- d. Phoenix Building Products: Type ACC-Asphalt Bituminous Coated.
- e. Sandell Manufacturing Co.: Coated Copper Flashing.

2.7 ACCESSORIES

A. Preformed Control Joints: Neoprene material. Provide with corner and tee accessories, fused joints.

1. Manufacturers:

- a. Dur-O-Wal: www.dur-o-wal.com.

- b. Hohmann & Barnard, Inc: www.h-b.com.
 - c. Masonry Reinforcing Corporation of America: www.wirebond.com.
 - d. Substitutions are permitted- See Section 012500 Substitution Procedures.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; 3 in. wide x by maximum lengths available.
 - 1. Manufacturers:
 - a. Dur-O-Wal: www.dur-o-wal.com.
 - b. Hohmann & Barnard, Inc: www.h-b.com.
 - c. Masonry Reinforcing Corporation of America: www.wirebond.com.
 - d. Substitutions are permitted- See Section 012500 Substitution Procedures.
- C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
 - 1. Mortar Diverter: Panels designed for installation at flashing locations.
 - a. Manufacturers:
 - 1) Advanced Building Products Inc; Product Mortar Break: www.advancedflashing.com.
 - 2) Mortar Net USA, Ltd; Product Mortar Net: www.mortarnet.com.
 - 3) Dayton Superior Corporation, Dur-O-Wal Division; Product Polytite MortarStop.
 - 4) Substitutions are permitted- See Section 012500 Substitution Procedures.
- D. Wicking Material: Absorbent rope, made from cotton, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity. Use only for weeps.
- E. Proprietary Non-Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 1. Manufacturers:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.8 MORTAR MIXES

- A. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.

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.
- C. Protect all windows and doors with plastic.

3.3 COLD AND HOT WEATHER REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

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. Match adjacent areas of masonry in coursing.
- D. Brick Units:
 - 1. Coursing: Three units and three mortar joints to equal 8 inches.
 - 2. Mortar Joints: Concave.

3.5 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. 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.
- 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.

3.6 WEEPS/CAVITY VENTS

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

3.7 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.8 REINFORCEMENT AND ANCHORAGE - GENERAL

- A. Place masonry joint reinforcement in first and second horizontal joints above and below openings unless otherwise indicated on contract drawings.
- B. Place continuous joint reinforcement in first and second joint below top of walls unless otherwise indicated on contract drawings.
- C. Lap joint reinforcement ends minimum 6 inches unless otherwise indicated on contract drawings.
- D. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.9 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

- A. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 1.77 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.
- B. Seismic Reinforcement: Connect veneer anchors with continuous horizontal wire reinforcement before embedding anchors in mortar.

3.10 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry or turn up at least 4 inches to form watertight pan at non-masonry construction.
 - 2. Remove or cover protrusions or sharp edges that could puncture flashings.
 - 3. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Extend plastic, laminated, and EPDM flashings to within 1/4 inch of exterior face of masonry.
- C. Lap end joints of flashings at least 4 inches and seal watertight with mastic or elastic sealant.

3.11 LINTELS

- A. Install loose steel lintels over openings.
- B. Maintain minimum 8 inch bearing on each side of opening.

3.12 CONTROL JOINTS

- A. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.13 TOLERANCES

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

3.14 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with non-acidic cleaning solution, compatible with brick and surrounding surfaces.

- D. Use non-metallic tools in cleaning operations.
- E. Protect all windows and doors with plastic.

3.15 PROTECTION

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

END OF SECTION 042000

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Related Documents:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section Includes:
 - 1. Nonload bearing metal stud wall framing, with anchorage and bracing.
 - 2. Ceiling joist framing and bracing, with anchorage and bridging.

1.2 REFERENCES

- A. General:
 - 1. The following documents form part of the Specifications to the extent stated. Where differences exist between codes and standards, the one affording the greatest protection shall apply.
 - 2. Unless otherwise noted, the referenced standard edition is the current one at the time of commencement of the Work.
 - 3. Refer to Division 01 Section "General Requirements" for the list of applicable regulatory requirements.
- B. Federal Specification (FS)
 - 1. FS TT-P-645 Primer, Paint, Zinc-Chromate, Alkyd Type
- C. ASTM International:
 - 1. ASTM A36 / A36M Standard Specification for Carbon Structural Steel
 - 2. ASTM A90 / A90M Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
 - 3. ASTM A653 / A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- D. American Welding Society (AWS):
 - 1. AWS D1.3 Structural Welding Code – Sheet Steel
- E. International Code Council (ICC)
 - 1. Report ER-4943P
- F. Steel Deck Institute (SDI):
 - 1. SDIStandard #1

1.3 SUBMITTALS

- A. Submit under provisions of Division 01 Sections "General Requirements" and "Special Procedures."
- B. Product Data for each product specified.
- C. Shop Drawings: Indicate the following:
 - 1. Indicate component details, framing openings, bearing, anchorage, loading, temporary bracing, welds, type and location of mechanical fasteners, and accessories or items required of other work for complete installation.
 - 2. Detail stud, ceiling joist, bracing, layout.
- D. Submit manufacturers installation instructions for securing studs to tracks and for other framing connections.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold formed framing from corrosion, deformation and other damage during delivery, storage and handling. Damaged framing will be rejected by the University and replaced at no additional cost to the University.
- B. Store cold formed framing off the ground and at a slight angle with a ventilated, waterproof covering.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers listed in ICBO Report ER-4943P, or approved equal.
- B. Substitutions: Under provisions of Divisions 01 Section "General Requirements"

2.2 STEEL FRAMING

- A. Studs, Joists: Formed galvanized sheet steel conforming to ASTM A446 or ASTM A570; channel, hat, open box shaped sections: 14 gauge 0.0713 inches (1.81 mm); 16 gauge 0.0566 inches (1.44 mm); 1-5/8 inch (9.52 mm) deep by varying widths.
- B. Track: Formed galvanized steel; channel shaped; same width as studs, for tight fit; solid web.
 - 1. Minimum Steel Thickness: 14 gauge 0.0713 inches (1.81 mm)

2.3 ACCESSORIES

- A. Bracing, Furring, Bridging: Formed galvanized sheet steel; channel shaped.
- B. Plates, Gussets, Clips: Galvanized formed steel, thickness determined for conditions encountered, in manufacturer's standard shapes.

2.4 FASTENINGS

- A. Self-drilling, self-tapping screws, bolts, nuts, and washers: Hot dip galvanized: ASTM A 90.
- B. Anchorage Devices: Power driven or powder actuated, drilled expansion bolts; or screws with sleeves.
- C. Welding: AWS D1.1.

2.5 FINISHES

- A. Galvanizing: The minimum requirements of ASTM A 955.
- B. Primer: FS TT-P-645, touch-up for galvanized surfaces.

2.6 FABRICATION

- A. Galvanize, touch-up, and prime-paint metal materials used on exterior wall and soffit framing, and roof framing.
- B. Fabricate assemblies framed sections, of sizes and profiles required, with joints fitted, and secured, reinforced, and braced to suit design requirements.
- C. Fit and assemble in largest practical sections for delivery to site and installation.

PART 3 - EXECUTION

3.1 ERECTION

- A. Align floor and ceiling tracks, locating to wall and partition layout. Secure in place with screws or welding at maximum 24 inches (600 mm) O.C.
- B. Place studs at 16 inches (400 mm) O.C., not more than 2 inches (50 mm) from abutting walls, and at each side of openings. Connect studs to tracks using clips and ties, screws, or welding in accordance with manufacturer's instructions.
- C. Flame cutting of cold formed sections is prohibited on the job site.
- D. Construct corners using at least three studs. Double studs at door, window, and sidelite jambs. Install intermediate studs above and below openings to match wall-stud spacing.
- E. Provide deflection allowance below supported horizontal building framing in ceiling or head track for nonload bearing framing.
- F. Attach cross studs or furring channels to studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, grab bars, and other items anchored to partitions or walls.
- G. Install framing between studs for attachment of electrical boxes and other mechanical and electrical items.

- H. Erect load bearing studs one-piece full-length. Splicing and wire tying of framing components is not permitted. Join members forming trusses by welding.
- I. Erect load bearing studs, brace and reinforce to develop full strength to meet design requirements.
- J. The multiple pick method of erection (Christmas treeing) shall not be used.
- K. Set floor or ceiling joists parallel and level, with end bearing, lateral bracing, and bridging in accordance with manufacturer's instructions.
- L. As required, extend stud framing through ceilings, to underside of floor or roof structure above.
- M. As required, extend stud framing to ceiling only. Attach ceiling channel to acoustical ceiling track or ceiling framing securely in accordance with manufacturer's instructions.

END OF SECTION 054000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood blocking and nailers.
 - 2. Wood furring and grounds.
 - 3. Wood sleepers.
 - 4. Utility shelving.
 - 5. Plywood backing panels.

1.3 DEFINITIONS

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

1.4 PERFORMANCE REQUIREMENTS

- A. All horizontal ledgers to be sloped to provide gravity drainage as appropriate for the application.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type installation. Indicate component materials and dimensions and include construction and application details.

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

1.6 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
 1. Wood-preservative-treated wood.
 2. Power-driven fasteners.
 3. Powder-actuated fasteners.
 4. Expansion anchors.
 5. Metal framing anchors.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Retain only first option in first subparagraph below if authorities having jurisdiction require grade stamps on all materials.

3. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece
4. In DOC PS 20, dressed sizes of green lumber are larger than dry lumber.
5. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
6. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece Retain first option and delete list that follows if all rough carpentry must be treated with wood preservative.

D. Application: Wood Preservative-Treated Lumber

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
 2. Nailers.
 3. Cants.
 4. Furring.
 5. Grounds.
 6. Utility shelving.
- B. For items of dimension lumber size, provide Construction or No. 2 lumber Reference drawings for species and grade
- C. For utility shelving, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; Premium or No. 2 Common (Sterling) grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Mixed southern pine; No. 1 grade; SPIB.
 3. Hem-fir or hem-fir (north); Select Merchantable or No. 1 Common grade; NLGA, WCLIB, or WWPA.
 4. Spruce-pine-fir (south) or spruce-pine-fir; Select Merchantable or No. 1 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Mixed southern pine; No. 2 grade; SPIB.
 2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
 4. Eastern softwoods; No. 2 Common grade; NeLMA.
 5. Northern species; No. 2 Common grade; NLGA.
 6. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.
- E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exterior, C-C Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

1. Plywood shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M [
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.6 METAL FRAMING ANCHORS

- A. Reference structural drawings for anchors as indicated. For architectural elements please see below for anchors not indicated on drawings. Retain "Manufacturers" paragraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. Cleveland Steel Specialty Co.
 2. KC Metals Products, Inc.
 3. Phoenix Metal Products, Inc.
 4. Simpson Strong-Tie Co., Inc.
 5. USP Structural Connectors.

- C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.
- D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- E. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
 - 1. Use for wood-preserved-treated lumber and where indicated.
- F. Stainless-Steel Sheet: ASTM A 666, Type 316.
 - 1. Use for exterior locations and where indicated.

2.7 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
- B. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- C. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- E. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 1. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
- F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 1. Use inorganic boron for items that are continuously protected from liquid water.
 2. Use copper naphthenate for items not continuously protected from liquid water.
- H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- I. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 1. Comply with indicated fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
 3. Use common nails unless otherwise indicated. Drive nails snug but do not countersink nail heads.

3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring horizontally and vertically at as indicated.
- C. Furring to Receive Gypsum Board: Install 1-by-2-inch nominal- size furring vertically at as indicated.

3.4 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Plastic Faced Glass-fiber Blanket Insulation. (match Plastic Faced Glass-fiber Blanket Insulation at underside of pre-engineered metal building roof)
 - 2. Spray foam Insulation (Alternate in-lieu of Plastic Faced Glass-fiber Blanket Insulation)

1.3 SUBMITTALS

- A. See Division 01 Section - Submittal Procedures (Electronic), for submittal procedures.
- B. Product Data: For each type of product indicated.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver insulation materials to Project site before installation time.
 - 3. Quickly complete installation and concealment of insulation in each area of construction.

1.5 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.
- B. Owner will provide third party energy rater to perform pre-gyp.bd. thermal by-pass inspections. Contractor will correct all deficiencies prior to installation of gyp. bd..

PART 2 - PRODUCTS

2.1 PLASTIC FACED GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Match existing
 - 2. Johns Manville. Un-faced Fiber Glass Insulation
 - 3. Owens Corning.
 - 4. CertainTeed Corporation.
 - 5. Substitutions are permitted- See Section 012500 Substitution Procedures.
- B. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
- C. Un-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I
 - 1. Thermal Resistance at Roofs: R-38
- D. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide cross ventilation between insulated attic spaces and vented eaves.

2.2 SPRAY FOAM INSULATION (alternate in-lieu of plastic faced glass fiber blanket insulation)

- A. Provide polyurethane-based insulating foam sealant that fills small voids and cracks around building components.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Plastic Faced Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.

3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal doors and frames.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. See Division 01 Section - Submittal Procedures (Electronic), for submittal procedures.
- B. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- C. Shop Drawings: Include the following:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
- D. Samples for Initial Selection: For units with factory-applied color finishes.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

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

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

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

1.8 COORDINATION

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

PART 2 - PRODUCTS

2.1 MATERIALS - GENERAL

- A. Recycled Content Goal: Provide building materials with post-consumer or post-industrial recycled content such that the recycled content constitutes a minimum of 25% of the cost or value of materials used for Project.
- B. Regional Materials Goal: Provide 50% (minimum) of building materials (by cost) that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amweld Building Products, LLC.
 - 2. Benchmark; a division of Therma-Tru Corporation.

3. Ceco Door Products; an Assa Abloy Group company.
4. Curries Company; an Assa Abloy Group company.
5. Deansteel Manufacturing Company, Inc.
6. Firedoor Corporation.
7. Fleming Door Products Ltd.; an Assa Abloy Group company.
8. Habersham Metal Products Company.
9. Karpen Steel Custom Doors & Frames.
10. Kewanee Corporation (The).
11. Mesker Door Inc.
12. Pioneer Industries, Inc.
13. Security Metal Products Corp.
14. Steelcraft; an Ingersoll-Rand company.
15. Windsor Republic Doors.
16. Substitutions are permitted- See Section 012500 Substitution Procedures.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
 1. Design: As indicated on drawings.
 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - a. Fire Door Core: As required to provide fire-protection ratings indicated.
 - b. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than R-4 when tested according to ASTM C 1363.
 - 1) Locations: Exterior doors located in exterior walls.
 3. Vertical Edges for Single-Acting Doors: Square edge.
 4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
 5. Top and Bottom Edges: Closed with flush or inverted 0.042-inch thick, end closures or channels of same material as face sheets.
 6. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 1. Level 2 and Physical Performance Level B (Heavy Duty).
- C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 1 and Physical Performance Level C (Standard Duty).
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as welded.
 3. Frames for Level 2 Steel Doors: 0.053-inch thick steel sheet.
- C. Interior Frames: Fabricated from cold-rolled steel sheet.
 1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as welded for in-place gypsum board partitions.
 3. Frames for Level 1 Steel Doors: 0.042-inch- (1.0-mm-) thick steel sheet.
 4. Frames for Wood Doors: 0.042-inch thick steel sheet.
 5. Frames for Borrowed Lights: 0.042-inch thick steel sheet..
- D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:
 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117 and ANSI/NAAMM-HMMA 861.
- C. Hollow Metal Doors:
1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 2. Glazed Lites: Factory cut openings in doors.
 3. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door

Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.7 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
 - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

- a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including Division 01 Specification Section, apply to the work of this section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Interior doors.
 - b. Exterior and storefront doors.
 - c. Other doors to the extent indicated.
 - 2. Electrified door hardware.
- B. Coordinate the requirements of this Section with those of other sections that interface with finish hardware, particularly:
 - 1. Division 8 and Division 28.

1.3 SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: If directed by Architect to do so, submit samples for exposed door hardware, in specified finish, full size. Tag with full description for coordination with the Door Hardware Schedule. Submit samples before, or concurrent with, submission of the final Door Hardware Schedule.
 - 1. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
- C. Door Hardware Schedule: Prepared by or under the supervision of a certified Architectural Hardware Consultant (AHC) employed by the hardware distributor, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. The hardware schedule shall be signed and embossed with the DHI certification seal of the supervising AHC. The supervising AHC shall attend any meetings related to the project when requested by the architect. 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. Basis of Design – See ‘Basis-of-Design’ door schedule on drawing sheet A-SH-06
 2. Format: Comply with scheduling sequence and vertical format in DHI’s “*Sequence and Format for the Hardware Schedule.*” Submittals not using this format will be rejected.
 3. Organization: Organize the Door Hardware Schedule into door hardware sets matching the Drawings and these specifications indicating complete designations of every item required for each door or opening.
 - a. Use same identifying “set numbers” given in this Section. Coordinate submittal with doors and frames submittals and use same “opening number” identification as given on Drawings and in the Door Schedule.
 - b. Submittals not using numbering identification system shown on Architect’s Drawings and Schedules will be rejected.
 4. 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 each 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. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - i. Wiring Diagrams in accordance with Fire Detection and Alarm Section 28 13 00 Submittals as follows:
 - 1) Elevation Drawing with Finish Hardware Schedule
 - 2) Riser Diagram with Approved and Revised Finish Hardware Schedule
 - 3) Point to Point Wiring Diagrams after Low Voltage Meeting
 5. Architect's approval of schedule does not relieve Contractor of responsibility for furnishing all items specified or obviously required to complete the work or as required by job conditions, including screws, bolts, expansion shields, or other devices necessary or required for proper installation.
 6. 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.
 7. Furnish with first submittal, a list of required lead times for all hardware items.
- D. Keying Schedule: Prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- E. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 01.

- F. Warranties: Special warranties specified in this Section.
- G. Shop Drawings: Details of electrified door hardware, indicating details for wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring. Detail interface between hardware and fire alarm or security system.
- H. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed 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.
- B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 1. Electrified Door Hardware Supplier Qualifications: An Experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, function, and extent to the indicated for this Project, whose work has resulted in construction with a record of successful in-service performance, and who is acceptable to manufacturer of primary materials.
 - a. Electrified Door Hardware Supplier Engineering Responsibility: Prepare data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- C. Regulatory Requirements: Comply with provisions of the following:
 - 1. Where indicated to comply with accessibility requirements, comply with *Americans with Disabilities Act* (ADA), and "Accessibility Guidelines for Buildings and Facilities (ADAAG)".
 - 2. *NFPA 101*: Compliance required for means of egress doors.
 - 3. Electrified Door Hardware: Listed and labeled as defined in *NFPA 70*, Article 100, by a testing agency acceptable to authorities having jurisdiction.
 - 4. Fire-Rated Door Assemblies: Provide door hardware for 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 *NFPA 252*.
- D. Single Manufacturer: Obtain each type of hardware (hinges, latch & locksets, exit devices, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.

- E. Keying Conference: After receipt of approved hardware schedule, Hardware supplier shall initiate a meeting including the owner's representative to determine keying requirements. Upon completion of the initial key meeting, hardware supplier shall prepare a proposed key schedule with symbols and abbreviations as set forth in the door and hardware institute's publication "Keying Procedures, Systems, and Nomenclature". Submit copies of owner approved key schedule for review and field use in quantities as required by Division 01 - General Conditions. Determine during the meeting who will take receipt of the permanent key and cores if applicable.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Contractor is responsible for inventorying the door hardware on receipt and providing secure lock-up for door hardware delivered to Project site.
- B. Handling: 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. Packaging: All hardware shall be delivered in manufacturers' original cartons and shall be clearly marked with set and door number.
- D. Key Delivery: Deliver keys to the contact determined during the keying conference by registered mail or overnight package service.

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 door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, and other related systems.

1.7 PRE-INSTALATION MEETING

- A. Schedule a hardware pre-installation meeting on site to review and discuss the installation of continuous hinges, locksets, door closers, exit devices, overhead stops, and electromechanical door hardware.
- B. Meeting attendees shall be notified 7 days in advance and shall include: Architect, Contractor, Door Hardware Installers (including low voltage hardware), Door Hardware Distributor representative, Manufacturers representative for above hardware items, and any other effected subcontractors or suppliers.
- C. All attendees shall be prepared to distribute installation manuals, hardware schedules, templates, and physical hardware samples.

1.8 WARRANTY

- A. General Warranty: 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 Repairs and Replacements: Upon notice from Owner or Architect, promptly repair or replace defective items together with any work affected in correcting such defects, at no additional cost to the Owner.
- C. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
 - 1. Structural failures including excessive deflection, cracking, or breakage.
 - 2. Faulty operation of operators and door hardware.
 - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- D. Warranty Period:
 - 1. Door Closers (Surface): Thirty (30) year period
 - 2. Exit Devices: Three (3) year period
 - 3. Locks: Ten (10) year period
 - 4. Cylinders: Three (3) year period

1.9 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Parts kits: Furnish manufacturer's standard parts kits for locksets, exit devices, and door closers.
- C. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in "Door Hardware Schedule" indicated in "Hardware Group A, B, and C" on Drawing A-SH-06 to comply with requirements in this Section.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.

2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
 2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.
 3. Basis of Design Products: Where Specifications name a product, or refer to a scheduled product and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - a. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - b. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - c. Evidence that proposed product provides specified warranty.
 - d. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 - e. Samples, if requested.
 4. Product, Manufacturer: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements. Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 5. Owner's Standard: Where Specifications refer to a product or manufacturer as an owner standard, substitutions are not allowed.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
1. Provide Non-Removable Pin (NRP) Hinges at exterior doors
 2. Provide Steel base or Stainless-steel base at all fire rated doors
 3. Provide Stainless-steel base at exterior doors unless specified to use non-ferrous base.

- B. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled product manufactured by Hager Companies, or a comparable product by:
- a. Bommer Industries, Inc.
 - b. IVES Hardware; an Allegion company
 - c. Stanley Commercial Hardware; Div. of The Stanley Works.

2.3 MECHANICAL LOCKS AND LATCHES

- A. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
- B. Mortise Cylinder: BHMA A156.13; Grade 3;.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product manufactured by Hager Companies, owner standard; no substitutions.
- C. Dead Locks: BHMA A156.5; Grade 1.
1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled product manufactured by Hager Companies, or a comparable product by:
- a. Sargent; an ASSA ABLOY Group company.
 - b. Stanley Commercial Hardware; Div. of The Stanley Works

2.4 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
- B. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

2.5 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Match owner's existing keying, and incorporate decisions made in keying conference.
1. Quantity: In addition to one extra key blank for each lock, provide the following:
- a. Cylinder Change Keys: Three (3).
 - b. Master Keys: Five (5).
 - c. Grand Master Keys: Five (5).
 - d. Great-Grand Master Keys: Five (5).

2.6 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3. Grade 1; certified by independent testing lab for minimum 1,000,000 cycles; listed by UL for accident and hazard; and conforming to applicable requirements of NFPA 80 and NFPA 101.
1. Provide roller strikes for rim and surface vertical rod exit devices.
 2. Internal springs: Coil compression type
 3. Provide security dead latching for active latch bolts
 4. Latch Bolts: Self lubricating coating to reduce friction and wear. Plated latchbolts are not acceptable.
 5. Provide flush end caps
 6. Provide dead-latching latch bolts
 7. Touch Pad: Stainless steel with return stroke fluid dampers and rubber bottoming dampers.
 8. Provide filler plates and shim kits as needed for flush mounting of devices on doors.
 9. Devices with exposed rivets or screws on back of device that would be visible through a glass light are not acceptable.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product manufactured by Hager Companies or comparable product by one of the following:
1. Detex Corporation; Advantex Series
 2. Falcon; an Allegion company
 3. Precision; Div of. The Stanley Works
 4. Von Duprin; an Allegion company

2.7 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm.
1. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use.
 2. Provide factory-sized closers that are adjustable to meet field conditions and requirements for opening force.
 3. Closers with pressure release valves are not acceptable.
 4. Mount closers on room side (non-corridor) unless conditions will not permit the proper installation and use of the closer or unless otherwise specified.
 5. On exterior doors, always mount closers on building interior (protected) side unless otherwise specified.
 6. Utilize lowest energy closers whenever possible.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product manufactured by Hager Companies, or comparable product by one of the following:
1. Falcon; an Allegion company
 2. Norton; an ASSA ABLOY Group company
 3. Stanley; Div. of The Stanley Works
 4. LCN; an Allegion company

2.8 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.

1. **Basis-of-Design Product:** Subject to compliance with requirements, provide scheduled product manufactured by Hager Companies, or comparable product by one of the following:
 - a. Baldwin Hardware Corporation.
 - b. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
 - c. IVES Hardware; an Allegion company

2.9 PROTECTION PLATES

A. Kick plates: minimum of 0.050 inch thick as scheduled with four beveled edges. Furnish with sheet metal or wood screws, finished to match plates.

B. Sizes of plates:

1. Kick Plates: 8 inches high by 1 inches less width of door on single doors, 1 inch less width of door on pairs
2. **Basis-of-Design Product:** Subject to compliance with requirements, provide the scheduled product by Hager Companies or comparable product by one of the following:
 - a. Ives; an Allegion Company
 - b. Trimco.
 - c. Hiawatha

2.10 SILENCERS:

A. General: Provide silencers as scheduled, and where the frame does not have an integral weather seal or where another type of seal along the head and jamb is not called for.

B. Metal Frames

1. **Basis-of-Design:** Hager Companies 307D : (3) per single leaf opening, (2) per double leaf opening.

2.11 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. **Basis-of-Design Product:** Subject to compliance with requirements, provide the scheduled product by Hager Companies or comparable product by one of the following:

- a. National Guard Products.
- b. Reese Enterprises, Inc.
- c. Zero International.

2.12 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide the scheduled product by Hager Companies or comparable product by one of the following:
 - a. National Guard Products.
 - b. Reese Enterprises, Inc.
 - c. Zero International.

2.13 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - 3. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.14 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

- B. Mounting Heights: Mount door hardware units at heights indicated or as required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
- C. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- D. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- E. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Replace construction cores with permanent cores as directed by Owner.
 - 2. Furnish permanent cores to Owner for installation.
- F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic. Stops that are a component part of the door closer do meet the requirement to provide door stops.
- H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- J. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- K. 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.

END OF SECTION 087100

SECTION 088300 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes the following types of silvered flat glass mirrors:
 - 1. Glass mirrors.

1.3 SUBMITTALS

- A. See Division 01 Section - Submittal Procedures (Electronic), for submittal procedures.
- B. Product Data: For each type of product indicated.
 - 1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.
- C. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
- C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.
- D. Glazing Publications: Comply with the following published recommendations:
 - 1. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."
- E. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

PART 2 - PRODUCTS

2.1 GLASS MIRRORS

- A. Glass Mirrors, General: Select materials and/or provide supports as required to limit mirrored glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.
- B. Mirror Glass: ASTM C 1503, Mirror Select Quality clear glass, 1/4 inch thick minimum.
 - 1. 24" width unless size noted otherwise on the Drawings.

2.2 MISCELLANEOUS MATERIALS

- A. Mirror Bottom Clips: stainless steel.
- B. Mirror Top Clips: spring loaded stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 INSTALLATION

- A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.
- B. Set mirrors plumb and level, free of optical distortion.
- C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.
- D. Frameless Mirrors: Install a minimum of 2 stainless steel clips with tamperproof stainless steel fasteners at top and bottom of mirror.

3.3 CLEANING AND PROTECTION

- A. Protect mirrors from breakage and contaminating substances resulting from construction operations.
- B. Do not permit edges of mirrors to be exposed to standing water.
- C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.
- D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Interior moisture resistant gypsum board at showers/wet locations.

1.3 SUBMITTALS

- A. See Division 01 Section - Submittal Procedures (Electronic), for submittal procedures.
- B. Product Data: For each type of product.

1.4 PERFORMANCE REQUIREMENTS

- A. National Green Building Standard Requirements: 602.1.11 Tile Backing Materials:
 - 1. Tile backing materials installed under tiled surfaces in wet areas are in accordance with ASTM C1178, C1278, C1288, or C1325.

1.5 QUALITY ASSURANCE

- A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

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

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. USG Corporation.
 - 2. American Gypsum.
 - 3. CertainTeed Corp.
 - 4. Georgia-Pacific Gypsum LLC.

5. National Gypsum Company.
 6. Substitutions are permitted- See Section 012500 Substitution Procedures.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
1. Thickness: 1/2 inch unless noted otherwise in UL assemblies, partition types, and details..
 2. Long Edges: Tapered.
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch unless noted otherwise in UL assemblies, partition types, and details..
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.
- D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
1. Thickness: 1/2 inch unless noted otherwise in UL assemblies, partition types, and details..
 2. Long Edges: Tapered.
- E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: As indicated in UL assemblies, partition types, or details.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10.
- F. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use.
1. Products: Georgia-Pacific Gypsum LLC; DensArmour Plus.
 2. Thickness: As indicated on drawings
 3. Long Edges: Tapered.
 4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. USG Corporation.
 2. American Gypsum.
 3. CertainTeed Corp.
 4. Georgia-Pacific Gypsum LLC.
 5. National Gypsum Company.
 6. Substitutions are permitted- See Section 012500 Substitution Procedures.
- B. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
1. Core: As indicated in UL assemblies, partition types, or details.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.
 - h. Trim for where gypsum board abuts window frames, tub surrounds, communications/media boxes, and other recessed devices with no trim or mud rings: Trim-Tex #9000 tear away vinyl L-trim.

B. Exterior Trim: ASTM C 1047.

1. Material: Hot-dip galvanized steel sheet.
2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound. Use setting-type compound for installing paper-faced metal trim accessories.
3. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Exterior Applications:

1. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 1. Laminating adhesive shall have a VOC content of 50 g/L or less.
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than percent.
- E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
 - b. Substitutions are permitted- See Section 012500 Substitution Procedures.
 2. Acoustical joint sealant shall have a VOC content of 50 g/L or less.
- F. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with

manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

- K. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:

- 1. Wallboard Type: As indicated on Drawings.
- 2. Type X: As indicated on Drawings.
- 3. Ceiling Type: As indicated on Drawings.
- 4. Moisture- and Mold-Resistant Type: As indicated on Drawings.

- B. Single-Layer Application:

- 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated. Top floor ceilings shall be installed in strict accordance with board manufacturer's recommendations to avoid cracking and separation of joints due to truss uplift.
- 2. On partitions/walls, apply gypsum panels vertically (parallel to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
- 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- 5. Gypsum ceiling board at exterior walls: Contractor shall fasten gypsum ceiling board with screws at 6" o.c. where board abuts top plate.

- C. Multilayer Application:

- 1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
- 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
- 3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with

vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Fasten base layers and face layers separately to supports with screws unless noted otherwise for fire rated assemblies.

- D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Apply panels perpendicular to supports, with end joints staggered and located over supports.
 1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
 2. Fasten with corrosion-resistant screws.

3.5 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use where indicated.
 4. U-Bead: Use where indicated.
- D. Exterior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. LC-Bead: Use at exposed panel edges.

3.6 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 09 Sections.
- E. Glass-Mat Gypsum Sheathing Board: Provide skim coat to conceal mesh. See manufacturers finishing directions for balance of information.

3.7 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 095123 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Acoustical tiles for ceilings. 5% of ceiling tiles to be replaced throughout. See drawings A-RC-01 and A-RC-02, and specification section 012100 Allowances.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

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

1.4 SUBMITTALS

- A. See Division 01 Section - Submittal Procedures (Electronic), for submittal procedures.
- B. Product Data: For each type of product.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Tile: Set of full-size Samples of each type, color, pattern, and texture.
 - 2. Concealed Suspension-System Members: 6-inch long Sample of each type.
 - 3. Exposed Moldings and Trim: Set of 6-inch long Samples of each type and color.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Two unopened bundles of each type.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to the National Voluntary Laboratory Accreditation Program (NVLAP) for testing indicated.
- B. Mockups: Build or install mockups in existing grid to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical ceiling area as shown on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical tiles, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.8 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 ACOUSTICAL TILES, GENERAL

- A. Low-Emitting Materials: Acoustical tile ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Source Limitations:

1. Acoustical Ceiling Tile: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

C. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

D. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL TILE SYSTEM

A. Basis of Design:

1. Match Existing.
2. Armstrong Cortega w/ Prelude 15/16 inch suspension system.
3. Substitutions are permitted- See Section 012500 Substitution Procedures.

B. Modular Size: 24 inch x 48 inch; or 24 inch x 48 inch where occurs

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

B. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Per manufacturers directions.

C. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.

D. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical tiles in-place.

E. Seismic Restraint: Seismic restraint shall satisfy and meet the requirements of St. Louis County.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

- A. General: Install acoustical panel ceilings in existing metal suspension system to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Where required, suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger

- involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns.
- D. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Arrange directionally patterned acoustical tiles as follows:
1. Match Existing.
- F. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.
1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
 2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches o.c.
 3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

- A. Acoustical tile ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

3.5 CLEANING

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

END OF SECTION 095123

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient stair accessories.
 - 2. Vinyl Base

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.

- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 RUBBER STAIR ACCESSORIES

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Stair Treads, Risers, and Landings:
 - 1. Manufacturer: Johnsonite.
 - 2. Angle Fit™ Rubber Stair Treads without Integrated Riser – Raised Round Profile
 - 3. Color: As indicated on drawings, finish legend, and finish schedule, or if not indicated, from manufacturer's full standard range of colors.
 - 4. Substitutions are permitted- See Section 012500 Substitution Procedures.

2.2 VINYL WALL BASE

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Vinyl Base:
 - 1. Manufacturer: Johnsonite.
 - 2. Size: 6"
 - 3. Color: As indicated on drawings, finish legend, and finish schedule, or if not indicated, from manufacturer's full standard range of colors.
 - 4. Substitutions are permitted- See Section 012500 Substitution Procedures.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
 - 1. Adhesives shall have a VOC content of 50 g/L or less.
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - 2. Tightly adhere to substrates throughout length of each piece.
 - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

3.4 CLEANING AND PROTECTION

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

END OF SECTION 096513

SECTION 096519 – VINYL COMPOSITION TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Vinyl composition floor tile.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For adhesives, indicating VOC content.
 - 2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
 - 3. Product Data: For chemical-bonding compounds, indicating VOC content.
- C. Samples for Initial Selection: For each type of floor tile indicated.
- D. Samples for Verification prior to installation: Full-size units of each color and pattern of floor tile required.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (30 deg C). Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C), in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).
- C. Close spaces to traffic during floor tile installation.
- D. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 VINYL COMPOSITION FLOOR TILE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Johnsonite, a Tarkett Company; Armstrong Flooring - Imperial Texture or comparable product by one of the following:

1. American Biltrite.
 2. Armstrong World Industries, Inc.
 3. Congoleum Corporation.
 4. Mannington Mills, Inc.
 5. Or approved equal
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.
- C. Wearing Surface: Smooth
- D. Thickness: 0.125 inch (3.2 mm).
- E. Size: 12 by 12 inches (305 by 305 mm).
- F. Colors and Patterns: As selected by Architect from full range of industry colors.
- G. Test data:
1. Resistance to Chemicals, ASTM F 925: Passes
 2. Resistance to Heat, ASTM F 1514: Passes with $\Delta E \leq 8$
 3. Dimensional Stability, ASTM D 3389: Does not exceed 0.024 inches (0.610 mm) per linear foot, maximum
 4. Squareness, ASTM F 2055: Maximum 0.010 inches (0.254 mm)
 5. Static Coefficient of Friction, ASTM D 2047: Minimum 0.5 SCOF
 6. Static Load Limit, ASTM F 970: Passes 150 psi load with no greater than 0.005 inch residual indentation
 7. Indentation (flat surface), ASTM F 1914: Passes

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
1. Adhesives shall have a VOC content of 0 g/L or less.
 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Basis-of-Design Product: Tarkett 122 SpraySmart Adhesive.
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 80 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- H. Roll flooring in both directions using 100 lb (45 kg) three-section roller. Use hand roller in area not reached by 100 lb (45 kg) floor roller.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 - 1. No traffic for 24 hours after installation.
 - 2. No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.
 - 3. Wait 72 hours after installation for performing initial cleaning.
- D. Maintenance: A Regular maintenance program must start after the initial cleaning.

- E. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply **two** coat(s) or as otherwise required by manufacturer's warranty.
- F. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096700 - EPOXY RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED SECTIONS:

1. Cast-in-Place Concrete: Section 03300.
 - a. Concrete sub-floor to be level (maximum variation not to exceed ¼ inch in 10 feet) and to have a steel troweled finish. No curing agents or other additives which could prevent bonding should be used unless the mechanical surface preparation method completely removes the curing agent residue or sealer.
 - b. Slabs on grade must have an efficient puncture resistant vapor barrier placed directly under the slab.
2. Sealants: Section 07920.
3. Gypsum Drywall: Section 09250.
4. Adjacent floor finishes: Division 9.

1.2 SUMMARY

A. Section Includes:

1. Fluid applied seamless flooring with integral cove base.
2. Joint, edge, and termination strips.
3. Prior to installation of structural floor slab, advise General Contractor in writing, of all requirements of concrete substrate regarding finish, level tolerance, curing and below substrate vapor barrier; see INSPECTION in Part 3.
4. Locate all flexible joints required. See submittals below.
5. Accessories necessary for complete installation.

1.3 REFERENCE STANDARDS

The publications listed below from a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Society for Testing and Materials (ASTM) Publications:

- | | |
|-------|--|
| C-307 | Test Method for Tensile Strength of Chemical-Resistant Mortars. |
| C-501 | Test Method for Relative Resistance to Wear Unglazed Ceramic Tile by the Taber Abraser. |
| C-531 | Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing. |

- C-579 Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfaces.
- C-580 Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing.
- C-884 Test Method for Thermal Compatibility Between Concrete and an Epoxy Resin Overlay.
- D-570 Water Absorption of Plastics.
- D-695 Compression Properties of Rigid Plastic.

B. Military Specifications (Mil. Spec.)

- MIL D-3 134 F (Impact Resistance) Section 4.7.3.
- MIL D-3 134 F (Indentation Resistance) Section 4.7.4.
- MIL D-3234 F (Resistance to Elevated Temperature) Section 4.7.5.

C. ACI 301 Specifications for Structural Concrete for Buildings (most recent edition). Committee in Concrete 403 bulletin 59-43, Bond Strength to Concrete.

1.4 DEFINITIONS

- A. Epoxy Resin Flooring specified under this section is referenced on the drawings as 'Poured Epoxy Floor'.

1.5 SYSTEM DESCRIPTION

- A. System shall be 40-60 mil textured epoxy surfacing with broadcast aggregate to form a skid resistant surface. Surface finish coating shall be a two component, 100% solids epoxy, Key #520 or Key #510. Sealer shall be Key #450 pigmented aliphatic urethane.

1.6 SUBMITTALS

- A. Samples: Submit 6 by 6 inch cured samples of flooring system indicating color combination and non-skid properties. Approved samples will be used during installation for product match.
- B. Certified Test: Submit two copies of suppliers/ manufacturers written certification that flooring system meets or exceeds required properties.
- C. Manufacturers Application Instructions: Submit descriptive data and specific recommendations for mixing, application, curing including any precautions of special handling instructions required to comply with the Occupational Safety and Health Act.

- D. Shop Drawings: Shop Drawings shall be furnished showing installation of cove base and termination details, and details at floor material transitions and where adjoining equipment.
 - 1. Locate and provide detailing for flexible joints required for flooring in area of installation.
- E. Maintenance Instructions: Submit current copies of the flooring manufacturer's printed recommendations on maintenance methods and products. Submit in accordance with Section 017823.

1.7 QUALITY ASSURANCE

- A. Materials used in the floor surfacing shall be the products of a single manufacturer.
- B. Installation shall be performed by an applicator with minimum 3 years experience in work of similar nature and scope. Installer must be approved by the manufacturer of the floor surfacing materials. The contractor shall furnish a written statement from the manufacturer that the installer is acceptable.
- C. Installer to verify locations of all flexible joints required by the provisions of this Section and by the recommendations of the related material manufacturers.
 - 1. Joint locations may or may not be shown in drawings.
 - 2. Refer to drawings required under SUBMITTALS above.
- D. Installer to keep daily log of the date of installation, room number, type, color, and method of application of product being installed. Log must be available for inspection by the Architect upon request.
- E. Contractor to have proven experience with specified system.
- F. Portable mock-up: Prior to starting application of flooring, provide full scale portable mock-up to establish acceptable quality, durability, and appearance. Mock-up size must not be less than 4 square feet.
 - 1. Acceptable mock-up to be standard of quality for installed work.
 - 2. Unacceptable installed work to be removed and replaced until acceptable. Aesthetically unacceptable but well bonded work may be overlaid or recoated per Manufacturer's instructions if thickness clearances permit.
- G. Qualifications:
 - 1. Installer: Must be acceptable to Architect, and Manufacturer.

1.8 PROJECT CONDITIONS

- A. Maintain the ambient room and the floor temperatures at 60 degrees Fahrenheit, or above, for a period extending from 72 hours before, during and after floor installation. Concrete to receive surfacing shall have cured for at least 28 days and shall have been free of water for at least 7 days.
- B. Dew Point: Substrate temperature must be minimum of 5 degrees above dew point prior to, during or up to 24 hours after application of flooring system.

C. Illumination: Apply flooring system only where a minimum of 30 footcandles exist when measured 3 feet from surface.

D. Advise other trades of fixtures and fittings not to be installed until flooring is cured and protected.

1.9 PROTECTION

A. Protect adjacent surfaces not scheduled to receive the flooring by masking, or by other means, to maintain these surfaces free of the flooring material.

B. Provide adequate ventilation and fire protection at all mixing and placing operations. Prohibit smoking or use of spark or flame producing devices within 50 feet of any mixing or placing operation.

C. Provide polyethylene or rubber gloves or protective creams for all workmen engaged in applying products containing epoxy.

1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered to project site in original manufacturer's sealed containers including type of material, batch numbers, date of manufacture, and pertinent labels intact and legible.

B. Store materials in dry protected area at a temperature between 60° F to 80° F.

C. Follow all manufacturer's specific instructions and prudent safety practices for storage and handling.

1.11 WARRANTY

A. Contractor to guarantee work under this Section to be free from defects of material and installation for the duration of the warranty period. Defects occurring during warranty period shall be repaired, in a manner satisfactory to the Owner and the Architect, at no additional cost to the Owner.

1. Warranty Period: One (1) Year.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Dur-A-Flex

C. Alternative manufacturers must have as a minimum the standards set forth in this specification and must be preapproved in accordance with project requirements.

2.2 MATERIALS

A. System description: Two component epoxy resin surfacing broadcast with silica aggregate for non-skid texture. Grouted with epoxy resin and sealed with chemical resistant aliphatic urethane.

- B. Prime Coat: Two component penetrating damp-proof epoxy or optional moisture vapor control epoxy primer (consult with Manufacturer for recommended material and thickness).
- C. Aggregates:
 - 1. Blended silica aggregate for base.
 - 2. Broadcast silica aggregate, 30 mesh or 40-60 mesh to match approved sample.
- D. Matrix: Matrix-epoxy/aggregate composition, Key #510 Pigmented or Key #520.
- E. Grout and Topcoats:
 - 1. Two component epoxy grout, Key #510 or Key #520.
 - 2. Two component urethane sealer, Key #450.

2.3 MIXING

- A. Apply flooring to specified physical properties.
- B. Provide slip-resistant, cleanable textured finish. Samples to be approved by Owner and Architect.

2.4 FINISHES

- A. Dur-A-Quartz Q28-21 (2) Grout coats Armor Top Gloss, installed per DAF application guidelines to meet minimum requirements for slip resistance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Obtain Architect's approval of mock-up before installing flooring; see QUALITY ASSURANCE in PART 1.
- B. Preparation of Surface:
 - 1. Inspect surfaces to receive flooring and verify that condition is smooth and free from conditions that will adversely affect execution, permanence, or quality of work.
 - a. Remove all projections, all debris detrimental to flooring system, and dirt, oil contaminates, grease, and surface coatings affecting bond.
 - 2. Notify Architect or Owner in writing prior to commencing work of any conditions deemed unsatisfactory for the installation; installation of flooring materials is understood as acceptance of the substrate as satisfactory.
 - 3. Concrete: The General Contractor shall be responsible for hiring an independent testing service to test for moisture content and moisture vapor emission rate; install no flooring over concrete until the concrete has been cured and is sufficiently dry to achieve acceptable bond with flooring as determined by material manufacturer's recommended bond and moisture tests.
 - a. Effectively remove concrete laitance by steel shot blasting or other method approved by flooring manufacturer.

- b. Concrete slab shall have an efficient puncture-resistant moisture vapor barrier 10 mils thick minimum placed directly under the concrete slab (for slab on grade). Do not use vapor barrier manufactured with recycled material. Testing must be done to verify that the moisture vapor emission rate of the slab does not exceed that as recommended by the manufacturer at time of installation of the flooring or at any future date. Moisture vapor emission and moisture content testing must conform with the requirements of ASTM F-1869-98 (Calcium Chloride Test) and ASTM F-2170-02 (Relative Humidity Probe Test). If test results show excessive levels of moisture content or vapor emission rate, apply manufacturer's recommended moisture vapor emission control material at required thickness.
- c. Treat cracks in concrete using manufacturer's recommended practices. Rout out crack and fill with rigid epoxy; Reinforce crack with fiberglass cloth. Refer to section 3.02.B.

3.2 INSTALLATION

- A. Install all floor materials in strict conformance with manufacturer's instructions.
- B. Route out all cracks (larger than 1/16" width) and fill with Key Crack Filler or other material approved by Manufacturer of floor materials. Reinforce crack with fiberglass cloth using Key #502 Primer or the epoxy used to fill the crack.
- C. Prime entire surface with recommended primer or moisture vapor control primer.
- D. Apply epoxy and broadcast aggregate to achieve a total minimum thickness of 40-60 mils after application of grout and topcoats.
- E. Apply epoxy grout coat and urethane sealer to provide a uniform, dense surface.
- F. Installed per DAF application guidelines to meet minimum requirements for slip resistance.
- G. Match finished work to approved samples, uniform in thickness, sheen, color, pattern and texture, and free from defects detrimental to appearance.
- H. Integral Cove Base: Where scheduled, provide integral cove base formed from flooring over tile backerboard as specified under 09250 - Gypsum Drywall. Provide cove cap strip at top of base as recommended by flooring manufacturer and trowel material up wall to form smooth, integral transition and base 4-6 inches high unless otherwise indicated or scheduled.
- I. Apply temporary protection until floor is fully cured. The General Contractor shall protect the finished floor from the time that the sub-contractor completes the work.

END OF SECTION 096700

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates – exterior doors, jambs and sidelights only:
 - 1. Steel.
 - 2. Galvanized metal.
 - 3. Aluminum (not anodized or otherwise coated).
- B. Related Requirements:
 - 1. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Label each coat of each Sample.
 - 3. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Indicate VOC content.

1.4 CLOSEOUT SUBMITTALS

- A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used,

product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacture's label with the following information:

1. Product name and type (description).
2. Batch date.
3. Color number.
4. VOC content.
5. Environmental handling requirements.
6. Surface preparation requirements.
7. Application instructions.

- B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
- D. Hazardous Materials: Hazardous materials including lead paint [are] [may be] present in buildings and structures to be painted. A report on the presence of known hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified.
 - 2. Perform preparation for painting of substrates known to include lead paint in accordance with EPA Renovation, Repair and Painting Rule and additional requirements of authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); products.
- B. Comparable Products: Comparable products of approved manufacturers will be considered in accordance with Section 012500 "Substitution Requirements," and the following:
 - 1. Products are approved by manufacturer in writing for application specified.
 - 2. Products meet performance and physical characteristics of basis of design product including published ratio of solids by volume, plus or minus two percent.
- C. Source Limitations: Obtain paint materials from single source from single listed manufacturer.
 - 1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content: For field applications, provide paints and coatings that complies with VOC content limits of authorities having jurisdiction.

C. Colors: As selected by Architect from manufacturer's full range.

1. 80 percent of surface area will be painted with deep tones.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.

1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer[.] [but not less than the following:]
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
 - 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
 - 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- G. Aluminum Substrates: Remove loose surface oxidation.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint entire exposed surface of window frames and sashes.

5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
1. Contractor shall touch up and restore painted surfaces damaged by testing.
 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Ferrous Metal, Galvanized-Metal, and Aluminum Substrates:
1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer, water based.

- 1) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, 5.0 to 10.0 mils (0.127 to 0.254 mm) wet, 2.0 to 4.0 mils (0.051 to 0.102 mm) dry.
- b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
- c. Topcoat: Light industrial coating, exterior, water based eggshell.
- 1) S-W Pro Industrial Eg-Shel Acrylic B66-660 Series, at 2.5 to 4.0 mils (0.064 to 0.102 mm) dry, per coat.
- d. Topcoat: Light industrial coating, exterior, water based, semi-gloss.
- 1) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils (0.064 to 0.102 mm) dry, per coat.
- e. Topcoat: Light industrial coating, exterior, water based, gloss.
- 1) S-W Pro Industrial Acrylic Gloss Coating, B66-600 Series, at 2.5 to 4.0 mils (0.064 to 0.102 mm) dry, per coat.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete masonry units (CMU).
 - 2. Steel.
 - 3. Galvanized metal.
 - 4. Aluminum (not anodized or otherwise coated).
 - 5. Wood.
 - 6. Gypsum board.
- B. Related Requirements:
 - 1. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Label each coat of each Sample.
 - 3. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Indicate VOC content.

1.4 CLOSEOUT SUBMITTALS

1. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint: 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling: Deliver products to Project site in undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer's label with the following information:
 1. Product name and type (description).
 2. Batch date.
 3. Color number.
 4. VOC content.
 5. Environmental handling requirements.

6. Surface preparation requirements.
7. Application instructions.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

C. Lead Paint: It is not expected that lead paint will be encountered in the Work.

1. If suspected lead paint is encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The):

B. Comparable Products: Comparable products of approved manufacturers will be considered in accordance with Section 012500 "Substitution Procedures," and the following:

1. Products are approved by manufacturer in writing for application specified.
2. Products meet performance and physical characteristics of basisofdesign product including published ratio of solids by volume, plus or minus two percent.

C. Source Limitations: Obtain paint materials from single source from single listed manufacturer.

1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall provide materials that comply with VOC limits of authorities having jurisdiction and for interior paints and coatings applied at Project site, the following VOC limits exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: 50 g/L.
 2. Nonflat Paints and Coatings: 150 g/L.
 3. Primers, Sealers, and Undercoaters: 200 g/L.
 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 5. Floor Coatings: 100 g/L.
 6. Shellacs, Clear: 730 g/L.
 7. Shellacs, Pigmented: 550 g/L.
- C. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small Scale Environmental Chambers."
- D. Colors: As selected by Architect from manufacturer's full range
1. 30 percent of surface area will be painted with deep tones.

2.3 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and

primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.

1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Masonry (Clay and CMU): 12 percent.
 - c. Wood: 15 percent.
 - d. Gypsum Board: 12 percent.
 - e. Plaster: 12 percent.
2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
3. Plaster Substrates: Verify that plaster is fully cured.
4. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

- C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
1. Concrete Floors: Remove oil, dust, grease, dirt, and other foreign materials. Comply with SSPC-SP-13/NACE 6 or ICRI 03732.

- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer[.] [but not less than the following:]
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
 - 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
 - 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - 2. Sand surfaces that will be exposed to view, and dust off.
 - 3. Prime edges, ends, faces, undersides, and backsides of wood.
 - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
 - 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. CMU Substrates:

1. Latex System:

- a. Block Filler: Block filler, latex, interior/exterior:

- 1) S-W Loxon Block Filler, A24W200, at 10.0 mils (0.254 mm) wet, 8.0 mils (0.203 mm) dry, per coat.

- b. Intermediate Coat: Latex, interior, matching topcoat.

- c. Topcoat: Latex, interior, semi-gloss:

- 1) S-W ProMar 400 Zero VOC Latex Semi-Gloss, B31-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.

B. Metal Substrates (Aluminum, Steel, Galvanized Steel):

1. Latex System:

- a. Prime Coat: Primer, rust-inhibitive, water based:

- 1) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10 mils (0.127 to 0.254 mm) wet, 2.0 to 4.0 mils (0.051 to 0.102 mm) dry.

- b. Intermediate Coat: Water-based acrylic, interior, matching topcoat.

- c. Topcoat: Water-based acrylic, gloss:

- 1) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-660 Series, at 2.5 to 4.0 mils (0.064 to 0.102 mm) dry, per coat.

C. Wood Substrates: Including exposed wood items not indicated to receive shop-applied finish.

1. Latex System:

- a. Prime Coat: Primer sealer, latex, interior:

- 1) S-W PrepRite ProBlock Primer Sealer, B51-620 Series, at 4.0 mils (0.102 mm) wet, 1.4 mils (0.036 mm) dry.

- b. Intermediate Coat: Latex, interior, matching topcoat.

- c. Topcoat: Latex, interior, eggshell:

- 1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series, at 4.0 mils (0.102 mm) wet, 1.7 mils (0.043 mm) dry, per coat.

d. Topcoat: Latex, interior, semi-gloss:

- 1) S-W ProMar 200 Zero VOC Latex Semi-Gloss, B31-2600 Series, at 4.0 mils (0.102 mm) wet, 1.6 mils (0.041 mm) dry, per coat.

D. Gypsum Board Ceiling Substrates:

1. Latex System:

a. Prime Coat: Primer, latex, interior:

- 1) S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils (0.102 mm) wet, 1.0 mils (0.025 mm) dry.

b. Intermediate Coat: Latex, interior, matching topcoat.

c. Topcoat: Latex, interior, semi-gloss:

- 1) S-W ProMar Interior Latex Ceiling Paint

E. Gypsum Board Substrates:

1. Latex System:

a. Prime Coat: Primer, latex, interior:

- 1) S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils (0.102 mm) wet, 1.0 mils (0.025 mm) dry.

b. First Coat: Latex, interior, matching topcoat.

c. Topcoat: Latex, interior, satin:

- 1) S-W Paint Pro-Mar 200 Zero VOC Latex, at 4.0 mils (0.102 mm) wet, 1.8 mils (0.046 mm) dry, per coat. Brush and roll application only.

END OF SECTION 099123

SECTION 099656 - EPOXY RESINOUS WALL COATING

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. Epoxy wall coating system as shown on the drawings and in schedules.
- B. Related sections include the following:
 - 1. Concrete Curing, section 03 39 00
 - 2. Unit Masonry, section 04 20 00
 - 3. Plaster and Gypsum Board, section 09 20 00

1.3 SYSTEM DESCRIPTION

- A. The work shall consist of preparation of the substrate, the furnishing and application of a epoxy based wall coating system, with fiberglass reinforcing and urethane topcoats. The system shall have the color and texture as specified by the Owner with a nominal thickness of 42 mils. It shall be applied to the prepared area(s) as defined in the plans strictly in accordance with the Manufacturer's recommendations.

1.4 SUBMITTALS

- A. Product Data: Latest edition of Manufacturer's literature including performance data and installation procedures.
- B. Manufacturer's Safety Data Sheet (SDS) for each product being used.
- C. Samples: A 3 x 3 inch square sample of the proposed system. Color, texture, and thickness shall be representative of overall appearance of finished system subject to normal tolerances.

1.5 QUALITY ASSURANCE

- A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.
- B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.
- C. No requests for substitutions shall be considered that would change the generic type of the specified System.
- D. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.
- E. System shall be in compliance with the Indoor Air Quality requirements of California section 01350 as verified by a qualified independent testing laboratory.

- F. A pre-installation conference shall be held between Applicator, General Contractor and the Owner to review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.
- G. Portable mock-up: Prior to starting application of flooring, provide full scale portable mock-up to establish acceptable quality, durability, and appearance. Mock-up size must not be less than 4 square feet.
 - 1. Acceptable mock-up to be standard of quality for installed work.
 - 2. Unacceptable installed work to be removed and replaced until acceptable. Aesthetically unacceptable but well bonded work may be overlaid or recoated per Manufacturer's instructions if thickness clearances permit.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Packaging and Shipping
 - 1. All components of the system shall be delivered to the site in the Manufacturer's packaging, clearly identified with the product type and batch number.
- B. Storage and Protection
 - 1. The Applicator shall be provided with a storage area for all components. The area shall be between 60 F and 90 F, dry, out of direct sunlight and in accordance with the Manufacturer's recommendations and relevant health and safety regulations.
 - 2. Copies of Safety Data Sheets (SDS) for all components shall be kept on site for review by the Engineer or other personnel.
- C. Waste Disposal
 - 1. The Applicator shall be provided with adequate disposal facilities for non-hazardous waste generated during installation of the system.

1.7 PROJECT CONDITIONS

- A. Site Requirements
 - 1. Application may proceed while air, material and substrate temperatures are between 60 F and 90 F providing the substrate temperature is above the dew point. Outside of this range, the Manufacturer shall be consulted.
 - 2. The relative humidity in the specific location of the application shall be less than 85 % and the surface temperature shall be at least 5 F above the dew point.
 - 3. The Applicator shall ensure that adequate ventilation is available for the work area.
 - 4. The Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.
- B. Conditions of substrate to be coated with epoxy material.
 - 1. Concrete shall be cured for a minimum of twenty eight days prior to the application of the coating system.
 - 2. Block wall mortar joints have cured no less than 7 days under good conditions.
 - 3. Sealers and curing agents should not to be used.
 - 4. Drywall shall be completely clean and free of any oils, soap residue, and gypsum dust and prepared to a #4 to #5 finish.
- C. Safety Requirements
 - 1. All open flames and spark-producing equipment shall be removed from the work area prior to commencement of application.
 - 2. "No Smoking" signs shall be posted at the entrances to the work area.

3. The Owner shall be responsible for the removal of foodstuffs from the work area.
4. Non-related personnel in the work area shall be kept to a minimum.

1.8 WARRANTY

- A. Dur-A-Flex, Inc. warrants that material shipped to buyers at the time of shipment substantially free from material defects and will perform substantially to Dur-A-Flex, Inc. published literature if used in accordance with the latest prescribed procedures and prior to the expiration date.
- B. Dur-A-Flex, Inc. liability with respect to this warranty is strictly limited to the value of the material purchase.

PART 2 – PRODUCTS

2.1 COATING

- A. Dur-A-Flex, Inc, Dur-A-Wall FGR, epoxy seamless wall system with urethane topcoat
 1. System Materials:
 - a. Base Coat and Grout Coats: Dur-A-Flex, Inc, Dur-A-Gard No Sag resin and hardener.
 - b. Fiberglass: Dur-A-Flex, Inc, PMG fiberglass mat
 - c. Topcoats: Dur-A-Flex, Inc. Armor Top (2 coats)
 2. Patch Materials
 - a. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Dur-A-Glaze #4 Cove Rez
- B. Substitutions are permitted- See Section 012500 Substitution Procedures.

2.2 MANUFACTURER

- A. Dur-A-Flex, Inc., 95 Goodwin Street, East Hartford, CT 06108, Phone: (860) 528-9838, Email: Contact_Us@dur-a-flex.com
- B. Manufacturer of Approved System shall be single source and made in the USA.
- B. Substitutions are permitted- See Section 012500 Substitution Procedures.

2.3 PRODUCT REQUIREMENTS

A	Base Coat, Grout Coat	Dur-A-Wall
1.	Percent Solids	100 %
2.	VOC	3.45 g/L
3.	Compressive Strength, ASTM D 695	16,000 psi
4.	Tensile Strength, ASTM D 638	3,800 psi
5.	Flexural Strength, ASTM D 790	4,000 psi
6.	Abrasion Resistance, ASTM D 4060	
	C-10 Wheel, 1,000 gm load, 1,000 cycles	35 mg loss
7.	Flame Spread/NFPA-101, ASTM E 84	Class A
8.	Flammability, ASTM D 635	Self Extinguishing
9.	Impact Resistance MIL D-3134	0.025 inch Max
10.	Water Absorption. MIL D-3134	0.04 %

11. Potlife @ 70 F	20-25 minutes
B. Topcoats	Armor Top
1. Percent Solids	95.2 %
2. VOC	0 g/L
3. Tensile Strength, ASTM D 2370	7,000 psi
4. Adhesion, ASTM 4541	Substrate Failure
5. Hardness, ASTM D 3363	>4H
6. 60° Gloss ASTM D 523	Gloss: 75 +/- 10 Satin: 50 +/- 10
7. Abrasion Resistance, ASTM D4060	Gloss Satin
CS 17 wheel (1,000 g load) 1,000 cycles	4 8 mg loss with grit
	10 12 mg loss without grit
8. Pot Life, 70 F, 50% RH	45 mins
9. Full Chemical Resistance	7 days

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas and conditions, with Applicator present, for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting coating performance.
 - 1. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

3.2 PREPARATION

- A. General
 - 1. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, and dirt.
 - 2. There shall be no visible moisture present on the surface at the time of application of the system.
 - 3. Remove loose mortar spatter, joint compounds etc.
 - 4. Create a surface profile on concrete with sandblasting apparatus and/or dust-free diamond grinders.
 - 5. Masonry block shall be clean, dry and coated with a high solids block filler.
 - 6. Drywall shall be completely clean and free of any oils, soap residue, gypsum dust etc.
 - 7. Prime with a “gripper” based primer

3.3 APPLICATION

- A. General
 - 1. The system shall be applied in five distinct steps as listed below:
 - a. Substrate preparation
 - b. Priming
 - c. Base coat application with fiberglass mat

- d. Grout coat application
- e. Topcoat applications (2 coats)
2. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
3. The system shall follow the contour of the substrate.
4. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

B. Priming - For priming use DUR-A-FLEX DUR-A-WALL HP GRIPPER PRIMER.

C. Base Coat

1. The base coat shall be comprised of Dur-A-Gard No-Sag resin, and hardener.
2. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
3. The base coat shall be applied by a roller at the rate of 300 sf/gal to yield a dry film thickness of 6 mils.
4. Hang semi-rigid fiberglass mat directly into wet epoxy resin so that seams are uniform and even per Manufacturers instructions.
5. Apply another coat to saturate mat.

D. Grout Coat

1. The grout coat shall be comprised of Dur-A-Gard No-Sag resin, and hardener.
2. The resin shall be added to the hardener and thoroughly mixed by suitably approved mechanical means.
3. The grout coat shall be applied by a roller at the rate of 100 sf/gal to yield a dry film thickness of 16mils.
4. Second grout coat yields 200 sf/gal at 8mils

E. Performance Topcoats

1. The topcoats shall be comprised Armor Top resin and hardener mixed at the ratio per the manufacturer's instructions.
2. The topcoat of Armor Top is typically applied using the dip and roll method at the rate of 500 sf/gal. Armor Top should not be applied more than 3 mils wet.
3. Repeat steps 1 through 3
4. The finish coating will have a nominal thickness of 42 mils.

3.4 FIELD QUALITY CONTROL

A. Tests, Inspection

1. The following tests shall be conducted by the Applicator:
 - a. Temperature
 1. Air, substrate temperatures and, if applicable, dew point.
 - b. Coverage Rates
 1. Rates for all layers shall be monitored by checking quantity of material used against the area covered.

3.5 CLEANING AND PROTECTION

- A. Cure material in compliance with manufacturer's directions, taking care to prevent their contamination during stages of application and prior to completion of the curing process.
- B. Remove masking. Perform detail cleaning to leave cleanable surface for subsequent work of other sections.

END OF SECTION 099656

SECTION 102113 - PLASTIC TOILET PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Plastic toilet compartment partitions for following applications:

- a. Toilet enclosures.
- b. Sight screens.
- c. Urinal screens.

B. Related Requirements:

Division 03 Section "Cast in Place Concrete" for compartment anchorage to concrete substrates.
Division 04 Section "Unit Masonry" for compartment anchorage to masonry substrates.
Division 05 Section "Metal Fabrications" for miscellaneous structural and support metal components required to secure compartments.
Division 06 Section "Rough Carpentry" for compartment anchorage to frame walls.

1.2 REFERENCES

A. ASTM International (ASTM):

ASTM A 240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
ASTM A 743/A 743M - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion Resistant, for General Application.
ASTM B 86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings.
ASTM B 221 - Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. International Code Council (ICC)/American National Standards Institute (ANSI):

ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities, as applicable to toilet compartments designated as accessible.

C. United States Department of Justice:

ADA - Americans with Disabilities Act, Excerpt from 28 CFR Part 36 - ADA Standards for Accessible Design.

D. GREENGUARD Environmental Institute (GREENGUARD):

- 1. GREENGUARD certified low emitting products.

1.3 ACTION SUBMITTALS

- A. Product Data: Manufacturer's data sheets for each type of product indicated. Include fabrication details, description of materials and finishes.

Product Test Reports: When requested by Architect, submit documentation by qualified independent testing agency indicating compliance of products with requirements.

- B. Shop Drawings: Include overall product dimensions, floor plan, elevations, sections, details, and attachments to other work. Include choice of options with details.
- C. Samples for Selection: Furnish samples of manufacturer's full range of colors for initial selection.
- D. Samples for Verification: Furnish physical sample of material in selected color.

Size: 2 by 2 inch (52 by 52 mm) minimum, in type of finish specified.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance and cleaning instructions.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in the manufacture of toilet compartments.
- B. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in the manufacture of toilet compartments. Manufacturers seeking approval must submit the following in accordance with Instructions to Bidders and Division 01 requirements:

Product data, including test data from qualified independent testing agency indicating compliance with requirements.

Samples of each component of product specified.

List of successful installations of similar products available for evaluation by Architect.

- C. Installers Qualifications: Experienced Installer regularly engaged in installation of toilet compartments for minimum 3 years.
- D. Source Limitations: Obtain toilet compartment components and accessories from single manufacturer.
- E. Accessibility Requirements: Comply with requirements of ICC/ANSI 117.1, and with requirements of authorities having jurisdiction.
- F. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by qualified testing agency. Identify products with appropriate markings of applicable testing agency.

Flame-Spread Index: Not greater than 75.
Smoke-Developed Index: 450.

- G. Tested in accordance with NFPA 286.
- H. Indoor Environmental Quality Certification: Provide certificate indicated that products have been certified under the following programs, or a comparable certification acceptable to Owner:
 - 1. GREENGUARD Indoor Air Quality Certified.
 - 2. GREENGUARD Certified for Children and Schools.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver toilet compartments to site until building is enclosed and HVAC systems are in operation.

Deliver toilet compartments in manufacturer's original packaging.
Store in an upright condition.

1.8 WARRANTY

- A. Special Manufacturer's Warranty: Provide manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship during the following period after substantial completion:

Plastic Toilet Partitions: Against corrosion, breakage, and delamination: 15 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide products of **Bradley Corporation, The Mills Company, Menomonee Falls, WI 53051.**

Contact Information: (800)272-3539, fax (262)251-5817; Email info@BradleyCorp.com;
Website www.bradleycorp.com.

2.2 MATERIALS

- A. Plastic Panels: High density polyethylene (HDPE) suitable for exposed applications, waterproof, non-absorbent, and graffiti-resistant textured surface, [Class C] [Class B].

Provide panels with minimum 30 percent pre-consumer recycled content.
Provide panels with 100 percent post-consumer recycled content.
Provide panels with 100 percent pre-consumer recycled content.

- B. Zinc Aluminum Magnesium and Copper Alloy (Zamac): ASTM B 86.
- C. Stainless Steel Sheet: ASTM A 240 or A 666, 300 series.
- D. Stainless Steel Castings: ASTM A 743/A 743M.

E. Aluminum: ASTM B 221.

2.3 PLASTIC TOILET COMPARTMENTS

A. Toilet Compartment Type:

Floor and ceiling anchored.

a. Basis of Design Product: **Bradley, Mills Partitions, Floor to Ceiling, Series 700.**

B. Sight Screen Type:

Floor anchored.

a. Basis of Design Product: **Bradley, Mills Partitions, Floor Braced, Series 500.**

Floor and ceiling anchored.

C. Urinal Screen Style:

Wall hung with brackets:

a. Basis of Design Product: **Bradley, Mills Partitions, Model No. 4.**

D. Door, Panel, and Pilaster Construction, General: HDPE, with a 3/16" (4.8mm) radiused edge.

Provide exposed surfaces free of pitting, visible seams and fabrication marks, stains, or other imperfections.

Provide aluminum heat sink at bottom edge of panels and doors.

E. Door Construction: 1 inch (25 mm) thick.

F. Panel Construction: 1 inch (25 mm) thick.

G. Pilaster Construction: 1 inch (25 mm) thick.

H. Headrail: Extruded anodized aluminum headrail with anti-grip profile. Clamps around pilaster and is secured to the wall with stainless steel brackets.

I. Shoes: 4 inches (76 mm) high minimum, 300 series stainless steel with No. 4 satin brushed finish.

J. Urinal-Screen Construction: Matching toilet compartment panel construction

K. Urinal-Screen Post: Manufacturer's standard post design of [material matching the thickness and construction of pilasters] [or] [1-3/4-inch- (44-mm-) square], aluminum tube with satin finish; with shoe [and sleeve (cap)] matching that on the pilaster.

L. Brackets (Fittings):

Stirrup Type: Ear or U-brackets; [aluminum] [stainless steel].

Full-Height (Continuous) Type: Manufacturer's standard design; [aluminum] [stainless steel].

- M. Plastic Panel Finish: Manufacturer's standard impregnated finish, with [one color] [two colors] in each room.

Color: As selected by Architect from manufacturer's full range.

2.4 HARDWARE

- A. Hardware, Standard Duty: Manufacturer's standard 6463-T-5 aluminum, including stainless steel tamper-resistant fasteners:

Hinges: Self-closing [integral, nylon, gravity-type] [continuous spring-loaded type] [8" wraparound type] adjustable to hold doors open at any angle up to 90 degrees, with emergency access by lifting door.

Latch and Keeper: Surface-mounted slide latch with flat rubber-faced combination door strike and keeper, meeting requirements for accessibility at accessible compartments.

Coat Hook: Combination hook and rubber-tipped stop, sized to prevent door from hitting compartment-mounted accessories. Provide wall bumper where door abuts wall. Provide formed L-shaped hook without stop at outswing doors.

Door Pull: Standard unit on outside of inswing doors. Provide pulls on both sides of outswing doors.

2.5 FABRICATION

- A. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, inswinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine work area to verify that measurements, substrates, supports, and environmental conditions are in accordance with manufacturer's requirements to allow installation.

Proceed with installation once conditions meet manufacturer's requirements.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
- B. Install toilet partitions and screens in spaces with operating, temperature controlled HVAC systems. Shield partitions and screens from direct sunlight.

- C. Clearances: Install with clearances indicated on Drawings. Where clearances are not indicated, allow maximum 1/2 inch (13 mm) between pilasters and panels, and 1 inch (25 mm) between panels and walls.
- D. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 15 degrees from closed position when unlatched. Set hinges on out-swinging doors [and doors in privacy screens] to return doors to fully closed position.

3.4 FINAL CLEANING

- A. Remove packaging and construction debris and legally dispose of off-site.
- B. Clean partition and screen surfaces with materials and cleansers in accordance with manufacturer's recommendations.

END OF SECTION 102133.19

SECTION 102813 – COMMERCIAL TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Commercial toilet accessories
 - 2. Standard grab bars.

1.3 SUBMITTALS

- A. See Division 01 Section - Submittal Procedures, for submittal procedures.
- B. Product Data: For each type of product indicated. Include the following:
 - 1. Construction details and dimensions.
 - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
 - 3. Material and finish descriptions.
 - 4. Features that will be included for Project.
 - 5. Manufacturer's warranty.
- C. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
 - 1. Approved full-size Samples will be returned and may be used in the Work.
- D. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify locations using room designations indicated.
 - 2. Identify products using designations indicated.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Where available, obtain products from single source manufacturer.
- B. Preinstallation Conference: Conduct conference at Project site.

1.5 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

PART 2 - PRODUCTS

2.1 TOILET ACCESSORIES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Bradley
 - 2. Bobrick Washroom Equipment, Inc.
 - 3. Creative Specialties International.
 - 4. American Pride.
 - 5. U-Line
 - 6. Broan
 - 7. Substitutions are permitted- See Section 012500 Substitution Procedures.
- B. Toilet Tissue Dispenser:
 - 1. Basis-of-Design Product: By owner, installed by contractor to match existing building standards.
 - 2. Description: Single-roll dispenser.
 - 3. Mounting: Surface mounted.
 - 4. Quantity: 1 per Toilet Stall
- C. Shower Curtain Rod:
 - 1. Basis-of-Design Product: American Pride 604S.
 - 2. Mounting: Tension Shower Rod.
 - 3. Quantity: 2 per shower area (1 for each changing area + 1 for each shower area)
 - 4. Rod Finish: Chrome.
 - 5. Size: 60" adjustable
- D. Shower Curtain:
 - 1. Basis-of-Design Product: U-Line S-25181 (42") or U-Line S-25182 (72").
 - 2. Mounting: Chrome Hooks. U-Line H 10742
 - 3. Quantity: 2 per shower area (1 for each changing area + 1 for each shower area)
 - 4. Rod Finish: Chrome.
 - 5. Size: 42" adjustable at standard showers/changing areas; 72" at accessible shower/changing areas

- E. Robe Hook:
1. Basis-of-Design Product: Bobrick Gamco 76717 Surface-Mounted Robe Hook
 2. Description: Robe hook.
 3. Quantity: 3 per locker room + 2 per shower area (1 for each changing area + 1 for each shower area)
 4. Mounting: Post flanges with concealed fasteners.
 5. Material and Finish: Satin finish.
- F. Grab Bar Side of Toilet:
1. Basis-of-Design Product: Bobrick B-5806.99x42
 2. Mounting: Flanges with concealed fasteners.
 3. Quantity: 1 per Bathroom.
 4. Material: Stainless steel type 304, smooth finish.
 5. Outside Diameter: 1-1/4 inches.
 6. Configuration and Length: 42" long mounted 33"-36" above finished floor per ANSI A117.1. 18" long mounted vertically as indicated on drawings.
- G. Grab Bar Rear of Toilet:
1. Basis-of-Design Product: Bobrick B-5806.99x36.
 2. Mounting: Flanges with concealed fasteners.
 3. Quantity: 1 per Bathroom.
 4. Material: Stainless steel type 304, smooth finish.
 5. Outside Diameter: 1-1/4 inches.
 6. Configuration and Length: 36" long mounted 33"-36" above finished floor per ANSI A117.1.
- H. Grab Bar at Each Side of Shower (Vertical):
1. Basis-of-Design Product: Bobrick B-5806x18.
 2. Mounting: Flanges with concealed fasteners.
 3. Quantity: 2 per Shower Enclosure.
 4. Material: Stainless steel type 304, smooth finish.
 5. Outside Diameter: 1-1/4 inches.
 6. Configuration and Length: 18"
- I. Grab Bar at Rear of Shower (Horizontal):
1. Basis-of-Design Product: Bobrick B-5806x24.
 2. Mounting: Flanges with concealed fasteners.
 3. Quantity: 1 per Shower Enclosure.
 4. Material: Stainless steel type 304, smooth finish.
 5. Outside Diameter: 1-1/4 inches.
 6. Configuration and Length: 24"
- J. Feminine Napkin Vendor – Surface Mounted:
1. Basis-of-Design Product: By owner, installed by contractor to match existing building standards.

2. Description: Napkin vendor.
3. Mounting: Surface mounted.
4. Location/Quantity: 1 per women's restroom.

K. Feminin Napkin Disposal – Surface Mounted:

1. Basis-of-Design Product: By owner, installed by contractor to match existing building standards.
2. Description: Standard series napkin disposal.
3. Mounting: Surface mounted.
4. Location/Quantity: 1 per women's toilet with adjacent side wall 1-side

L. Soap Dispenser:

1. Basis-of-Design Product: By owner, installed by contractor to match existing building standards.
2. Description: Horizontal tank soap dispenser.
3. Mounting: Surface mounted.
4. Quantity: 1 per sink.

M. Paper Towel Dispenser:

1. Basis-of-Design Product: By owner, installed by contractor to match existing building standards.
2. Description: High capacity towel dispenser.
3. Mounting: Surface mounted.
4. Quantity: 1 per Bathroom

N. Vanity Mirror:

1. Basis-of-Design Product: Frameless Mirror
2. Mounting: Spring Clips.
3. Quantity: 1 per lavatory sink.
4. Configuration and Length: 42" tall x 24" wide.

2.2 UNDERLAVATORY GUARDS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Plumberex Specialty Products, Inc.
2. Substitutions are permitted- See Section 012500 Substitution Procedures.

B. Underlavatory Guard:

1. Basis-of-Design Product: Handy Shield Maxx.
2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
3. Material and Finish: White.

4. Quantity in Accessible Units: 1 per accessible bathroom sink and 1 per accessible kitchen sink.
5. Quantity in Accessible Public Restrooms: 1 per accessible restroom sink.

2.3 SHOWER GRAB BARS

A. Grab Bar at Each Side of Shower (Vertical):

1. Basis-of-Design Product: Bobrick B-5806x18.
2. Mounting: Flanges with concealed fasteners.
3. Quantity: 2 per Shower Enclosure.
4. Material: Stainless steel type 304, smooth finish.
5. Outside Diameter: 1-1/4 inches.
6. Configuration and Length: 18"

B. Grab Bar at Rear of Shower (Horizontal):

1. Basis-of-Design Product: Bobrick B-5806x24.
2. Mounting: Flanges with concealed fasteners.
3. Quantity: 1 per Shower Enclosure.
4. Material: Stainless steel type 304, smooth finish.
5. Outside Diameter: 1-1/4 inches.
6. Configuration and Length: 24"

C. Feminin Napkin Vendor – Surface Mounted:

1. Basis-of-Design Product: Bradley 407-11.
2. Description: Napkin vendor.
3. Mounting: Surface mounted.
4. Location/Quantity: 1 per women's restroom.
5. Capacity: 18 napkins.
6. Operation: Flush tumbler lock.
7. Material and Finish: Satin stainless-steel finish

D. Feminin Napkin Disposal – Surface Mounted:

1. Basis-of-Design Product: Bradley 4722-15.
2. Description: Standard series napkin disposal.
3. Mounting: Surface mounted.
4. Location/Quantity: 1 per women's toilet with adjacent side wall 1-side
5. Capacity: 1.5 gallons.
6. Operation: Flush tumbler lock.
7. Material and Finish: Satin stainless-steel finish

E. Soap Dispenser:

1. Basis-of-Design Product: Bradley 6543.
2. Description: Horizontal tank soap dispenser.
3. Mounting: Surface mounted.
4. Quantity: 1 per sink.

5. Capacity: 40 oz. liquid soap.
6. Operation: Flush tumbler lock.
7. Material and Finish: Satin stainless-steel finish

F. Combination Paper Towel Dispenser/Waste Receptacle:

1. Basis-of-Design Product: BBradley 238.
2. Description: High capacity towel dispenser.
3. Mounting: Surface mounted.
4. Quantity: 1 per Bathroom
5. Capacity: 1,100 single fold towels, 8.2 gallon waste.
6. Operation: Flush tumbler lock.
7. Material and Finish: Satin stainless-steel finish

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated. Note: All toilet, bath, and laundry accessories shall be mechanically fastened into blocking or studs.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102813

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 GENERAL

- A. The general conditions, supplementary conditions and instructions to bidders shall apply to and be part of this specification.
- B. Contractor shall comply with all applicable codes, rules and regulations.
- C. Contractor shall obtain and pay for all permits, certificates of inspection and approvals required.
- D. The base bid shall include furnishing all materials, labor, tools, equipment and installation of all work required to provide complete plumbing systems as outlined in Division-22.
- E. Examine the drawings, specifications, and visit the site prior to submitting a bid.

1.2 APPLICABLE STANDARDS

- A. The applicable provisions of the following standards shall govern:
- B. American Society for Test Materials (ASTM);
- C. American Standards Association (ASA);
- D. Underwriters Laboratories (UL);
- E. National Fire Protection Association (NFPA);
- F. State Building Code.
- G. State Plumbing Code.
- H. The installation of all plumbing work shall conform to the applicable local plumbing codes and statutes.

1.3 PLANS

- A. Plans are diagrammatic indicating required size, points of termination of piping and suggested routes. However, it is not intended that drawings indicate all necessary offsets. Install piping in such manner as to conform to the structure, avoid obstructions and preserve headroom. All piping shall be run as straight as possible and symmetrical with architectural items. Piping shall be concealed in pipe shafts, pipe spaces, and furring wherever possible. Piping fabricated before coordination with the other trades will be done at contractors' own risk.
- B. In the event of inconsistencies or conflict within or between the Contract Documents, provide the better quality, more costly or greater quantity of work and comply with the more stringent requirements. Seek the direction of the Engineer of Record for clarification of conflicts as soon as a conflict is identified. (Prior to installation)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CUTTING, PATCHING AND DEMOLITION

- A. Contractor shall include all necessary cutting and patching required to perform their work.
- B. Care shall be taken when working in existing spaces so as not to damage existing walls and ceilings where work is being performed.
- C. Provide non-destructive concrete structural scanning or concrete x-ray prior to drilling, cutting or coring.
- D. Core drill or Saw cut all slab penetrations as required. Seal around all wall, floor and ceiling pipe penetrations with NFPA approved sealant material to maintain the fire resistant and watertight integrity of the assembly.
- E. Disconnect, demolish, and remove from site all plumbing systems, equipment, and components indicated to be removed and as necessary to perform the described scope of work. No unused plumbing systems, equipment, and components shall be abandoned.
- F. No means of demolition shall be used that would result in damage to structures, materials, equipment or components indicated to remain or endanger the health, safety and welfare of the general public.

3.2 EXCAVATION AND BACKFILL

- A. Perform all excavation and backfilling required for this work. Contractor shall consult with utility company prior to beginning excavation.
- B. At a minimum, all piping shall be laid on a bed of sand, 6" deep, well tamped into place and properly graded to permit the pipe to have an even bearing throughout its entire length. Sand shall be installed around the piping and to a point 6" above the piping.

3.3 PIPE JOINTS AND CONNECTIONS

- A. Any minor adjustment in location of alignment of new work or connection to existing utilities shall be performed as directed by the engineer without additional cost to the owner.
- B. The contractor shall be responsible for damages to the grounds, walks, road, building, piping systems, electrical systems, and their equipment and contents, caused by leaks in the piping systems being installed or having been installed by him. The contractor shall repair at his expense all damaged so caused. All repair work shall be done as directed by and in such manner as satisfactory to the architect.
- C. Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding the contractor's guarantee bond nor relieving the contractor of his responsibilities during the bonding period.

3.4 PROJECT CONDITIONS

- A. Where new plumbing systems are required to be connected to existing plumbing systems, it is the contractor's responsibility to verify the location, size, invert elevation, pressure, condition, and they shall verify that the existing plumbing system is indeed the correct and appropriate plumbing system before any work is done. Provide all necessary camera scoping and dye testing as necessary. If there is any need for concern, if it is determined that the existing plumbing system is not a correct or appropriate plumbing system or not connected to a correct or appropriate plumbing system, if the condition of the existing plumbing system is not viable for re-use, or any other condition that would not allow the proper functioning of the new plumbing system, the contractor shall notify the engineer in writing immediately via RFI and wait for direction before proceeding.
- B. Interruption of Existing Plumbing Services: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
- C. Notify, Architect, Construction Manager, and Owner no fewer than seven days in advance of proposed interruption of service.
- D. Do not proceed with interruption of service without Architect's written permission.

3.5 WARRANTY

- A. This contractor shall warrant that all work under this section shall be free of defective work, materials and parts for a period of one year after acceptance of the work and shall repair, revise, and replace, at no cost to the owner, any such defects occurring within the warranty period.

END OF SECTION 220500

SECTION 220503 - SUBMITTALS FOR PLUMBING

PART 1 - GENERAL

1.1 REQUIREMENTS

- A. Where submittals are required by the Contract Documents, they shall be prepared and supplied in accordance with the Contract Documents. In addition to Division 01, the Contractor is advised to review and comply with the requirements articulated within each Division and within each section of that Division.
- B. The contractor is not relieved of responsibility for providing specified or drawn scope of work should any errors or omissions in submittal information not be noted by the Design Professional during submittal reviews or site observations.
- C. Some Divisions may include a division-specific “Submittal Requirements for” section. Where this section exists, it articulates additional requirements for submittals that apply to the work of that Division.
- D. The submittal requirements help to identify, track and keep the project organized for all parties involved. They are necessary to ensure a timely turnaround and an appropriate technical review. Submittals that do not conform to the administrative requirements are rejected and returned, without technical review.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Reference Specification Section 01 33 00.00 for a full list of submittal procedures and required formats.

3.2 USE OF ELECTRONIC DRAWINGS FROM THE OWNER’S DESIGN TEAM

- A. Plan drawings for the Project were created with AutoCAD and Revit.
- B. If expressly permitted by the Owner and the terms of the Contract, editable electronic versions of standard-scale, AutoCAD-based plan drawings may be made available for the creation of shop and as-built drawings.
- C. Upon request, when available, electronic versions of standard-scale, Navisworks (.dwf) and (.nwc) or AutoCAD 360 (.dwg) files may be made available for coordination purposes.
- D. Due to the proprietary nature of internal design systems, editable native-software versions of some drawings, including but not limited to system diagrams and details, will not be made available in an editable form. In these cases, electronic versions of the drawings may be made available only in PDF, JPG, or similar non-editable electronic form, at the sole discretion of the Design Professional.

END OF SECTION 220503

SECTION 220523 - GENERAL DUTY VALVES

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 GENERAL

- A. Valves on domestic water piping shall be ball valves.
- B. Ball valves - 2 inch and smaller: Lead-Free, 2-piece body, 600 psi CWP, 100 psi at 300OF, cast bronze body, full port, Teflon seats, blowout-proof stem, adjustable packing gland, chrome plated bronze ball, and vinyl-covered steel handle. Provide solder ends. Provide extended valve stems for valves used on insulated lines. Provide equal to Nibco series 585-80-LF.
- C. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the work include, and are limited to, the following: American Valve, Inc., Conbraco Industries, Inc.; Apollo Valves., Crane Co.; Crane Valve Group; Crane Valves., Hammond Valve., Milwaukee Valve Company., NIBCO INC., Red-White Valve Corporation., Watts Regulator Co.; a division of Watts Water Technologies, Inc

2.2 CHECK VALVES

- A. Spring check valves - class 125, cast bronze body and cap, horizontal swing, y-pattern, with a bronze disc, and having threaded or solder ends. Provide solder ends for domestic hot and cold water service. Provide equal to Nibco T-480-Y-LF.

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Provide stops or isolation valves on domestic water supplies to isolate hot and cold water to each fixture, including all equipment and equipment provided by others.
- B. Fixtures, item or units furnished by the manufacturer with integral stops or stops specified with the fixture are considered to be properly valved at the fixtures.
- C. Access shall be provided to all valves.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data:
 - 1. For each type of product indicated.
- B. General
 - 1. Support all piping and equipment by hangers or brackets. Provide structural steel members where required to support piping and equipment. No portion of piping or valves shall be supported by equipment.
- C. Delegated Design
 - 1. For equipment supports, this contractor shall retain a qualified professional engineer to provide support calculations of static and dynamic loading due to operating equipment weight, seismic and wind forces. The signed and sealed calculations and details shall be submitted by the retained professional engineer.

PART 2 - PRODUCTS

2.1 PIPING

- A. Individual pipe hangers to be Anvil International Clevis Hanger Fig. 260, Elcen, or approved equal.
- B. Rod sizes to conform to the following: 3/8" rods for 3/4" to 2" pipe; 1/2" rods for 2-1/2" to 3" pipe; 5/8" rods for 4" to 5" pipe; 3/4" rods for 6" pipe.
- C. Hangers shall be sized to allow insulation to pass through unobstructed, provide saddle support for insulation at all hangers.
- D. Hanger spacing for steel piping unless otherwise noted is to be as follows: 1-1/4" or smaller to be 8' on center; 1-1/2" to 2" to be 10' on center; 2-1/2" and larger to be 12' on center and at each change of direction.
- E. Hanger spacing for copper pipe to be as follows: 1" or smaller 6' on center; 1-1/4" or larger 8' on center.
- F. Hanger spacing for cast iron piping shall be 5'-0" on center.
- G. Hanger space for CPVC and PVC pipe to be as follows: 1" and smaller to be 3' on center; 1-1/4" or larger to be 4' on center.

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Provide hangers, supports, clamps and attachments to support piping properly from building structure. Support from the decking above is prohibited. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible. Where piping of various sizes is supported together by trapeze hangers, space hangers for smallest pipe size or provide intermediate supports for smaller diameter pipe as specified above for individual pipe hangers.
- B. Piping shall also be supported at each change in direction, valves and equipment.

END OF SECTION 220529

SECTION 220548 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Shop Drawings
 - 1. Provide performance requirements and design criteria, including analysis data signed and sealed by the qualified engineer responsible for their preparation.

PART 2 - PRODUCTS

2.1 SEISMIC BRACING

- A. Provide seismic bracing of equipment and components where required by code.

2.2 QUALITY ASSURANCE

- A. The contractor shall provide seismic restraint systems to meet total design lateral force requirements for support and restraint of piping, ductwork, equipment and other similar systems and equipment where required by the applicable building code.
- B. Seismic Bracing and Support of Systems and Components
- C. Seismic restraint designer shall coordinate all attachments with the structural engineer of record. Provide engineered stamped and signed drawings of seismic design.
- D. Seismic restraint designer shall provide visual inspection after installation and approve installation of seismic design components.
- E. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
- F. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.
- G. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.
- H. Friction from gravity loads shall not be considered resistance to seismic forces.
- I. Fire protection systems shall meet the requirements of NFPA-13 and NFPA-14 for the building seismic requirements.

PART 3 - EXECUTION

3.1 GENERAL

- A. The contractor shall subcontract a licensed structural engineer for the design of all seismic restraint systems required by the presiding jurisdiction. The structural engineer shall provide engineered stamped and signed drawings of seismic design and submit as deferred submittal to supplement the permit drawings.

3.2 QUALITY ASSURANCE

- A. The contractor shall provide seismic restraint systems to meet total design lateral force requirements for support and restraint of piping, conduit, cable trays and other similar systems and equipment where required by the applicable building code.

END OF SECTION 220548

SECTION 220719 - PLUMBING SYSTEM INSULATION

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

1.2 GENERAL

- A. Insulation shall be listed and labeled per ASTM E 84 for plenum installations employing slip on techniques.

PART 2 - PRODUCTS

2.1 PIPING SYSTEMS REQUIRING INSULATION

- A. Insulate domestic cold water piping, associated fittings and valves with flexible elastomeric 1/2" wall thickness insulation.
- B. Insulate domestic hot water piping, associated fittings and valves with 1" thick flexible elastomeric, 1-1/2" thick fiberglass insulation or per local energy code, whichever greater.
- C. Insulate domestic hot water return piping, associated fittings and valves with 1" wall thickness insulation or per local energy code, whichever greater.
- D. Insulate waste piping above ceilings that receive condensate with 1/2" wall thickness insulation.
- E. Insulate exposed sanitary drains, domestic water, domestic hot water, and stops for plumbing fixtures for people with disabilities.

2.2 FLEXIBLE ELASTOMERIC INSULATION

- A. Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
- B. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.
- C. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the work include, and are limited to, the following: Aeroflex USA, Inc.; Aerocel., Armacell LLC; AP Armaflex., K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

2.3 FIBERGLASS INSULATION

- A. Fiberglass piping insulation: ASTM C 547, Class 1
- B. Encase pipe fittings insulation with one-piece pre-molded PVC fitting covers.

- C. Vapor Barrier Material: Paper-backed aluminum foil, except as otherwise indicated, strength and permeability rating equivalent to adjoining pipe insulation jacketing.
- D. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.
- E. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.
- F. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the work include, and are limited to, the following: Armstrong World Industries, Inc., Owens-Corning Fiberglass Corp., Keene Corp., CertainTeed., Johns Manville.

2.4 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Insulation for handicap accessible fixtures
- C. All handicap lavatory p-trap and angle stop assemblies shall be insulated with trap wrap protective kit manufactured by Proflo model PF202WH or equal. Abrasion resistant, anti-microbial vinyl exterior cover shall be smooth. For traps, the insulation shall have a cleanout nut cap to allow service to the trap without disassembly. For stops, the insulation shall have a lock lid that prevents tampering but allows access without removal of the insulation. Fasteners shall remain substantially out of sight.
- D. Manufacturers: subject to compliance with requirements: Proflo, Truebro, Plumberex

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Provide insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

END OF SECTION 220719

SECTION 220800 - PLUMBING COMMISSIONING SPECIFICATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The requirements of this Section apply to all sections of Division 22.
- B. This project will have selected building systems commissioned including all scope of work outlined in Division 22 specifications including but not limited to, plumbing systems and equipment, controls and piping distribution. A Commissioning Agent (CxA) appointed by the owner will manage the commissioning process.

1.2 SUMMARY

- A. This Section includes requirements for commissioning the plumbing systems, subsystems and equipment.
- B. The commissioning activities have been developed to support code & LEED outlined delivery of an efficient project in accordance with the Contract Documents developed by the design team evolved from the Owner's Project Requirements (OPR).

1.3 SYSTEMS AND EQUIPMENT TO BE COMMISSIONED

- A. Commissioning of a system or systems specified in this Division is part of the construction process and required by OPR and/or code (IECC). The commissioning process for these systems is required in cooperation with the Owner, Construction Manager and the Commissioning Agent.
- B. The following systems, components, and equipment are the focus of the commissioning process on the Project:
 - 1. Domestic Water Heating System and Controls
 - a. New domestic water heating equipment
 - b. Relocated existing domestic water heating equipment
 - c. Modified existing domestic water heating equipment
 - d. Associated domestic water heating controls

1.4 SUBMITTALS

- A. The commissioning process requires review of Submittals for equipment and systems that are part of the commissioning scope of work. The Construction Manager will be responsible for delivering these submittals to the CxA for their review.
- B. The commissioning process requires Submittal review simultaneously with engineering review.

1.5 COMMISSIONING TEAM

- A. The commissioning team shall consist of members appointed by the Owner, including members of the design team, and members appointed by Contractor(s). Each individual shall have the

authority to act on behalf of the represented entity and shall be organized to implement the commissioning process through coordinated actions and be dedicated to remain involved in the Project until completion.

1. Members Appointed by Owner:
 - a. CxA: The designated person, company or entity that plans, schedules and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
 - b. Representatives of the facility user and operation and maintenance personnel.
 - c. Architect and engineering design professionals (i.e., design team).
2. Members Appointed by Contractor(s):
 - a. Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers and specialists deemed appropriate by the CxA.

1.6 COMMISSIONING PLAN

- A. Prior to permit issuance a commissioning plan shall be completed to document how the project will be commissioned and shall be started during the design phase of the building project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONTRACTOR RESPONSIBILITY

Contractor shall provide support and work as specified, needed and required to conduct and facilitate building commissioning efforts. This work will be comprised of three distinct efforts:

1. Support commissioning agent (CxA) during installation verification and correct disclosed deficiencies.
 2. Perform testing, adjusting, balancing and system startup and support functional performance testing by CxA;
 3. Correct deficiencies disclosed by functional performance testing and submit reports.
- A. Systems subject to commissioning may include, but are not limited to domestic hot water generation.
 - B. Contractor shall provide written responses to all CxA's reviews and comments. Responses shall be provided in a timely manner.
 - C. Contractor shall include commissioning activities in project schedule and show intervals for performance of work for which contractor is responsible and intervals for work performed by CxA. Contractor shall show resources for performing all work related to commissioning activities on a line item in the schedule of values.
 - D. Contractor shall install equipment in accordance with the manufacturer's requirements and all contract documents. Ensure that all equipment is installed totally complete and accessible to

CxA for installation verification and functional performance testing prior to the scheduled start of installation verification.

- E. Contractor shall complete manufacturer's startup procedures prior to commissioning coordination with CxA.
- F. Contractor shall be readily available during installation verification to correct any deficiencies or defects is closed by the installation verification process. Corrections shall be made in a timely manner without disruption of the construction schedule.
- G. Provide a list of all factory and field settings that have been programmed into the equipment (such as setpoints, schedules, dip switch settings, condenser and evaporator operating pressure/temperature, etc...).
- H. Contractor shall inform CxA when equipment is ready for functional performance testing. All equipment shall be ready for functional performance testing prior to starting testing. This includes rehearsing all functional performance tests before demonstrating to the CxA. Contractor shall operate equipment for CxA and verify by demonstrating the correct operation of equipment, sensor calibration, temperature, sound and control response. Provide any security access, hardware, software or other support as needed for the CxA to efficiently witness and document all equipment testing. CxA will record the equipment operation and response to testing sequences and prepare a list of any deficiencies disclosed by the functional performance tests for correction by the contractor. Equipment includes, but is not limited to, domestic water heating systems, etc... Deliverables: provide completed copies of all start up reports, filled out on the manufacturer's forms, to the CxA.
- I. Contractor is responsible for correcting any issues or deficiencies disclosed during the functional performance testing process. Corrections should be made in a timely manner without disruption to the system and construction schedule.
- J. Contractor shall be readily available for any re-testing of equipment deemed necessary by CxA during installation verification and functional performance testing. Contractor is responsible for correcting any issues or deficiencies found in the system during any and all re-testing. Corrections should be made in a timely manner without disruption to the system and construction schedule. Deliverables: final balance report, deficiencies list noting corrective actions performed by contractor in response to installation verification and functional performance test results.
- K. Construction and post construction testing: additional testing may be required by LEED and other processes that may occur out of sequence with commissioning service. Contractor shall conduct. Document, support and schedule this testing as directed by CxA.
- L. Contractor shall provide a training plan for each trade (mechanical, electrical, plumbing, renewable systems) for the CxA's approval. The training plan shall outline all the topics that are to be covered along with the time duration for each topic. It shall also include the instructor's name, qualifications and company logo.
- M. The contractor is responsible for recording attendance for each training session. Copies of these shall be submitted to the CxA.
- N. Contractor shall submit O&M manuals for all pieces of equipment at least 6 weeks in advance of the training sessions.

3.2 GENERAL DIRECTION

- A. Equipment Verification Checklists (EVC'S)

1. The Contractor shall complete EVC's to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems start-up and Functional Performance Testing. The Commissioning Agent will prepare all EVC's to be used by the installing contractors to document equipment verification and installation.
 2. The installing personnel shall complete the checklists. Completed checklists shall be submitted to the CM. The CM is responsible for sending all completed copies to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists for completion and accuracy. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all checklists for that type of equipment will be returned to the Contractor for correction and resubmission.
- B. Functional performance testing:
1. Contractor tests as required by other sections of Division 22 shall be scheduled and documented in accordance with the applicable sections. The Commissioning Agent will work with the CM to incorporate the Functional Performance Testing schedule into the master construction schedule. The CxA will conduct and witness all Functional Performance Testing performed by the Contractors. The commissioning process includes Functional Performance Testing that is intended to test systems functional performance under steady state conditions, reactions to changes in operating conditions and performance under emergency conditions. The contractors shall review and comment on the functional performance tests prior to testing.
- C. Training Of Operations And Maintenance Personnel
1. Training operations and maintenance personnel on the proper operation, maintenance and any emergency situations is required. Provide competent, factory authorized personnel to provide instructions to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the CxA after submission and approval of formal training plans. The CxA will review the training plans and observe the training performed by the factory personnel and installing contractors.
- D. Final Commissioning Report
1. A complete report of commissioning process activities from design through post-construction phases of the building project shall be completed by the CxA and provided to the Owner.
 2. The final commissioning report shall include the following:
 - a. Executive summary of process and results of commissioning program – including observations, conclusions and any outstanding items.
 - b. A history of all deficiencies and issues and how they were resolved
 - 1) Includes outstanding issues and a plan for resolution
 - 2) Include plans for seasonal testing schedule for a later date
 - c. Functional performance test results and evaluations
 - d. Summary of training process
 - e. Cx Process Documents
 - 1) Cx Plan
 - 2) OPR

- 3) BOD
- 4) Equipment Verification Checklists/Installation Checklists
- 5) Functional Performance Test Checklists
- 6) Recommendations for end-of-warranty review activities

END OF SECTION 220800

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

- A. Domestic Water Piping Above Ground:
 - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.
 - 2. Solder Filler Metals: ASTM B 32, lead-free alloys.
 - 3. Flux: ASTM B 813, water flushable.
 - 4. Where allowed by code, PEX and CPVC is approved for interior water piping. Type “L”; copper pressure-seal joint; and pressure-seal joint systems.
- B. Cathodic Protection
 - 1. Provide dielectric insulation at points where copper or brass pipe comes in contact with ferrous piping, reinforcing steel or other dissimilar metal in structure.

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Install piping concealed from view unless noted otherwise, free of sags and bends. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction. Clean and disinfect potable domestic water piping using approved procedures by authorities having jurisdiction.
- B. Install at right angles; diagonal runs are prohibited unless otherwise shown. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal. Coordinate all piping with all other trades.
- C. Provide water pressure regulators where necessary to limit the incoming water pressure to 80 psi inside the building.

END OF SECTION 221116

SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 BALANCING VALVES

- A. Provide balancing valves where required for proper balancing of water systems as shown on the contract documents.
- B. Balancing valves shall be equal to Red-White Valve Corporation model 9517AB (NPT) or model 9519 (solder). Valve shall have brass body, globe valve regulation and isolation properties, fixed orifice design for precise measurement, integral memory stop to ensure repeatable setting, full shutoff without affecting memory settings, high and low pressure metering points, precision indicator windows, rugged top set hand-wheel assembly, pressure rating of 300 psi, and temperature rating of 15 deg. F to 260 deg. F.
- C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, and are limited to, the following: Crane Co.; Crane Valve Group; Crane Valves., Hammond Valve.
- D. Milwaukee Valve Company., NIBCO Inc., Watts, Red-White Valve Corp.

2.2 TRAP-SEAL PRIMER DEVICE

- A. The plumbing contractor shall provide trap primers for all floor drains and floor sinks that do not regularly receive waste water. Trap primer shall be equal to Mifab MR-500 trap primer valve. Provide access panel in wall or ceiling for all concealed trap primers. Install trap seal primer valves with outlet piping pitched down toward drain trap a minimum of 1% and connect to floor drain body, trap or inlet fitting. Coordinate exact location with architect prior to installation.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, and limited to, the following: MIFAB, Inc., Precision Plumbing Products, Inc., Sioux Chief Manufacturing Company, Inc., Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc., Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.

2.3 WATER HAMMER ARRESTERS

- A. Provide water-hammer arresters in water piping according to PDI-WH 201.
- B. Standard: ASSE 1010 or PDI-WH 201.

- C. Type: Metal bellows or copper tube with piston.
- D. Size: ASSE 1010, sizes AA and A through F, or PDI-WH 201, sizes a through F.
- E. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, and are limited to, the following: Amtrol, Inc., Josam Company., Precision Plumbing Products, Inc., Sioux Chief Manufacturing Company, Inc., Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc., Watts Drainage

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Installation: Install per manufacturer's published installation and operation manual.

END OF SECTION 221119

SECTION 221123 - RECIRCULATION DOMESTIC WATER PUMP

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 GENERAL

- A. Pump shall be an in-line, seal-less, and centrifugal type. Factory-assembled and tested, close-coupled, canned motor, overhung-impeller centrifugal pump.
- B. Pump and motor assembly to be hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
- C. Pump casing to be bronze with threaded or companion-flange connections.
- D. Pump impeller to be plastic in material.
- E. Pump motor to be single speed unless noted otherwise.
- F. Pump working pressure to be a minimum 125 psig with a maximum continuous operating temperature of 220 degree F temperature.
- G. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, and are limited to, the following: Armstrong Pumps Inc., Barnes; Crane Pumps & Systems, Bell & Gossett; ITT Corporation, Grundfos, Peerless Pump Inc., TACO Incorporated

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Pump control to be Thermostat and Time Clock.
 - 1. During occupied mode, the pump shall run based on return water temperature. When the return water temperature drops below setpoint, the pump shall energize. Return water setpoint shall be 104 deg. F (adjustable). During unoccupied mode, the pump shall be off.
 - 2. Thermostat: Electric; adjustable for control of hot-water circulation. Water immersion type temperature sensor for installation in piping.
 - 3. Timer: Electric; for control of hot-water circulation. Programmable type, seven day, twenty-four hour clock with manual override on-off switch. Program up to two on-off cycles each day for seven days.

3.2 CONNECTIONS

- A. Install recirculation pump on hot water return piping at the end of the hot water loop back to the water heating system as detailed.
- B. Install piping adjacent to pump to allow service and maintenance. Provide unions and shutoff valves on each side of pump. Provide check and balancing valves. Provide strainer upstream of pump and downstream of shutoff valve. Install pressure and temperature gage connectors at suction and discharge of each pump.
- C. Interlock pump between water heater and hot-water storage tank with water heater burner and time-delay relay.

END OF SECTION 221123

SECTION 221316 - SANITARY, WASTE AND VENT PIPING SYSTEM

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

1.2 GENERAL

- A. Provide a complete soil, waste and vent system in the building and on the site as indicated on the drawings and as specified herein.
- B. Above ground soil, waste and vent piping within buildings including soil stacks, vent stacks, horizontal branches, traps, and connections to fixtures and drains.
- C. Underground building drain piping including mains, branches, traps, connections to fixtures and drains, and connections to stacks, terminating at connection to existing sanitary sewer.

PART 2 - PRODUCTS

2.1 INTERIOR PIPING

- A. No-Hub cast iron soil, waste, and vent piping and fittings 1-1/2" and larger shall conform to ASTM A-888.
- B. Hub and Spigot cast iron soil, waste, and vent piping and fittings 2" and larger shall conform to ASTM A-74 with ASTM C-564 gasketed joints.
- C. Soil, waste and vent piping smaller than 1-1/2" shall be Type "M" copper and conform to ASTM B-306.
- D. No-hub cast iron pipe and fittings may be used aboveground for soil, waste, and vent piping.
- E. Hub and spigot cast iron pipe may be used underground for soil, waste, and vent piping.
- F. Piping alignment shall be as indicated on the drawings using approved wye branches or eight bands for direction changes and shall be surely supported or secured to maintain such alignment.

2.2 EXTERIOR PIPING

- A. Poly (vinyl chloride) pipe (PVCPP): ANSI/ASTM D 3033, Type PSP or ASTM D 3034, Type PSM SDR-35.
- B. Contech construction products a-2000 PVC sewer pipe
- C. Install top of cleanout and cap 6" above finished grade.

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Piping alignment shall be as indicated on the drawings using approved wye branches or eighth bends for direction changes and shall be surely supported or secured to maintain such alignment.
- B. Pitch of sanitary piping shall be uniform at a minimum of 1/8" per foot for building drains, drainage piping greater than 2" and as indicated on the drawings. Pitch of sanitary piping shall be uniform at a minimum of 1/4" per foot for drainage piping 2" and smaller and as indicated on the drawings.
- C. Protection shall be given all footings, other structural elements during underground work adjacent to such items. Refer to architectural and/or structural drawings for locations.
- D. Vent all fixtures, connect branch vents to main vent risers at least six inches above flood rim of fixtures. Pitch vent lines back to soil or waste pipe, free of drops and sags.
- E. Cleanouts shall be full size of pipe up to 4", and 4" for larger sizes. For underground and concealed lines, provide cleanouts in accessible positions at each right angle turn and at intervals not to exceed fifty feet. In floors, install flush with finish floor with extension pipe from cleanout wye.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 CLEANOUTS

- A. Floor cleanout equal to Zurn Z-1400 adjustable floor cleanout.
- B. Wall cleanout equal to Zurn Z-1443 with smooth nickel bronze square wall access panel and frame.
- C. Grade cleanout equal to Zurn Z-1400 adjustable cleanout.
- D. Provide a sanitary tee and threaded cap cleanout plug in suspended waste piping.
- E. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the work include, and are limited to, the following: Josam, Jay R Smith, Watts Regulator Co.; a division of Watts Water Technologies, Inc, Mifab, Zurn

2.2 FLOOR DRAINS

- A. Provide floor drains in compliance with ASME A112.6.3. Provide floor drains with trap-seal primer fitting. All floor drains located in rooms with tile floors shall be provided with manufacturer's standard square grate, unless noted otherwise.
- B. Refer to plumbing drain schedule for project specific floor drain manufacturers and models.
- C. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the work include, and are limited to, the following: Jay R Smith MFG. Co., Josam, Mifab, Watts Drainage Products Inc., Zurn Plumbing Products Group

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Installation Instructions:
 - 1. Install per manufacturer's published installation and operation manual.

**FESTUS READINESS CENTER –
PROJECT # T2330-01**

SITE# 6302

FACILITY # 56377

END OF SECTION 221319

SECTION 221613 - NATURAL GAS PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

2.2 BUILDING DISTRIBUTION PIPING:

- A. All piping from meter/regulator to gas fired equipment connections shall be black steel.
- B. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
- C. Pipe size 2" and smaller: Malleable-Iron Threaded Fittings
- D. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
- E. Pipe size 2-1/2" and larger: Wrought-Steel Welding Fittings for butt welding and socket welding.
- F. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.

2.3 GENERAL DUTY VALVES:

- A. Metallic valves 2 inches and smaller shall comply with ASME B16.33, cold working pressure of 125 psig.
- B. Metallic valves larger than 2 inches shall comply with ASME B16.38, cold working pressure of 125 psig.
- C. Provide one-piece ball valves with bronze body, chrome-plated brass ball, blowout proof stem and seat, and bronze trim complying with MSS SP-110.
- D. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, and limited to, the following: BrassCraft Manufacturing Company; a Masco company, Conbraco Industries, Inc.; Apollo Div., Lyall, R. W. & Company, Inc., McDonald, A. Y. Mfg. Co., Perfection Corporation; a subsidiary of American Meter Company.

2.4 PRESSURE REGULATORS:

- A. Provide pressure regulators to conform with ANSI Z21.80, cast iron or die-cast aluminum body, interchangeable zinc-plated steel springs and diaphragm plate, single port, self-contained

regulator with orifice no larger than required at maximum pressure inlet and no pressure sensing piping external to the regulator.

- B. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.
- C. Overpressure Protection Device: Factory mounted on pressure regulator.
- D. Regulator shall include vent limiting device, instead of vent connection and piping, if approved by authorities having jurisdiction.

2.5 NATURAL GAS METERS:

- A. Service meters shall comply with the requirements of the utility supplying gas to the facility.

2.6 FLEXIBLE CONNECTORS FOR GAS APPLIANCES

- A. Provide indoor, fixed-appliance flexible connector that complies with ANSI Z21.24.
- B. Provide indoor, movable-appliance flexible connector that complies with ANSI Z21.69.
- C. Flexible connector shall be corrugated stainless steel tubing with yellow polymer coating, operating pressure of 0.5 psig and zinc coated threaded steel connections complying with ASME B1.20.1. Maximum length shall be 72 inches.

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Plumbing contractor shall be responsible for installing gas piping run-outs to all gas-fired equipment, including equipment supplied by the HVAC and electric contractors. Piping shall be installed full-size (as indicated on the drawings) to each units' gas inlet connection, burner, regulator, etc. Plumbing subcontractor shall provide gas cock and make final connections. Connections to each gas-fired equipment item shall include a drip leg and shutoff gas cock. Comply with equipment manufacturer's instruction. For connections to gas-fired rooftop equipment, plumbing contractor shall be responsible for the roof penetration and shall install the gas piping through the roof in a location that has been coordinated with the HVAC contractor. Contractor shall be responsible for all the costs associated with work provided by the utility company, including tap fees, installation costs, materials, equipment, road cuts, and bores if applicable.
- B. Field prepare and paint exterior natural gas piping, fittings, etc. with alkyd anticorrosive metal primer and topcoat with exterior alkyd enamel flat. Color to match building exterior and approved by the architect.

END OF SECTION 221613

SECTION 223000 - COMMERCIAL WATER HEATERS

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 NATURAL GAS TANK TYPE

- A. Provide commercial fuel-fired tank type water heater as scheduled. Comply with UL 2523 Standard.
- B. Provide corrosion resistant metal drain pan with raised edge sized not less than the base of the water heater and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads.
- C. Provide field fabricated piping heat trap arrangement according to ASHRAE/IESNA 90.1.
- D. Provide combination temperature and pressure relief valve, ASME rated and stamped with relieving capacity at least as great as heat input and pressure setting less than water heater's rated operating pressure.
- E. Provide water heater stands or mounting brackets with manufacturer's factory fabricated steel capable of supporting water heater and water.
- F. Provide steel pressure-rated expansion tank constructed with welded joints and factory-installed butyl rubber diaphragm, pre-charged to minimum system operating pressure at tank.
- G. Provide field-fabricated piping-type heat traps in accordance with ASHRAE/IESNA 90.1
- H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, and are limited to, the following: AO Smith, Bock Water Heaters, Bradford White Corporation., Lochinvar Corporation., State Industries.

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Installation: Install per manufacturer's published installation and operation manual.

END OF SECTION 223000

SECTION 223001 - POINT OF USE THERMOSTATIC MIXING VALVES

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Thermostatic mixing valves shall be provided for all lavatories and showers and shall be ASSE 1070 listed, lead free, sweat connections, 125 psi operating pressure.
- B. Point-of use thermostatic mixing valves shall be equal to Powers LFG480 for lavatories or Powers 900 for showers.
- C. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, and are limited to, the following: Taco Comfort Solutions, Symmons, Lawler, Leonard, Powers, Bradley

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Mount under lavatory. Set outlet temperature of thermostatic mixing valve to 110 degrees F. Route tempered water to hot water side of lavatories. Shower valves shall be set to maximum 110 degrees F.

END OF SECTION 223001

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES

- A. Flush Valve Water Closets:
 - 1. Provide floor mounted single cast, flush valve, elongated bowl with open front seat less cover.
 - 2. TOILET 1.28 GPF / Sensor / MaP of 350 grams per flush.
 - 3. Electronic Single-flush valve; 1.28 gal (4.8 L) per flush max.
- B. Urinals:
 - 1. Provide ultra-low flow flush urinal, wall hung siphon jet, flush valve type, 1/8 gallons (0.5 L) per flush.
 - 2. Electronic sensing flush valve
 - 3. Provide Battery Operated Electronic Sensing Flush Valve.

2.2 MATERIALS AND EQUIPMENT

- A. Manufacturers: Refer to plumbing fixture schedule for basis of design. Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the work include, and are limited to, the following: American Standard America., Crane Plumbing, LLC., Kohler Co., Sloan, Toto USA, Inc., Zurn Industries, LLC; Commercial Brass and Fixtures., Sterling; a Kohler Company., Eljer Inc

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Install per manufacturer's published installation and operation manual.

END OF SECTION 224000

SECTION 230501 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 GENERAL

- A. General Provisions of the Contract including General and Supplementary Conditions and General Requirements apply to work of this section.

1.2 SCOPE

- A. The base bid includes furnishing all materials, labor, tools, and equipment and the performance of all work required to install a complete heating and air conditioning system as outlined herein.

1.3 GUARANTEE

- A. The contractor shall provide a guarantee in written form stating that all work under this section shall be free of defective work, materials, or parts for a period of one year from the date of owner's final acceptance and shall repair, revise or replace at no cost to the owner any such defects occurring within the guarantee period. Contractor shall also state in written form that any items or occurrences arising during the guarantee period will be attended to in a timely manner and will in no case exceed four (4) working days from date of notification by owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 WORK IN EXISTING SPACES

- A. General:
 - 1. Care shall be taken when working in existing spaces so as not to damage existing walls and ceilings where work is being performed.
- B. Ceilings:
 - 1. Where work is being performed above ceilings, and the architectural drawings do not indicate ceiling modifications by the general contractor, it shall be the responsibility of this contractor to remove and replace existing ceilings where work is being performed. In those instances, all repair and installation of new grid, ceiling panels, etc shall be the responsibility of this contractor. Match existing finishes.
- C. Walls & Floors:
 - 1. It shall be the responsibility of this contractor to patch existing walls and floors and match existing finishes where work is being removed or installed and patching is being performed, unless noted otherwise on the architectural drawings.

3.2 DEMOLITION

- A. Any Equipment to be demolished shall also include the demolition of any and all ductwork, piping etc serving or served by the equipment, all accessories, air devices, wiring, gas piping, venting, control wiring and power wiring associated with the equipment.
- B. Demolition shall be coordinated with all trades. All materials shall be turned over to the owner or disposed at the owner's direction.
- C. Contractor is responsible for reclaiming any refrigerant in association with the demolition in accordance with all local, state and federal regulations.
- D. Any roof or wall penetration shall be patched watertight to the satisfaction of the architect.

3.3 TESTS AND ADJUSTMENTS

- A. No ducts, piping, fixtures or equipment shall be concealed or covered until they have been inspected and approved by the Architect and the inspector who shall be notified by the contractor when the work is ready for inspection.
- B. Work shall be completely installed, tested and leak tight before inspection is required. All tests shall be repeated to the satisfaction of those making the inspection.

3.4 ARCHITECTURAL COORDINATION ITEMS

- A. Cutting and Patching:
 - 1. Cut and drill all openings in walls and floors required for the installation. Secure approval of Engineer before cutting and drilling. Neatly patch all openings cut.
- B. Fire Caulking:
 - 1. Patching through fire rated walls and enclosures shall not diminish the rating of that wall or enclosure. Patch shall be equal to rockwool, firestop, caulk or approved "rated" patch.
- C. Access Panels and Pathways:
 - 1. Furnish all access panels required for proper servicing of equipment. Provide access panels for all concealed valves, vents, controls, cleanout doors, and sprinkler devices required by NFPA. Provide access panels for all fire and/or fire & smoke dampers. Provide frame as required for finish. Furnish panels to General Contractor. Exact locations to be approved by the Architect. Minimum size to be 12" x 12", units to be 16 gauge steel, locking device shall be screwdriver cam locks.

3.5 PROJECT EXISTING CONDITIONS

- A. Where new HVAC systems are required to be connected to existing HVAC systems, it is the contractor's responsibility to verify the location, size, pressure, condition, and they shall verify that the existing HVAC system is indeed the correct and appropriate HVAC system before any work is done. Provide all necessary camera scoping and dye testing as necessary. If there is any need for concern, if it is determined that the existing HVAC system is not a correct or appropriate HVAC system or not connected to a correct or appropriate HVAC system, if the condition of the existing HVAC system is not viable for re-use, or any other condition that would not allow the proper functioning of the new HVAC system, the contractor shall notify the engineer in writing immediately via RFI and wait for direction before proceeding.
- B. Interruption of Existing HVAC Services:
 - 1. Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
 - 2. Notify, Architect, Construction Manager, and Owner no fewer than seven days in advance of proposed interruption of service.
 - 3. Do not proceed with interruption of service without Architect's written permission.

END OF SECTION

SECTION 230503 - SUBMITTALS FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 REQUIREMENTS

- A. Where submittals are required by the Contract Documents, they shall be prepared and supplied in accordance with the Contract Documents. In addition to Division 01, the Contractor is advised to review and comply with the requirements articulated within each Division and within each section of that Division.
- B. The contractor is not relieved of responsibility for providing specified or drawn scope of work should any errors or omissions in submittal information not be noted by the Design Professional during submittal reviews or site observations.
- C. Some Divisions may include a division-specific “Submittal Requirements for” section. Where this section exists, it articulates additional requirements for submittals that apply to the work of that Division.
- D. The submittal requirements help to identify, track and keep the project organized for all parties involved. They are necessary to ensure a timely turnaround and an appropriate technical review. Submittals that do not conform to the administrative requirements are rejected and returned, without technical review.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Reference Specification Section 01 33 00.00 for a full list of submittal procedures and required formats.

3.2 USE OF ELECTRONIC DRAWINGS FROM THE OWNER’S DESIGN TEAM

- A. Plan drawings for the Project were created with Revit.
- B. If expressly permitted by the Owner and the terms of the Contract, editable electronic versions of standard-scale, AutoCAD-based plan drawings may be made available for the creation of shop and as-built drawings.
- C. Upon request, when available, electronic versions of standard-scale, Navisworks (.dwf) and (.nwc) or AutoCAD 360 (.dwg) files may be made available for coordination purposes.
- D. Due to the proprietary nature of internal design systems, editable native-software versions of some drawings, including but not limited to system diagrams and details, will not be made available in an editable form. In these cases, electronic versions of the drawings may be made available only in PDF, JPG, or similar non-editable electronic form, at the sole discretion of the Design Professional.

END OF SECTION

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC PIPING AND DUCTWORK

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Submittal Requirements
 - 1. Product Data: For each type of product indicated.
 - 2. Shop Drawings: Fabrication and installation details.

PART 2 - PRODUCTS (COMBINED WITH PART 3 - EXECUTION)

PART 3 - EXECUTION

3.1 GENERAL

- A. Support all piping, ductwork and equipment by hangers or brackets properly from the building structure. Support from decking above is prohibited. Furnish structural steel members where required to support piping and equipment. No portion of piping or valves shall be supported by equipment.
- B. Ductwork - Support by means of hangers as follows:

Duct Width	Hanger Size and Type	Max. Spacing
30 or less	(#16 gage)	8
- C. A pair of hangers shall be located at every transverse joint and elsewhere according to the table.

3.2 PIPING

- A. Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible. Where piping of various sizes is supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe as specified above for individual pipe hangers.
- B. Individual pipe hangers to be Anvil International Clevis Hanger Fig. 260, Elcen, or approved equal.
- C. Rod sizes to conform to the following: 3/8" rods for 3/4"-2" pipe.
- D. Hangers shall be sized to allow insulation to pass through unobstructed, provide saddle support for insulation at all hanger.
- E. Hanger spacing for steel piping unless otherwise noted is to be as follows: 1-1/4" or smaller to be 8' on center; and at each change of direction. Hanger spacing for copper pipe to be as follows: 1" or smaller 6' on center; 1-1/4" or larger 8' on center.
- F. Piping shall be also supported at each change in direction, at valves, and at equipment.

END OF SECTION

SECTION 230548 - SEISMIC CONTROL FOR HVAC

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Shop Drawings
 - 1. Provide performance requirements and design criteria, including analysis data signed and sealed by the qualified engineer responsible for their preparation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. The contractor shall subcontract a licensed structural engineer for the design of all seismic restraint systems required by the presiding jurisdiction. The structural engineer shall provide engineered stamped and signed drawings of seismic design and submit as deferred submittal to supplement the permit drawings.

3.2 SEISMIC BRACING

- A. Provide seismic bracing of HVAC components where required by code.

3.3 QUALITY ASSURANCE

- A. The contractor shall provide seismic restraint systems to meet total design lateral force requirements for support and restraint of conduit, cable trays, equipment, and other similar systems and equipment where required by the applicable building code.

3.4 DELEGATED DESIGN

- A. Seismic restraint designer shall coordinate all attachments with the structural engineer of record. Provide engineered stamped and signed drawings of seismic design.
- B. Seismic restraint designer shall provide visual inspection after installation and approve installation of seismic design components.
- C. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
- D. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.
- E. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.
- F. Friction from gravity loads shall not be considered resistance to seismic forces.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Shop Drawings:
1. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems. Final Report: Upon verification and approval prepare final reports, type written, and organized and formatted as specified below. Submit 2 complete sets of final report to the owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

1. Test, adjust, and balance the following mechanical systems:
2. Supply air systems.
3. Return air systems.
4. Exhaust air systems.
5. Verify temperature control system operation.
6. Test systems for proper sound and vibration levels.

3.2 QUALITY ASSURANCE

- A. Codes and Standards:
1. AABC: "National Standards for Total System Balance".
 2. ASHRAE: ASHRAE Handbook, 2011 Applications, Chapter 38, Testing, Adjusting, and Balancing.

3.3 QUALIFICATIONS

- A. The contractor shall procure the services of an independent Balance and Testing Agency, approved by the Engineer, and a member of Associated Air Balance Council (AABC) or NEBB, which specializes in the balancing and testing of heating, ventilating and air conditioning systems, to balance, adjust and test all air and water systems and equipment as herein specified. All work by this agency shall be done under direct supervision of a qualified heating and ventilating Engineer employed by this agency. All instruments used by this agency shall be accurately calibrated and maintained in good working order.

3.4 SEQUENCING AND SCHEDULING

- A. General:
1. Test, adjust, and balance the air systems indicated above.
 2. Test, adjust and balance air conditioning systems during summer season and heating systems during winter season, including at least a period of operation at outside conditions within 5 deg F wet bulb temperature of maximum summer design condition, and within 10 deg F dry bulb temperature of minimum winter design condition. Take final temperature readings during seasonal operation.

3. Check all filters for cleanliness, provide new as required. Check dampers (volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans. Place outlet dampers in full open position. Lubricate all motors and bearings. Check fan belt tension. Check fan rotation.
4. Air balance and testing shall not begin until the system has been completed and is in full working order. The Contractor shall put all heating, ventilating and air conditioning systems and equipment into full operation and shall continue the operation of same during each working day of testing and balancing. The contractor shall submit within 30 days after receipt of contract, 8 copies of submittal data for the testing and balancing of the air conditioning, heating, and ventilating systems. The Air Balance and Testing Agency shall provide proof of having successfully completed at least five projects of similar size and scope.
5. The air balancing contractor shall include the additional cost to change every fan factory installed sheave, pulley and/or belt of in order to obtain the design air flows.

B. Renovations:

1. In areas where existing HVAC equipment is being utilized, balancing contractor shall include the cost to pre-check each equipment air flows, serving the area of work, prior to demolition, and re-check and adjust each air handler after new construction. Air flows of existing air handlers serving existing spaces shall be similar after project is complete.

3.5 Performing testing, adjusting and balancing

- A. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
- B. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
- C. Patch insulation, ductwork, and housings, using materials identical to those removed.
- D. Seal ducts and piping, and test for and repair leaks.
- E. Seal insulation to re-establish integrity of the vapor barrier.
- F. Mark equipment settings, including damper control positions; valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
- G. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

END OF SECTION

SECTION 230713 - DUCT INSULATION

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data:
 - 1. For each product indicated.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details and attachments to other work.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. All liners, insulation and adhesives shall have a flame spread index not more than 25 and a smoke developed index of not more than 50. Insulation shall have a minimum installed thermal resistance value of R6 for interior ductwork, R8 for exterior ductwork, or code minimum, whichever higher.
- B. Rigid Fiberglass Ductwork Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, without facing and with vapor barrier all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
- C. Flexible Fiberglass Ductwork Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with vapor barrier all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.
- D. Vapor Barrier Material for Ductwork: Paper-backed aluminum-foil, except as otherwise indicated; strength and permeability rating equivalent to factory-applied vapor barriers on adjoining ductwork insulation, where available; with following additional construction characteristics:
- E. High Puncture Resistance: Low vapor transmission (for ducts in exposed areas: Mech. Rooms, etc.)
- F. Moderate Puncture Resistance: Medium vapor transmission (for ducts in concealed areas).

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. All ductwork shall be insulated except:
 - 1. Double wall ductwork
 - 2. Fabric ductwork
 - 3. Metal ducts with duct liner of sufficient thickness to comply with energy code.
 - 4. Factory insulated flexible ductwork
 - 5. Factory insulated plenums and casings
 - 6. Flexible connectors
 - 7. Vibration control devices
 - 8. Factory insulated access panels and doors
 - 9. Supply ductwork exposed in conditioned spaces excluding mechanical rooms, server rooms and electric equipment rooms
 - 10. Toilet exhaust, general exhaust and return ductwork in an insulated joist or attic space.
- B. Installation: Install per manufacturer's published installation manual.

**FESTUS READINESS CENTER –
PROJECT # T2330-01**

SITE# 6302

FACILITY # 56377

END OF SECTION

SECTION 230719 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Provide 3/4" armaflex on refrigerant piping.
- B. Provide 1" fiberglass insulation on concealed condensate drain piping.
- C. Insulation shall have a minimum thickness as required by Code.
- D. All insulation and adhesives shall have a flame spread index not more than 25 and a smoke developed index of not more than 50.

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Provide insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

END OF SECTION

SECTION 230800 - COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. The requirements of this Section apply to all sections of Division 23.
- B. This project will have selected building systems commissioned including all scope of work outlined in Division 23 specifications including but not limited to, HVAC systems and equipment, ductwork distribution and controls. A Commissioning Agent (CxA) appointed by the owner will manage the commissioning process.

1.2 SUMMARY

- A. This Section includes requirements for commissioning the HVAC systems, subsystems, and equipment.
- B. The commissioning activities have been developed to support code & LEED outlined delivery of an efficient project in accordance with the Contract Documents developed by the design team evolved from the Owner's Project Requirements (OPR).

1.3 SYSTEMS AND EQUIPMENT TO BE COMMISSIONED

- A. Commissioning of a system or systems specified in this Division is part of the construction process and required by OPR and/or code (IECC). The commissioning process for these systems is required in cooperation with the Owner, Construction Manager, and the Commissioning Agent.
- B. The following systems, components, and equipment are the focus of the commissioning process on the Project:
 - 1. Air Handling Systems - Roof Top Units
 - 2. Unitary Equipment - Split Systems
 - 3. Fans - Exhaust Fans, Fan Motors, Variable Speed Drives, Controls and Safeties
 - 4. Direct Digital Control System (BACnet or similar Local Area Network (LAN), Operator Workstation, all sequences of operations for systems being commissioned, system accuracy and response time).

1.4 SUBMITTALS

- A. The commissioning process requires review of Submittals for equipment and systems that are part of the commissioning scope of work. The Construction Manager will be responsible for delivering these submittals to the CxA for their review.
- B. The commissioning process requires Submittal review simultaneously with engineering review.

1.5 COMMISSIONING TEAM

- A. The commissioning team shall consist of members appointed by the Owner, including members of the design team, and members appointed by Contractor(s). Each individual shall have the authority to act on behalf of the represented entity and shall be organized to implement the commissioning process through coordinated actions and be dedicated to remain involved in the Project until completion.
 - 1. Members Appointed by Owner:

- a. CxA: The designated person, company or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
- b. Representatives of the facility user and operation and maintenance personnel.
- c. Architect and engineering design professionals (i.e., design team).
2. Members Appointed by Contractor(s):
 - a. Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

1.6 COMMISSIONING PLAN

- A. Prior to permit issuance a commissioning plan shall be completed to document how the project will be commissioned and shall be started during the design phase of the building project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONTRACTOR RESPONSIBILITY

Contractor shall provide support and work as specified, needed and required to conduct and facilitate building commissioning efforts. This work will be comprised of three distinct efforts:

1. Support commissioning agent (CxA) during installation verification and correct disclosed deficiencies.
 2. Perform testing, adjusting, balancing and system startup and support functional performance testing by CxA;
 3. Correct deficiencies disclosed by functional performance testing and submit reports.
- A. Systems subject to commissioning may include, but are not limited to domestic hot water generation, HVAC systems, rooftop units, exhaust fans, HVAC controls, lighting controls, air curtains, built-in refrigeration, equipment and renewable energy systems.
 - B. Contractor shall provide written responses to all CxA's reviews and comments. Responses shall be provided in a timely manner.
 - C. Contractor shall include commissioning activities in project schedule and show intervals for performance of work for which contractor is responsible and intervals for work performed by CxA. Contractor shall show resources for performing all work related to commissioning activities on a line item in the schedule of values.
 - D. Contractor shall install equipment in accordance with the manufacturer's requirements and all contract documents. Ensure that all equipment is installed totally complete and accessible to CxA for installation verification and functional performance testing prior to the scheduled start of installation verification.
 - E. Contractor shall complete manufacturer's startup procedures prior to commissioning coordination with CxA.

- F. Contractor shall be readily available during installation verification to correct any deficiencies or defects is closed by the installation verification process. Corrections shall be made in a timely manner without disruption of the construction schedule.
- G. All HVAC exhaust fan and air curtain equipment shall be tested, adjusted and balanced by the contractor's testing, adjusting and balance agent (see testing adjusting and balancing) after the system is verified to be complete and correct by CxA, in accordance with the requirements of these documents. All HVAC control systems shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with these plans and specifications. Sequences of operation shall be tested to ensure that they operate in accordance with the contract requirements. Deliverables: preliminary, written testing and air balance report conforming to the requirements specified herein, documenting the information specified, etc... To the CxA immediately upon completion of the work.
- H. Provide a list of all factory and field settings that have been programmed into the equipment (such as setpoints, schedules, dip switch settings, condenser and evaporator operating pressure/temperature, etc...).
- I. Contractor shall inform CxA when equipment is ready for functional performance testing. All equipment shall be ready for functional performance testing prior to starting testing. This includes rehearsing all functional performance tests before demonstrating to the CxA. Contractor shall operate equipment for CxA and verify by demonstrating the correct operation of equipment, sensor calibration, response of actuators and proper execution of HVAC control and lighting sequences, including but not limited to air movement, temperature, sound and control response. Provide any security access, hardware, software or other support as needed for the CxA to efficiently witness and document all equipment testing. CxA will record the equipment operation and response to testing sequences and prepare a list of any deficiencies disclosed by the functional performance tests for correction by the contractor. Equipment includes, but is not limited to, air handling units, rooftop and split type, condensing units, exhaust fans, lighting controls, etc... Deliverables: provide completed copies of all start up reports, filled out on the manufacturer's forms, to the CxA.
- J. Contractor is responsible for correcting any issues or deficiencies disclosed during the functional performance testing process. Corrections should be made in a timely manner without disruption to the system and construction schedule.
- K. Contractor shall be readily available for any re-testing of equipment deemed necessary by CxA during installation verification and functional performance testing. Contractor is responsible for correcting any issues or deficiencies found in the system during any and all re-testing. Corrections should be made in a timely manner without disruption to the system and construction schedule. Deliverables: final balance report, deficiencies list noting corrective actions performed by contractor in response to installation verification and functional performance test results.
- L. Construction and post construction testing: additional testing may be required by LEED and other processes that may occur out of sequence with commissioning service. Contractor shall conduct. Document, support and schedule this testing as directed by CxA.
- M. Contractor shall provide a training plan for each trade (mechanical, electrical, plumbing, renewable systems) for the CxA's approval. The training plan shall outline all the topics that are to be covered along with the time duration for each topic. It shall also include the instructor's name, qualifications and company logo.
- N. The contractor is responsible for recording attendance for each training session. Copies of these shall be submitted to the CxA.

- O. Contractor shall submit O&M manuals for all pieces of equipment at least 6 weeks in advance of the training sessions.

3.2 GENERAL DIRECTION

- A. Equipment Verification Checklists (EVC’S)
 - 1. The Contractor shall complete EVC’s to verify systems, subsystems, and equipment installation is complete and systems are ready for Systems start-up and Functional Performance Testing. The Commissioning Agent will prepare all EVC’s to be used by the installing contractors to document equipment verification and installation.
 - 2. The installing personnel shall complete the checklists. Completed checklists shall be submitted to the CM. The CM is responsible for sending all completed copies to the Commissioning Agent for review. The Commissioning Agent may spot check a sample of completed checklists for completion and accuracy. If the Commissioning Agent determines that the information provided on the checklist is not accurate, the Commissioning Agent will return the marked-up checklist to the Contractor for correction and resubmission. If the Commissioning Agent determines that a significant number of completed checklists for similar equipment are not accurate, the Commissioning Agent will select a broader sample of checklists for review. If the Commissioning Agent determines that a significant number of the broader sample of checklists is also inaccurate, all checklists for that type of equipment will be returned to the Contractor for correction and resubmission.
- B. Functional performance testing:
 - 1. Contractor tests as required by other sections of Division 23 shall be scheduled and documented in accordance with the applicable sections. The Commissioning Agent will work with the CM to incorporate the Functional Performance Testing schedule into the master construction schedule. The CxA will conduct and witness all Functional Performance Testing performed by the Contractors. The commissioning process includes Functional Performance Testing that is intended to test systems functional performance under steady state conditions, reactions to changes in operating conditions and performance under emergency conditions. The contractors shall review and comment on the functional performance tests prior to testing.
- C. Training Of Operations And Maintenance Personnel
 - 1. Training operations and maintenance personnel on the proper operation, maintenance and any emergency situations is required. Provide competent, factory authorized personnel to provide instructions to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the CxA after submission and approval of formal training plans. The CxA will review the training plans and observe the training performed by the factory personnel and installing contractors.
- D. Final Commissioning Report
 - 1. A complete report of commissioning process activities from design through post-construction phases of the building project shall be completed by the CxA and provided to the Owner.
 - 2. The final commissioning report shall include the following:
 - a. Executive summary of process and results of commissioning program – including observations, conclusions and any outstanding items.
 - b. A history of all deficiencies and issues and how they were resolved
 - 1) Includes outstanding issues and a plan for resolution
 - 2) Include plans for seasonal testing schedule for a later date

- c. Functional performance test results and evaluations
- d. Summary of training process
- e. Cx Process Documents
 - 1) Cx Plan
 - 2) OPR
 - 3) BOD
 - 4) Equipment Verification Checklists/Installation Checklists
 - 5) Functional Performance Test Checklists
 - 6) Recommendations for end-of-warranty review activities

END OF SECTION

SECTION 230993 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data:
1. Provide written sequences of operation for each controlled system and piece of equipment.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

PART 3 - EXECUTION

3.1 SPLIT SYSTEM DX WITH O.A.

1. Startup
 - a. The unit shall operate on an occupied/unoccupied cycle as controlled by the programmable thermostat.
2. Supply Fan Control
 - a. The supply fan speed shall be constant, run continuously during occupied mode and set to the required CFM.
3. Space Temperature Control
 - a. Space temperature sensor furnished by EMS vendor.
4. Minimum Outside Air Control
 - a. During occupied mode the minimum outside air damper shall be open. Provide motorized outdoor air damper.
5. Cooling Control
 - a. Cooling shall be controlled to maintain space temperature setpoint. On a call for cooling the heating shall be off. On a further call for cooling, stage mechanical cooling on. Provide Low Ambient Controls on condensing unit for operation down to -20 degrees F.
6. Heating Control
 - a. Heating shall be controlled to maintain space temperature setpoint. On a call for heating, the mechanical cooling shall be off. On a further call for heating the furnace shall fire.
7. Unoccupied Mode
 - a. During the unoccupied mode of operation, the ACU shall go into night setback mode.
8. Night Setback/Shutdown
 - a. At night setback/shutdown the ACU shall go to fail safe position. Fail safe position is defined by the following: The supply fan is off, the outdoor air intake damper is closed, the heating is off and the mechanical cooling is off. The supply fan shall cycle in conjunction with either the heating or cooling system to maintain a minimum/maximum space temperature depending on the season.

3.2 TOILET EXHAUST FANS

- A. Exhaust fan operation shall be controlled by the time clock. During occupied mode the exhaust fan motor damper shall open and fan shall start. During unoccupied mode the exhaust fan motor damper shall be closed and fan shall be off.

3.3 CONTROLS

- A. Electrical contractor will provide power wiring. HVAC contractor shall provide all the low voltage wiring of HVAC units and controls, thermostats and controllers. Provide plastic protective cover for all thermostats. Replace controls on existing unit, adjust and calibrate controls.

3.4 GENERAL CONTROL WIRING REQUIREMENTS AND INSTALLATION METHODS

- A. Except where specifically indicated otherwise above, the HVAC/Temperature Control Contractor shall provide all electrical work as required for all temperature control related wiring (i.e. conduit, raceway, outlet boxes, junction boxes, wiring, etc.) in accordance with Electrical Specifications requirements. All conduit shall be 3/4" minimum.
- B. Coordinate all thermostat locations in field (case by case) with Architect, Owner and Electrical Contractor to ensure that they are placed in locations that will not interfere with furniture, equipment, artwork, wall-hung specialties, room finishes, etc. All thermostat wall locations indicated on HVAC drawings are schematic only and must be verified case-by-case prior to rough-in.
- C. All electrical work as described in this specification shall be per the latest edition of the National Electrical Code (NEC) and per applicable state and local codes.
- D. Where "free-air" installation methods (either exposed above the ceilings, in bridge rings or in cable trays) are permitted under Electrical Specifications above ceilings, provide plenum-rated cables wherever plenum ceilings (if any) exist and install as defined under Electrical Specifications. Install low voltage circuits, located in concrete slabs and masonry walls, in inaccessible locations, or exposed in occupied areas, in electrical conduit regardless of what wiring methods are permitted under Electrical Specifications.
- E. Where cable trays or bridge rings are provided by the electrical contractor for low voltage cables, these raceways may be utilized for control wiring by this contractor (provide special color coded jackets, label cable jackets per Electrical Specifications and group control wiring cables together). Provide conduit drops from cable tray/bridge ring paths to wall outlet boxes and equipment unless directed otherwise under Electrical Specifications.
- F. Regardless of permitted methods in Electrical Specifications, all cables/wiring installed concealed by gypsum board, masonry or other inaccessible materials in walls or above ceilings shall be installed in conduit, 3/4" minimum.
- G. All conduit, bridge rings, raceway, outlet boxes, etc. necessary for complete operational installation of control wiring shall be provided (furnished and installed) by the temperature control contractor in strict compliance with Electrical Specifications documents. Coordinate all work with all other applicable trades including the electrical contractor.
- H. Provide all required conduit work to and between equipment in a manner compliant with that described above (i.e. between condensing units, etc. as applicable).
- I. Install control wiring without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code and per Electrical Specifications.
- J. Install circuits over 25 volt with color-coded No. 12 wire in electrical metallic tubing, per Electrical Specifications. Install circuits under 25 volt with color-coded No. 18 wire with 0.031" high temperature (105 degs. F) plastic insulation on each conductor and plastic sheath

over all. Install electronic circuits with color-coded No. 22 wire with 0.023" polyethylene insulation on each conductor with plastic-jacketed copper shield over all.

END OF SECTION

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Submittal Requirements
 - 1. Product Data: For liners, adhesives, sealants and gaskets.
 - 2. Shop Drawings: Sheet metal thickness, reinforcing details, duct layouts indicating sizes, configuration, liner material, elevation and static pressure class.

PART 2 - PRODUCTS

2.1 DUCTWORK MATERIALS

- A. Exposed Ductwork Materials:
 - 1. Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting. Exposed ductwork which is to be painted shall have paint grip applied.
- B. Sheet Metal:
 - 1. Except as otherwise indicated, fabricate ductwork from galvanized sheet steel, lock forming quality; with G 90 zinc coating and mill phosphatized for exposed locations. Minimum gauge shall be 24.

2.2 MISCELLANEOUS DUCTWORK MATERIALS

- A. Volume Dampers:
 - 1. Provide volume dampers in all branch ducts or as required for balancing to required air flows.
- B. Fittings:
 - 1. Provide radius type fittings fabricated of multiple sections with maximum 15 deg. change of direction per section. Unless specifically detailed otherwise, use 45 deg. laterals and 45 deg. elbows for branch takeoff connections. Where 90 deg. branches are indicated, provide conical type tees.
- C. Duct Sealant:
 - 1. Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.
- D. Duct Cement:
 - 1. Non-hardening migrating mastic or liquid neoprene based cement, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.
- E. Ductwork Support Materials:
 - 1. Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
 - 2. For exposed stainless steel ductwork, provide matching stainless steel support materials.
 - 3. For aluminum ductwork, provide aluminum support materials except where materials are electrolytically separated from ductwork.

2.3 FLEXIBLE DUCTS

- A. Either spiral-wound spring steel with flameproof vinyl sheathing, or corrugated aluminum. Unless specifically mentioned, the maximum length of flex duct on the supply equals 5 feet. Flex is not allowed for return, relief or exhaust applications. The flexible ducts indicated for use in the H.V.A.C. system shall conform to the requirements of UL 181 for Class 0 or Class 1 flexible air ducts and shall be so identified.
- B. Where installed in unconditioned spaces other than return air plenums, provide 1" thick 1-1/2 lb. continuous flexible fiberglass sheath with vinyl vapor barrier jacket.
- C. Installation is not permitted above drywall ceilings and inaccessible ceilings.

2.4 FABRICATION

- A. Shop fabricate ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. All ductwork shall be Pittsburgh Construction with a minimum of thickness of 24 gauge. In addition, ductwork used in systems over 3" W.G. shall have cold sealant applied. Shop fabricate ductwork of gauges and reinforcement complying with SMACNA "HVAC Duct Construction Standards".

2.5 LINED DUCT

- A. The following ductwork shall be lined: Return from open ceiling plenum return to HVAC unit and transfer air ducts, if any.
- B. The following ductwork shall be lined with flexible duct liner: Return ductwork in ducted return systems 10 feet downstream of HVAC unit, and transfer air ducts, if any.
- C. Fabricate ductwork with duct liner in each section of duct where indicated. Laminate liner to internal surfaces of duct in accordance with instructions by manufacturers of lining and adhesive, and fasten with mechanical fasteners. Duct liner to be 3-lb density for acoustic requirements 1" thick or as noted. Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used.
- D. Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used.
- E. Duct Liner: Fibrous glass of thickness indicated. 3-lb density. All liners, insulation and adhesives shall have a flame spread index not more than 25 and a smoke developed index of not more than 50.
- F. Duct Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.
- G. Duct Liner Fasteners: Comply with SMACNA HVAC Duct Construction Standards.

2.6 DOUBLE WALL DUCTS

- A. Exposed round and rectangular ductwork and fittings shall be manufactured or shop-fabricated double wall a minimum G-90 galvanized steel ductwork with 1" fiberglass insulation between the solid outer shell and perforated inner liner. All ducts and fittings shall be construction for SMACNA's latest standards. All gaskets shall be UL listed to conform to ASTM E84-91a and NFPA 90A.
- B. Manufacturers: Subject to compliance with requirements, provide ductwork of one of the following: United-McGills K-27, Lindab Safe, Semco or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION OF METAL DUCTWORK

A. General:

1. Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.

B. Sealing:

1. Seal all longitudinal seams, S's and drives and all joints with mastic or cement. Install according to SMACNA standards.

C. Balancing Dampers:

1. The sheet metal contractor shall be fully responsible for installing balancing dampers in the ductwork, (whether shown on the drawing or not) in order to arrive at the intended air flow. The balancing sub-contractor shall provide direction and assistance in determining locations where dampers are required. Additional dampers, if required shall be installed at no additional cost to the owner.

D. Wall Penetrations:

1. Seal and pack around all ducts and piping sleeves which pass through walls that extend to bottom side of structure and rated walls.

E. Field Fabrication:

1. Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.

F. Routing:

1. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.
2. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

G. Electrical Equipment Spaces:

1. Do not route ductwork through transformer vaults and their electrical equipment spaces and enclosures.

H. Penetrations:

1. Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2". Fasten to duct and substrate.

2. Where ducts pass through fire-rated floors, walls, or partitions, provide fire dampers and firestopping between duct and substrate, in accordance with requirements of Division-7 Section "Firestopping".
3. All dampers integral to or utilized as part of an engineered smoke control system shall be listed and comply with UL 555S.
4. All fire dampers shall be listed and comply with UL 555.
5. All dampers shall be low leakage with edge and blade seals. Damper manufacturers are subject to specification compliance. Provide products by one of the following: Greenheck Fan Corporation, Nailor Industries, Ruskin Company, Young Regulator Company

I. Coordination:

1. Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.

3.2 INSTALLATION OF DUCT LINER

A. General:

1. Install duct liner in accordance with SMACNA HVAC Duct Construction Standards. Size of ductwork shown on the drawings is free net area, outside dimension of ducts will need to be increased if lined duct is used.
2. Store internally lined ductwork up off of the floor. Protect internally lined ductwork from water and dust. "Butter the leading edge of all internal duct lining with the manufacturer's recommended adhesive.
3. Inspect and repair all damaged lining prior to installation of ductwork.

3.3 INSTALLATION OF FLEXIBLE DUCTS

A. Maximum Length:

1. For any duct run using flexible ductwork, do not exceed 5' - 0" extended length. Installation shall have smooth full radius turns down to diffuser.
2. Installation not permitted above inaccessible ceilings.

3.4 ACCESS PANELS

1. Furnish all access panels required for proper servicing of equipment. Provide access panels for all concealed valves, vents, controls and cleanout doors, and sprinkler devices required by NFPA. Provide frame as required for finish. Furnish panels to General Contractor. Exact locations to be approved by the Architect. Minimum size to be 12" x 12", units to be 16 gauge steel, locking device shall be screwdriver cam locks.

END OF SECTION

SECTION 233423 - HVAC POWER VENTILATORS

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 INLINE TYPE CENTRIFUGAL FANS

- A. Provide inline exhaust fans of type, size, and capacity as scheduled, and as specified herein.
- B. Type: Centrifugal fan, direct or belt driven as scheduled. Provide aluminum, galvanized steel, or fiberglass weatherproof housings as scheduled.
- C. Electrical: Provide factory-wired non-fusible type disconnect switch at motor in fan housing. Provide thermal overload protection in fan motor. Provide conduit chase within unit for electrical connection.
- D. All dampers integral to or utilized as part of an engineered smoke control system shall be listed and comply with UL 555S.
- E. Manufacturer: Subject to compliance with requirements, provide centrifugal roof ventilators of one of the following: Acme, Cook (Loren) Co., Greenheck., Twin City Fan & Blower

PART 3 - EXECUTION

3.1 INSPECTION

- A. General:
 - 1. Examine areas and conditions under which power and gravity ventilators are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate ventilator work with work of roofing, walls, and ceilings, as necessary for proper interfacing.
- B. Access: Provide access and service space around and over fans as indicated, but in no case less than that recommended by manufacturer.
- C. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
- D. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Ensure that rotation is in direction indicated and intended for proper performance. Do not proceed with centrifugal fan start-up until wiring installation is acceptable to fan Installer.

3.3 FIELD QUALITY CONTROL

- A. Testing:
 - 1. After installation of ventilators has been completed, test each ventilator to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units, which cannot be satisfactorily corrected.

3.4 ADJUSTING AND CLEANING

- A. Cleaning:
 - 1. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.5 SPARE PARTS

- A. General:
 - 1. Furnish to Owner, with receipt, one spare set of belts for each belt drive power ventilator.

END OF SECTION

SECTION 233713 - DIFFUSERS, REGISTERS AND LOUVERS

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. Anemostat Products; a Mestek company, Carnes, Metalaire, Inc., Nailor Industries Inc., Price Industries, Titus, Tuttle & Bailey, Warren Technologies.

2.2 CEILING DIFFUSERS, GRILLES AND REGISTERS

- A. Refer to schedules for basis of design.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- B. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers and air extractors.

END OF SECTION

SECTION 238126 – SPLIT SYSTEM HVAC

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

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

PART 2 - PRODUCTS

2.1 SPLIT SYSTEM AIR CONDITIONING UNITS

- A. General: Provide factory-assembled and tested units as indicated, consisting of insulated casing, filter and rack, fan, motor and drive, fan and limit controls, and control transformer. Provide full cased evaporator coil.
- B. Refrigeration Circuit: Provide refrigerant thermal expansion valve for refrigerant control. Provide access valves in suction and liquid lines.
- C. Compressors: Provide welded shell, hermetic compressors, or serviceable hermetic compressors, 1750 RPM. Provide crankcase heaters. Provide 5 year extended warranty on compressor.
- D. Evaporator Coil: Construct of copper tubing and aluminum fins, pressure and leak tested at 1.5 times working pressure.
- E. Fans: Provide direct double-inlet, forward curved, centrifugal fans with drive. Provide permanently lubricated fan and motor bearings, and thermal overloads in motor.
- F. Filters: Provide 1" thick throwaway filters.
- G. Integral Air-Cooled Condensing Units: Provide condenser coil constructed of copper tubes and aluminum fins. Factory leak-test at 1.5 times working pressure, dehydrate and provide full charge of refrigerant.
- H. Provide subcooler and accumulator.
- I. Low Ambient Control: Provide head pressure control, designed to operate at temperatures down to -20 deg. F. Provide for all units without economizers.
- J. Controls: Provide factory-installed and wired controls, with terminal strip. Provide connections for remote thermostat.

2.2 HIGH EFFICIENCY GAS FIRED FURNACE FAN COIL

- A. General: Provide factory-assembled and tested gas-fired condensing furnace for use with natural gas, consisting of insulated casing, filter and rack, fan, motor and drive, fan and limit controls, three stage heat exchanger, mono-port burner direct vent sealed combustion chamber and control transformer. Provide evaporator coil.
- B. Fans and Motors: Provide direct double-inlet, forward curved, centrifugal fans with drive. Fan shall be statically and dynamically balanced. Provide permanently lubricated fan and motor bearings, and thermal overloads in motor. Motor shall be of ECM type and shall be variable speed design. Motor shall have individual overload protection.
- C. Casing: 0.030 in. thickness minimum, pre—painted galvanized steel.
- D. Heat Exchanger: four-pass heat exchangers-both primary and condensing. Heat exchanger shall be constructed of 20 gauge corrosion- resistant aluminized steel. Condensing section to be high grade stainless steel.

- E. Monoport Inshot Burners:
- F. Electronic Ignition:
- G. Direct Vent sealed combustion chamber.
- H. Filters: Provide 1" thick throwaway filters.
- I. Controls: Controls shall include a micro-processor based integrated factory-installed and wired electronic control board. Controls shall allow multiple operational settings, including separate blower speeds for low heat, medium heat, high heat, low cooling, high cooling and continuous fan. Continuous fan speed may be adjusted from the thermostat. Provide connections for remote thermostat. Cooling airflow shall be selectable.
- J. National Account Information: Owner has engaged Trane and Carrier national account agreements. GC shall purchase, receive and install equipment. Purchasing will be through the national account agreement only. Coordinate with owner construction manager for additional information. Manufacturer: Subject to compliance with requirements, provide rooftop units of one of the following: Carrier Air Conditioning; Div. of Carrier Corp., Trane Co.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which air conditioning units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION

- A. General: Install units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- B. Support: Install exterior units on 4" thick concrete pad on grade, or Pate (or Equal) equipment rails spanning a minimum of two bar joists on roof.
- C. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
- D. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment Installer.
- E. Ductwork: Connect supply and return ducts to unit with flexible duct connections. Provide transitions to exactly match unit duct connection size. Provide 1" acoustic duct lining on return air side a minimum of 10' from fan. Connect outside air duct to unit with flexible connection, provide manual damper and motorized damper.
- F. Drain Piping: Connect unit drain to nearest indirect waste connection. Piping to be type L copper. Provide trap at drain piping connection to unit sized per manufacturer's recommendations.
- G. Attic & Ceiling Spaces: Provide auxiliary drain pan below unit with a minimum depth of 1-1/2" and minimum 3" larger than unit or coil dimensions. Drain pan shall be galvanized steel not less than .0276 inches, with a separate drain line to a conspicuous point.

- H. Start-up AC units, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

3.3 TRAINING OF OWNER'S PERSONNEL

- A. Provide services of manufacturer's technical representative for 1-half day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner, provide at least 7-day notice to Contractor and Engineer of training date.

3.4 SPARE PARTS

- A. General: Furnish to Owner, with receipt, the following spare parts for AC unit: 1 set of matched fan belts for each belt driven fan. 1 set filters for each unit.

END OF SECTION

SECTION 260501 - COMMON WORK RESULTS FOR ELECTRIC

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Closeout
 - 1. Operation and Maintenance Manual: For equipment and systems to include in operation and maintenance manuals.
- B. Shop Drawings
 - 1. As-Built Drawings: For recording installed conditions that deviate from design documents.

1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to all sections.
- B. Obtain the latest Design and Construction Standards document(s) from the Owner. Comply with all Owner-specific requirements in addition to requirements set forth in these specifications and accompanying drawings. Should there be a conflict, the Owner's standards shall take precedence, unless prevailing codes and regulations mandate otherwise.

1.3 GENERAL DIRECTION

- A. Submittal of a bid indicates that the contractor has examined the drawings, specifications, and had an opportunity to visit the site to be able to provide a comprehensive complete bid.
- B. The intent of these specifications and the accompanying drawings is to provide complete and workable systems as shown, specified, and required by applicable codes. Interpret these specifications in conjunction with the drawings and provide all work described. If work is shown on drawings and not mentioned in the specifications, or vice versa, it is to be included in the work the same as though clearly set forth by both. Should there be a conflict between the specifications and drawings, provide the greater quantity or better quality. Immediately notify the owner's representative and design professional of such conflicts.
- C. Provide all labor and material, tools, and equipment necessary to render all systems complete and operational, and ready for turnover to Owner. Work defined within this section applies for all Division 26 work, including work of Division 26 that is provided in support of work of other divisions. Unless specifically indicated otherwise in documents of other construction divisions, products to be installed shall also be furnished under Division 26.
- D. During mobilization or construction, if an abnormal condition is uncovered either with existing conditions, equipment loads, submittal data, etc. bring these to the attention of the Design Professional for review.
- E. Phasing - Where the scope of work dictates that the project shall be constructed in phases, all costs shall be incurred by this contractor for any temporary work required so that previous phases can be operational while construction is being done to adjacent spaces.

1.4 GENERAL STANDARDS

- A. Provide work in compliance with applicable provisions of the following standards. Provide listing and labeling for all electrical materials, marked for respective intended uses, from UL or other Nationally Recognized Testing Laboratory (NRTL) that is acceptable to applicable Authorities Having Jurisdiction (AHJs).

- B. Provide materials, installation methods, workmanship, testing, etc., in strict accordance with the latest adopted edition of applicable national standards and local adopted codes.

1.5 PERMITS AND REGULATIONS

- A. Obtain and pay for permits, fees, certificates of inspection and approval, etc. required for this branch of the work. Furnish Owner with certificates of final inspection and approval prior to final acceptance of this branch of the work.
- B. Laws and regulations which bear upon or affect the various branches of this work shall be complied with by this contractor and are hereby made a part of this contract.

1.6 DEFINITIONS

- A. Furnish - Procure, supply, and deliver to project site, ready for installation, install and warrant (unless indicated otherwise on documents). Include warranty expenses.
- B. Install - Assemble, wire, and connect loose-shipped components on site. Place in position for service or use, including material, labor, accessories, services, and testing. Wire, connect, and render fully operational for intended use.
- C. Provide - Furnish and Install. Similar Terms: "include", "shall", "equip with", "consisting of"

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Should deviation from basis of design equipment impact other contractors scope of work it shall be the responsibility of this contractor to coordinate with and cover these costs in addition to their own.

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Unless specifically indicated, provide all specified and drawn work as required to render all equipment and systems fully operational, including all ancillary, accessory, and support work.

3.2 UTILITY VERIFICATION REQUIREMENTS

- A. Field verify locations of underground and aboveground utilities, or those otherwise obscured from view, in the vicinity of work prior to commencing work. Utilize "811" call before you dig and hire locating service to identify, locate and mark remaining utilities and private lines. Obtain on-site approval from local utility prior to connecting services. Failure to perform the above shall result in contractor proceeding at their risk and accepting full responsibility for incorrect connections.

3.3 INTERRUPTION OF SERVICES

- A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others without notification to Owner's Representative and written permission. Arrange for and provide temporary electric service meeting requirements of owner. Notify Owner's Representative no fewer than fourteen days in advance of proposed interruption of electric service.

3.4 TEMPORARY SERVICE

- A. Where required, provide temporary electrical service. Make necessary arrangements with local utility companies for temporary electrical service and pay associated fees for inspections, connections, initiation, etc.

**FESTUS READINESS CENTER –
PROJECT # T2330-01**

SITE# 6302

FACILITY # 56377

END OF SECTION

SECTION 260502 - COMMON ELECTRIC MATERIALS AND METHODS

PART 1 - GENERAL

1.1 GENERAL

- A. Mounting Heights: Outlet mounting heights as indicated on the plans are approximate. Determine the exact mounting heights (and locations) of outlets in the field with relation to architectural detail and equipment being served. Coordinate outlet location with equipment, with furniture plans and with architectural elevation plans. Where mounting heights are not detailed or dimensioned, contact the Owner's Representative for direction. Prior to rough-in, coordinate final mounting heights of system outlet boxes in field with Owner's Representative. Install boxes at heights as follows, to center of box, unless directed otherwise in field or otherwise noted on E-series drawings or architectural plans. In cases where using center of box for measurement would result in a switch-height device having an operable component higher than 48 inches above finished floor, install boxes lower as needed so that uppermost part of operable component is no higher than 48 inches. Height of boxes dimensioned from ceiling apply to rooms having ceilings 9' or less; in rooms having higher ceilings, locate these as directed in the field.

Switches – Counters:	44" (field verify & match recept. heights)
Switches – Elsewhere:	46"
Occupancy Sensors, Wallbox:	46"
Occupancy Sensors, Elsewhere:	As recommended by manufacturer
Receptacles – Counters:	44" (field-verify)
Receptacles – Elsewhere:	18"
Starters:	46"
Disconnects:	46"
Circuit Breaker Panelboards:	72" to top unless code dictates otherwise
Wall Mounted Luminaires:	As noted on plans or directed by Design Prof.
Control Stations:	46"
Communication Outlets:	18"
Fire Alarm Manual Pull Stations:	46" to top of operating handle
Fire Alarm A/V Annunciators:	80" to bottom of outlet box
Fire Alarm Door Holders:	84"
Other Outlets/Fixtures/Equipment:	As directed by Design Professional

- B. Lock-Out Tag-Out Devices: Provide permanently installed lock-out tag-out devices compliant with NFPA 70 and OSHA, with padlocking provisions, at source overcurrent devices for the following applications.
1. Where the normal NFPA 70-compliant location of the disconnecting means is impracticable or introduces additional or increased hazards to persons or property.
 2. Where required by NFPA 70.
 3. Where required by OSHA.
 4. Where required by any other authority having jurisdiction.
- C. Electrical Installations:
1. Install conduit, wiring, outlet box and junction box type work in finished areas concealed. Such work installed in unfinished areas may be exposed only at the discretion of the Owner's Representative.
 2. All new electrically related work shall be supported directly from building structural members. New electrically related work shall not be supported from ductwork, ductwork hangers, ceiling supports, existing conduit supports, etc. All conduits (and cable assemblies, where applicable) shall be routed parallel to building structural

members. Noncompliant work installed by the electrical contractor shall be removed and reinstalled to the satisfaction of the Owner's Representative and the Design Professionals, at the expense of the electrical contractor.

3. Provide systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and architectural/structural components. Provide factory-furnished filler plates in unused spaces of manufactured equipment.
4. Install electrical equipment to facilitate servicing, maintenance, and repair and replacement of equipment components. Install equipment for ease of disconnecting, with minimum of interference with other installations. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope. Protect the structure, furnishings, finishes, and adjacent materials.
5. Verify dimensions by field measurements. Take measurements and be responsible for exact size and locations of openings required for the installation of work. Where detailed method of installation is not indicated or where variations exist between described work and approved practice, follow direction of the Owner's Representative.
6. Do not install device wall outlets directly back to back, where located on opposite sides of common walls. Offset outlets by at least two feet for applications in fire rated walls and smoke rated walls and applications in acoustically treated walls. Offset outlets by at least one foot for other applications.
7. Provide wires continuous from outlet to outlet and properly splice joints. Provide insulation value for joints 100% greater than that of the wire. Mechanical wire splicers may be used. Where friction and rubber tape is used, provide tape conforming to Federal Specifications HH-T-11 and HH-T-111. Where plastic electrical tape is used, provide Scotch #33, or approved equal. Provide minimum 8" tail for conductors terminating at each wired outlet at their outlet fittings to facilitate installment of devices, luminaires, etc.
8. Use of synthetic or plastic "tie-wraps", "zip ties", "wire ties" and similar products are not permitted as a permanent means of anchoring, securing, supporting or otherwise installing any cables, conductors, conduits, raceways, devices, equipment or other electrical work.
9. If during construction it becomes apparent that some specific minor changes in layout will result in a neater job or better arrangement, make such alterations without additional compensation and without having to offer credit. Obtain Design Professional's review before making such changes. Provide workmanship throughout that conforms to the standards of best practice. Marks, dents and finish scratches are prohibited on exposed materials, luminaires, fittings, etc. Clean inside of panels and equipment boxes.

D. Connectors and Connections:

1. Provide complete assembly of materials for each type of required electrical connection, including but not limited to, pressure connectors, terminals (lugs), electrical insulating tape, heat-shrinkable insulating tubing, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.
2. Unless otherwise indicated, provide wires/cables (conductors) for electrical connections that match, including sizes and ratings, of wires/cables that are supplying electrical power. Provide electrical connectors and terminals that mate and match, including sizes and ratings, with equipment terminals, and that are recommended by equipment manufacturer for intended applications. Provide connectors that are specifically UL listed and labeled for the exact splicing/termination application, including for instances where solid conductors are spliced/connected to stranded conductors. Provide electrical

- insulating tape, heat-shrinkable insulating tubing and boots, wirenuts, cable ties, etc. as recommended for use by accessories manufacturers for intended applications.
3. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment. Cover splices with electrical insulating material to achieve insulation at least 100 percent in excess of electrical insulation rating of those conductors being spliced. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Do not "ring" copper conductors while skinning wire.
 4. Ground metal frames of portable and stationary direct-wired electrically operated equipment by connecting frames to the circuit equipment grounding conductor and to grounded metal raceway. Provide necessary electrical connections between the specified equipment and junction boxes, disconnect switches, and starters near equipment with flexible metallic conduit and matched connectors. Do not expose flexible conduit in finished areas.
 5. Wire and connect electrical equipment furnished under this branch of work, other branches of work and by the Owner. Review documents of other trades to identify electrically operated/controlled equipment that is furnished or installed by the Owner, or by other trades. Provide power connections and local disconnects for same. Provide control wiring (including relays, starters, etc.), as required to render equipment fully operable unless indicated otherwise on drawings or in project manual. Determine exact requirements in field from respective equipment installer.

END OF SECTION

SECTION 250603 - SUBMITTALS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL

- A. Where submittals are required by the Contract Documents, they shall be prepared and supplied in accordance with the Contract Documents. In addition to Division 01, the Contractor is advised to review and comply with the requirements articulated within each Division and within each section of that Division.
- B. The contractor is not relieved of responsibility for providing specified or drawn scope of work should any errors or omissions in submittal information not be noted by the Design Professional during submittal reviews or site observations.
- C. Some Divisions may include a division-specific “Submittal Requirements for” section. Where this section exists, it articulates additional requirements for submittals that apply to the work of that Division.
- D. The submittal requirements help to identify, track and keep the project organized for all parties involved. They are necessary to ensure a timely turnaround and an appropriate technical review. Submittals that do not conform to the administrative requirements are rejected and returned, without technical review.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL DIRECTION

- A. Reference Specification Section 01 33 00.00 for a full list of submittal procedures and required formats.

3.2 USE OF ELECTRONIC DRAWINGS FROM THE OWNER’S DESIGN TEAM

- A. Plan drawings for the Project were created with AutoCAD and Revit.
- B. If expressly permitted by the Owner and the terms of the Contract, editable electronic versions of standard-scale, AutoCAD-based plan drawings may be made available for the creation of shop and as-built drawings.
- C. Upon request, when available, electronic versions of standard-scale, Navisworks (.dwf) and (.nwc) or AutoCAD 360 (.dwg) files may be made available for coordination purposes.
- D. Due to the proprietary nature of internal design systems, editable native-software versions of some drawings, including but not limited to system diagrams and details, will not be made available in an editable form. In these cases, electronic versions of the drawings may be made available only in PDF, JPG, or similar non-editable electronic form, at the sole discretion of the Design Professional.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For each type of conductor and cable.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below, or by an NRTL listed equivalent manufacturer.
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. Alpha Wire.
 - 3. Belden Inc.
 - 4. Encore Wire Corporation.
 - 5. General Cable Technologies Corporation.
 - 6. Southwire Incorporated.
 - 7. American Insulated Wire Corp
 - 8. Republic Wire
- B. Conductor Insulation and Multiconductor Cables: Comply with NEMA WC 70/ICEA S-95-658. Refer to Part 3 of this section for allowable types specific to this project.
- C. MC Cable (Metal-Clad):
 - 1. Provide Type MC Cables that are minimum 90 degrees C rated, with components and fittings listed for grounding, compliant with NEC Articles 250 and 330.
 - 2. Provide cable formed from continuous length of spirally wound, interlocked zinc coated or galvanized (inside and outside) strip steel or aluminum jacket. Provide cables with full parity insulated equipment ground conductor.
 - 3. Provide compatible steel fittings with integral red plastic insulated throat bushings, compliant with NEC 330.

2.2 CONNECTORS AND SPLICES

- A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide products by one of the manufacturers listed below, or by an NRTL listed equivalent manufacturer.
 - 1. AFC Cable Systems, Inc.
 - 2. Gardner Bender.
 - 3. Hubbell Power Systems, Inc.
 - 4. Ideal Industries, Inc.
 - 5. Ilsco; a branch of Bardes Corporation.
 - 6. NSi Industries LLC.
 - 7. O-Z/Gedney; a brand of the EGS Electrical Group.
 - 8. 3M; Electrical Markets Division.
 - 9. Tyco Electronics.
 - 10. Square D, a Schnieder Electric Company
 - 11. Thomas & Betts
 - 12. Arrow-Hart Div, Crouse-Hinds Co

- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

PART 3 - EXECUTION

3.1 APPLICATIONS AND INSTALLATION

- A. Feeders: Stranded copper conductors.
- B. Branch Circuits: Stranded copper conductors.
- C. Provide conductor insulation rated at 600VAC and 90 degrees C. Provide wire, cable and connectors suitable for the temperature, conditions and location where installed. Provide THHN/THWN-2 insulation for conductors for wiring indoors, above grade, and in dry locations. Provide XHHW-2 insulation for wiring below grade and for wiring subject to moisture conditions.
- D. Grounded (“Neutral”) Conductors: Provide dedicated parity sized grounded (“neutral”) conductor for each branch circuit phase conductor. Provide grounded (“neutral”) conductor in all lighting control device (switch, dimmer, occupancy sensor, etc.) wall outlet boxes, even if not immediately used. Provide grounded (“neutral”) conductor for all multi-pole feeders. Provide grounded (“neutral”) conductor(s) for all multi-pole feeders and branch circuits unless this contractor determines in field that the affected load(s) will never have need for a grounded (“neutral”) conductor and NEC does not mandate otherwise.
- E. Complete raceway installation between conductor and cable termination points prior to pulling conductors and cables. Use manufacturer UL approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- F. Install wire in raceway unless specifically permitted otherwise in this specification section, under other Division 26 sections, or on electrical drawings. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- G. Do not pull wire until raceways are complete, plastering is complete, and raceways are free of moisture. Install joints and splices only at NEC approved panels, accessible junction boxes, or accessible outlet boxes. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary to prevent damage to conductors. Use pulling means, including fish tape, cable, rope, and basket weave wire/cable grips that will not damage cables and raceways. Do not use rope hitches for pulling attachment to wire or cable. Conceal work in finished spaces.
- H. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems." Use of synthetic or plastic “tie-wraps”, “zip ties”, “wire ties” and similar products are not permitted as a permanent means of anchoring, securing, supporting or otherwise installing any cables, conductors, conduits, raceways, devices, equipment or other electrical work.
- I. Neatly dress work. Install work parallel and perpendicular to surfaces and exposed structural members, and follow surface contours where possible. Keep conductor splices to minimum. Install splice and tap connectors that possess equivalent, or better, mechanical strength and

insulation rating than conductors being spliced. Use splice and tap connectors that are compatible with conductor material. Install wires continuous from outlet to outlet. Provide insulation value of joints at least 100 percent more than that of the wire insulation. Provide adequate length of conductors within electrical enclosures, and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than #10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.

- J. De-rate cables per NFPA 70 where bundled, where passing through insulation, and where otherwise required to be compliant with NFPA 70 based on field conditions and/or means and methods that will be used. De-rate conductors per NFPA 70 where required based on quantities of conductors within raceways, and where otherwise required to be compliant with NFPA 70 based on field conditions and/or means and methods that will be used.
- K. Type MC cable may be utilized only if NEC approved and if approved by local authority having jurisdiction and if included in the limited applications defined below.
 - 1. Provide for final connections to luminaires that are installed in accessible tile ceiling systems (limited to “whips” from building electrical system junction boxes down to luminaires). Do not install Type MC cable from fixture to fixture unless a special properly listed and labeled UL approved system is specifically indicated.
 - 2. Type MC cable may be utilized for new concealed 15 through 60 ampere branch circuit work
 - 3. Provide only where concealed (install wiring for exposed applications in raceway).
 - 4. Route cables perpendicular and parallel to the building architectural lines, surfaces, and structural members, keeping offsets to a minimum and following surface contours where possible. Maintain a uniform elevation for cable runs wherever possible. Support and anchor cables at maximum 4-foot intervals and within 12" of box or outlet in a manner that prevents sagging. Install cables in a manner that prevents overheating. Fasten cables directly to the structure using factory clamps and clips specifically designed for the respective cable (Caddy or equal).

3.2 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors. Install conductor at each outlet with at least 8 inches of slack.
- B. Provide complete assembly of materials for each type of required electrical connection, including but not limited to, pressure connectors, terminal (lugs), electrical insulating tape, heat shrinkable insulating tubing, cable ties, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.
- C. Unless otherwise indicated, provide wires/cables (conductors) for electrical connections that match, including sizes and ratings, of wires/cables that are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 90 degrees. Provide factory splice kits (U.L. approved for submersion in water and direct burial) for wire splicing in outdoor grade, or slab on grade, junction boxes and for all other wet locations.
- D. Provide electrical connectors and terminals that mate and match, including sizes and ratings, with equipment terminals, and that are recommended by equipment manufacturer for intended applications. Connect wires #6 AWG and larger to panels and apparatus by means of approved lugs or connectors large enough to enclose all strands of the conductors. Provide solderless type connectors

- E. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment. Cover splices with electrical insulating material to achieve insulation at least 100 percent in excess of electrical insulation rating of those conductors being spliced. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Do not "ring" copper conductors while skinning wire.
- F. There may be cases where circuit or feeder conductor sizes are too large or too small to fit into the lugs normally supplied with the power distribution equipment or end-use equipment, due to circumstances such as increasing conductor sizes to offset voltage drop, unusual breaker frame sizes, type of conductors used, etc. In such cases provide appropriate factory lug kits for affected equipment if recommended by manufacturer; elsewhere provide insulated butt-splices with tails sized to fit respective lugs.
- G. Ground metal frames of portable and stationary direct-wired electrically operated equipment by connecting frames to the circuit equipment grounding conductor and to grounded metal raceway. Provide necessary electrical connections between the specified equipment and junction boxes, disconnect switches, and starters near equipment with flexible metallic conduit and matched connectors. Do not expose flexible conduit in finished areas.

3.3 CONDUCTOR SIZING

- A. Conductor sizes indicated in Division 26 documents are based on copper unless specifically indicated otherwise on single-line diagram on drawings.
- B. Unless specifically indicated otherwise on drawings, provide grounded ("neutral") conductors that are at least parity-sized with corresponding phase/line conductors for all applications.

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For grounding and bonding for electrical systems.

1.2 QUALITY ASSURANCE

- A. Provide Electrical Components, Devices, and Accessories listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Comply with UL 467 for grounding and bonding materials and equipment. Comply with ANSI/TIA/EIA-607, "Commercial Building Grounding and Bonding Requirements for Telecommunications. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Except as otherwise indicated, provide copper electrical grounding and bonding systems and materials with assembly of materials including but not limited to cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, and additional accessories needed for a complete installation. Where materials or components are not indicated, provide products that comply with NEC, UL, and IEEE requirements, and with established industry standards for those applications indicated. Utilize compatible metallic materials throughout system to eliminate galvanic action.
- B. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide conductors and connectors as specified in Section 260519. Subject to being equivalent and subject to compliance with requirements, provide other grounding related materials by Erico (as a standard of quality), or other equivalent available manufacturers where not otherwise specified in Division 26.

2.2 CONDUCTORS AND CONNECTORS AND ELECTRODES

- A. For insulated conductors, provide copper or tinned-copper wire or cable insulated (green-colored) conductors, insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction. For bare copper conductors, provide: Solid Conductors, ASTM B 3; Stranded Conductors, ASTM B 8; Tinned Conductors, ASTM B 33.
- B. Provide connectors listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected. Provide copper or copper alloy bolted connectors for conductors and pipes, pressure type with at least two bolts. Provide clamp type pipe connectors, sized for pipe. Use exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- C. Provide copper-clad steel (copper molecularly bonded to nickel-sealed high-strength steel core) ground rods, 3/4 inch in diameter by 10 feet in length (sectional rods may be used when rods are longer than 10 feet). Provide sheet copper plate electrodes that are 20-gage by 36" by 36", made from high-conductivity sheet, with cable attachments (minimum quantity of 2), sized for cables as necessary to fulfill project grounding requirements, where ground rods cannot or should not be used.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Provide green-colored insulation, unless indicated otherwise. Provide solid conductors for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated. Provide bare copper conductors below grade, No. 2/0 AWG minimum. Provide tinned conductors in corrosive areas. Where to be installed underground, bury at least 36 inches below grade.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors as required by NFPA 70 and as otherwise required. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70: all feeders; all branch circuits; expansion couplings; flexible raceway runs.
- B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- C. Water Heaters: Install a separate insulated equipment grounding conductor to each water heater. Bond conductor to heater units, piping, connected equipment, and components.
- D. Heat-Tracing Cables: Install a separate insulated equipment grounding conductor for bonding to each heat-tracing cable.
- E. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location. Terminate grounding conductors on grounding busses or cabinet grounding terminals as applicable.
- F. Lighting Poles and Standards Supporting Outdoor Lighting Fixtures: Provide grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit. Bond straps directly to basic structure, taking care not to penetrate any adjacent parts. Install bonding so vibration is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- C. Ground Rods: Drive rods until tops are at least 2 inches (50 mm) below finished floor or final grade unless otherwise indicated. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes,

and connect to the service grounding electrode conductor. Use driving sleeves or couplings when driving ground rods into the earth.

- D. Ground Plates: Provide copper ground plates where ground rods cannot be used. Provide connections to ground electrodes at a point not less than 1 foot below grade level, and not less than 2 feet away from footings and foundations. Weld grounding conductors to underground grounding electrodes where mechanical connections cannot, or should not, be utilized. Interconnect ground plates with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except if otherwise indicated.
 - 3. Connections to Structural Steel: Welded connectors.
- F. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Gas Piping: Bond each above ground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.
- H. Service Entrance Grounding Requirements
 - 1. Provide a parity sized insulated grounded conductor (neutral) for each set of service entrance feeder phase/line conductors, terminated and bonded to service equipment (i.e. to each and every service disconnect where applicable). This applies whether or not downstream loads require a neutral conductor. Install these neutral conductors unspliced and unbroken.
 - 2. Ground and bond service entrance neutrals to room ground busbar, to effectively grounded structural steel member, to effectively grounded metallic water pipe, and to grounding electrode system as required per NFPA 70 and as applicable.
 - 3. Provide an enclosed single ground busbar at electrical service entrance locations, bonded to the enclosure, and bonded to service ground with full parity sized green insulated ground conductor (sized same as service ground conductor). Provide quantity and sizes of lugs on busbars as required to accommodate bonding to service grounding electrode system, service neutrals, structural steel, effectively grounded metallic water pipe, and other grounding requirements set forth in project manual and in NFPA 70. Provide UL listed lugs for use with copper and aluminum conductors.
 - 4. Connect grounding electrode conductors to 1-inch diameter, or greater, metallic cold-water pipe at service entrance using a suitably sized ground clamp. Provide connections to flanged piping at street side of flange. Ground electrical service system neutral at service entrance equipment to grounding electrodes. Install braided type bonding jumpers

- with code-sized ground clamps on water meter piping to electrically bypass water meters and water service entrance valves.
5. Contact AHJ electrical inspector in advance of installing service grounding work. Determine locally approved methods that must be used for re-bar grounding that the AHJ considers compliant with NFPA 70 Article 250.52.
- I. Separately Derived System Grounding
1. Ground and bond each separately-derived system neutral to room ground busbar, to effectively grounded structural steel member, to effectively grounded metallic water pipe, and to separate grounding electrode system as required per NFPA 70 and as applicable.
 2. Provide an enclosed single ground busbar at derived electrical system locations, bonded to the enclosure, and bonded to derived system ground with full parity sized green insulated ground conductor (sized same as derived system ground conductor). Provide quantity and sizes of lugs on these busbars as required to accommodate bonding to derived system ground and other grounding requirements set forth in project manual and in NFPA 70. Provide UL listed lugs for use with copper and aluminum conductors.
- J. Telecommunications Grounding Requirements
1. At minimum, bond together telecommunications racks, cabinets, tray, ladder rack, and risers at telecommunications equipment to the ground busbar in the nearest electric panel. Bond additional points where indicated in the drawings and where required by NFPA 70.
 2. Bond the Main telecommunication service entrances to the electrical service equipment ground using the most direct route possible to minimize conductor length.
 3. Provide copper grounding conductor from main building grounding electrode system at service entrance to ground bus at the Telecommunications Entrance Facility.
 4. Provide copper bus bars on plywood backboard. See Division 27, Section 270526.00 for bus bar specifications.
 5. Provide isolation for grounding busbars from the structure support with a 2 inch minimum separation using manufacturer's recommended insulating stand-offs and hardware.

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - PRODUCTS

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For hangers and supports for electrical systems.

1.2 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly. Construct with 9/16" dia. holes, nominal 2" o.c. on top surface, with standard factory finish, and with the all necessary fittings which mate and match with U-channel. Select channel dimensions for applicable load criteria. Metallic Coatings shall be hot-dip galvanized after fabrication and threading, and applied according to MFMA-4. Manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Allied Tube & Conduit
 - 2. Caddy
 - 3. Cooper B-Line, Inc.; a division of Cooper Industries
 - 4. ERICO International Corporation
 - 5. GS Metals Corporation
 - 6. Hilti
 - 7. Powers
 - 8. Thomas & Betts Corporation
 - 9. Unistrut; Tyco International, Ltd.
 - 10. Wesanco, Inc.
 - 11. Perma-Cote
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
 - 1. Riser clamps for supporting rigid metal conduit; galvanized steel; with 2 bolts and nuts, and 4" ears.
 - 2. Clevis hangers: For supporting rigid metal conduit; galvanized steel; with 1/2" dia. hole for round steel rod.
 - 3. Galvanized steel clamps; 1/2" rod size.
 - 4. Galvanized steel clamps, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2".
 - 5. One-hole conduit straps for supporting 3/4" rigid metal conduit; galvanized steel.
 - 6. Two-hole conduit straps for supporting 3/4" rigid metal conduit, galvanized steel; 3/4" strap width; and 2-1/8" between center of screw holes.
 - 7. Offset conduit clamps for supporting rigid metal conduit; galvanized steel.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following.
 - 1. Products: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Cooper B-Line, Inc.; a division of Cooper Industries.
- b. Empire Tool and Manufacturing Co., Inc.
- c. Hilti, Inc.
- d. ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
- e. MKT Fastening, LLC.
- f. Simpson Strong-Tie Co., Inc.
2. Capacities: Provide materials and installed systems with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used, plus 100% safety factor.
3. Adverse and/or Corrosive Environment Areas: Provide stainless steel anchors. Provide hot-dipped galvanized (after fabrication) product and material versions of what is specified in this section for steel hangers, supports, systems, etc. (supported from stainless steel anchors), unless stainless steel is specified or otherwise indicated. Such applications and areas include, but are not limited to:
 - a. Outdoors.
 - b. Unconditioned Areas.
 - c. Coolers/Freezers.
 - d. Miscellaneous high-humidity or otherwise corrosive environments.
4. Mechanical-Expansion Anchors in Dry Conditioned Areas: Insert-wedge-type, zinc-coated steel, for use in hardened Portland cement Provide stainless steel anchors where located in areas subject to moisture or corrosion.
5. Drop-In Anchors: AISI Type 303 stainless steel, drop-in, shell or flush type, equivalent to Hilti HDI series.
6. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
7. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
8. Through Bolts: Steel structural type, hex head, and high strength. Comply with ASTM A 325.
9. Toggle Bolts: All-steel galvanized springhead type, minimum 3/16" x 4".
10. Hanger Rods: Threaded steel, Galvanized steel rods; 1/2" minimum diameter.
11. Clevis hangers: For supporting rigid metal conduit; galvanized steel; with 1/2" minimum diameter hole for round steel rod.
12. Galvanized steel rod reducing couplings: 1/2" x 5/8" minimum.
13. Galvanized steel clamps: 1/2" minimum rod size; Galvanized steel clamps: Minimum 1-1/4" x 3/16" stock; minimum 3/8" cross bolt; minimum flange width 2".
14. Hexagon nuts: Galvanized steel.
15. Expansion anchors: Minimum 1/2".

PART 2 - EXECUTION

2.1 APPLICATIONS AND INSTALLATION

- A. Provide supports, anchors, sleeves and seals furnished as part of factory-fabricated equipment as required.
- B. Coordinate layout and installation of equipment and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

- C. Provide supports for multiple raceways capable of supporting combined weight of supported systems and its contents, plus minimum 100% factor of safety. Provide equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components. Provide rated strengths adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this project, with a minimum structural safety factor of five times the applied force.
- D. Contractor is responsible for repairing all damage to structural elements resulting from the scope of this work. Anchor hole dimensions shall be per manufacturer recommendations. Select and apply anchor products based on collective weight being supported, plus 100% factor of safety.
- E. Comply with NECA 1 and NECA 101 for application and installation requirements of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter. Field Welding: Comply with AWS D1.1/D1.1M.
- F. Install equipment and enclosures on walls with tops at uniform height unless otherwise indicated, and by bolting units to structural wall or mounting on structural-steel channels bolted to wall. For equipment and enclosures not at walls, provide freestanding structural-steel channel racks that are anchored to floor structure and overhead structure.
- G. Use of synthetic or plastic “tie-wraps”, “zip ties”, “wire ties” and similar products are not permitted as a permanent means of anchoring, securing, supporting or otherwise installing any cables, conductors, conduits, raceways, devices, equipment or other electrical work. Provide metal clamps, clips, etc. that are manufactured for use for respective applications where they are used. Use of perforated straps is not permitted.
- H. Route all conduits, raceways and cables (where applicable) parallel and perpendicular to building structural members. Any and all noncompliant work installed by the electrical contractor shall be removed and reinstalled by the electrical contractor to the satisfaction of the Owner's Representative and the Design Professionals, at the expense of the electrical contractor.
- I. Fasteners shall be zinc-coated, type, grade, and class as required for a neat finished installation.
- J. Coordinate with installation of roof curbs, equipment supports, and roof penetrations as applicable. Install work so that no raceway or cable is within six inches below roof deck(s). Suspend and support overhead electrical work from roof trusses and joists/joist girders only at panel points, at top chord only, unless otherwise indicated.
- K. Do not suspend overhead hangers, or support any other overhead electrical work, from non-poured-concrete roof decks.
- L. Support overhead hangers supported from poured-concrete decks using stainless steel threaded inserts..
- M. Field-verify lengths of stems, pendants, cables, suspensions, etc. for all suspended luminaires with Owner's Representative.
- N. Strength of Support Assemblies: Minimum static design load used for strength determination shall be weight of supported components plus 200 lb. or 100 percent factor of safety, whichever is greater.
- O. Mounting and Anchorage of Surface-Mounted Equipment and Components: Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded. Install anchor bolts to elevations required for proper attachment to supported equipment. Provide female expansion anchors, and install studs and

nuts after equipment is positioned. Torque bolts and nuts on studs to values recommended by equipment manufacturer. Provide anchor bolt bushing assemblies for wall-mounted equipment to allow for resilient media where equipment and equipment-mounting channels are attached to wall.

1. To Wood: Fasten with lag screws or through-bolts. Number 3 Common or Standard Grade boards complying with WCLIB or AWPB rules, or Number 3 boards complying with SPIB rules. Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent. Provide marine grade products where subject to moisture conditions. Provide Simpson Strong Tie (or equal) expansion screw anchors. Make tight connections between members. Install fasteners without splitting wood members. Attach to substrates as required to support applied loads.
2. To Wood Structural Members: Provide bolts installed through members.
3. To New Concrete: Provide channel-type concrete inserts and bolt to inserts, or provide expansion anchors for applications where inserts are not practical.
4. To Existing Concrete: Expansion anchor fasteners.
5. Holes for Expansion Anchors in Concrete: Drill at locations and to depths that avoid reinforcing bars and other structural elements. Review proposed means, methods, locations, etc. in advance with Owner and Design Professionals.
6. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
7. To Steel: Welded threaded steel studs complying with AWS D1.1/D1.1M, with lock washers and nuts, or beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69, clamped to flanges of beams or on upper truss chords of bar joists.
8. To Light Steel: Sheet metal screws.
9. Items Mounted on Hollow Walls and Nonstructural Building Surfaces in finished areas: Provide blocking between studs behind finished wall surface. Mount equipment, devices and boxes with backs of enclosures flush to front of finished wall surface.
10. Items Mounted on Hollow Walls and Nonstructural Building Surfaces in unfinished areas: Mount equipment on slotted-channel racks attached to substrate.
11. Do not use powder/gas-actuated driven methods.

P. Coordinate all work with all other trades prior to commencement of the work.

2.2 CONCRETE BASES

- A. Provide dowel rods to connect concrete bases to concrete floors/slabs/substrates. Unless otherwise indicated, install dowel rods on maximum 18-inch centers around the full perimeter of concrete base.
- B. Provide epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor/slab/substrate. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- C. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast galvanized or stainless-steel anchor-bolt inserts into bases.
- D. Indoor bases shall be at least 4" thick. Reinforcing steel bars shall be placed in both directions of the bases.

- E. Outdoor bases shall be at least 6" thick. Perimeter of pads shall extend down below the frostline. Reinforcing steel bars shall be placed in both directions of the bases and a mesh overlay shall be provided.
- F. Unless indicated otherwise in specifications or on drawings, use minimum 3000-psi, 28-day compressive-strength concrete. Size and provide concrete bases so expansion anchors will be a minimum of 10 bolt diameters from the edge of the concrete base.

2.3 PLYWOOD EQUIPMENT BOARDS

- A. Plywood Equipment Boards: Lumber shall be preservative treated in accordance with AWPB LP-2, and kiln dried to a moisture content of not more than 19 percent. Provide plywood panels; APA C-D PLUGGED INT, with exterior glue; thickness as indicated, or if not indicated, not less than 3/4 inches deep. Provide marine grade plywood where subject to moisture conditions. Provide Simpson Strong Tie (or equal) expansion screw anchors.
- B. Unless otherwise noted, boards shall be painted with two coats of good grade weatherproof flat gray non-conductive fire-retardant paint on all sides and edges (prior to mounting) and plumbed in a true vertical position. Provide nominal 1/2" rustproof spacers between back of plywood and wall. Maintain at least 4 inches from bottom of plywood equipment boards and the finished floor surface.
- C. Unless directed otherwise in field, plywood equipment boards shall be 8 feet high by 3/4 inches deep by length shown on drawings (as dimensioned or as scaled) or length as required to accommodate equipment if not indicated on drawings. Unless directed otherwise in field, provide plywood equipment boards for all indoor surface mounted panelboards and systems "head-end" equipment for all applications where located in mechanical or electrical rooms/areas and only where specifically shown on drawings for all other applications

END OF SECTION

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - PRODUCTS

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For raceways and boxes for electrical systems.

1.2 MANUFACTURERS

- A. Products: Metal conduits, tubing, boxes and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.3 METAL CONDUITS, TUBING, AND FITTINGS

- A. EMT: Comply with FS WW-C-563, ANSI C80.3 and UL 797.
- B. GRC/RMC: Comply with ANSI C80.1 and UL 6. Provide steel conduit, galvanized/fused to inside and outside walls of conduit and fittings after fabrication and after threading.
- C. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
 - 1. Provide liquid-tight flexible metal conduit formed from continuous length of spirally wound, interlocked, double-wrapped hot-dipped zinc-galvanized (inside & outside) steel core. Provide liquid-tight jacket of flexible polyvinyl chloride (PVC) that is fully weatherproof, flame-retardant, heat resistant, oil resistant, sunlight resistant and that resists heat, oil and chemical breakdown.
 - 2. Provide smooth-wall type jackets (not a corrugated look) for furniture whip (and similar) applications in indoor finished areas.
 - 3. Provide Liquid-Tight Flexible Metal Conduit Fittings compliant with FS W-F-406, Type 1, Class 3, Style G. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated throat.
 - 4. Provide full parity size green insulated ground wire for all applications, regardless of length.
 - 5. Provide installed LFMC systems using materials and installation methods that result in IP67 compliance.
- D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. EMT: Provide steel, galvanized or zinc-coated water/concrete-tight fittings; do not use die-cast fittings. Provide Compression type for outdoor applications, and applications in other wet locations. Provide Compression or set screw type for indoor applications.
 - 2. GRC/RMC: Zinc-Galvanized Steel (after fabrication/factory-threading), threaded (fused-galvanized after threading.)
 - 3. Expansion Fittings: Material to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Provide locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening. Provide screw type grounding terminal for metal bushings of standard or insulated type.
- E. Joint Compound for Threaded Conduit: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

1.4 NONMETALLIC CONDUITS AND FITTINGS

- A. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated. Comply with NEMA TC 3 for fittings; match to conduit or tubing type and material.
 - 1. Provide electrical plastic conduit equal to Carlon Plus 40. Provide heavy wall electrical plastic conduit that is Schedule 40, 90 degrees C rated, constructed of polyvinyl chloride, in conformity with NEMA TC-2, in conformity with NFPA 70 Article 354, and is UL listed and labeled for direct burial, concrete encasement, and above ground use.
 - 2. Provide horizontal elbows for service entrance conduits that are maximum 45-degree. Provide minimum 24-inch radius. Provide larger minimum radius where indicated on drawings, or if directed in field. Provide multiple units as necessary to obtain required offset (i.e. provide two 45-degree elbows to obtain a 90-degree offset where needed). Provide 90-degree maximum elbows.
 - 3. Provide couplers, adapters, "O" rings, sealing, and other accessory components as required for a complete installation. Provide miscellaneous fittings that have been specifically designed and manufactured for their particular application.

1.5 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by the Design Professional or Prime coated, ready for field painting, Design Professional's choice. Provide factory fittings, dividers, clips, and other accessories as required for a neatly installed complete and operable installation. Provide factory-applied finish in color(s) and texture(s) as directed by Design professionals.
 - 1. Plugmold: Provide "plugmold" equal to Legrand #2000 series with single NEMA 5-15R receptacles on nominal 9-inch centers.

1.6 BOXES, ENCLOSURES, AND CABINETS

- A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be UL listed and labeled for use in wet locations, including cover plates and doors. Boxes, enclosures, and cabinets installed in damp and areas subject to moisture shall be UL listed and labeled for use in damp locations, including cover plates and doors. All other applications shall be UL listed and labeled for the location in which they are installed. Provide galvanized (after fabrication and after threading) boxes with galvanized or stainless-steel accessories, hardware and cover plates.
- B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A. Provide galvanized-coated flat rolled code-gage non-gangable sheet-steel outlet/junction/pull boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes and with cable and conduit-size knockout openings in bottom and sides where applicable. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding. Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Provide with stainless steel nuts, bolts, screws and washers.
- C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover. Only use for special applications with prior case-by-case approval from Design Professionals.
- D. Luminaire Outlet Boxes: Comply with outlet box specifications above; nonadjustable, designed for attachment of luminaire weight (50 lb, minimum) plus 100 percent factor of safety. Outlet

boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight, including 100 percent factor of safety.

- E. Floor Boxes: See Drawings and Section 262726 “Wiring Devices”.
- F. Bushings, knockout closures and locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.
- G. Device Box Dimensions: 4 inches square by 1-1/2 inches deep or 4 inches square by 2-1/8 inches deep, depending on device depths and wiring fill, with single-gang plaster/”mud” rings where only one device is being installed. Provide wider boxes for applications where more than two devices will be installed. Provide internal metal dividers where required under NFPA 70 for varying voltages, multiple circuits, etc. Gangable boxes (using multiple single-gang boxes to assemble multi-gang boxes) are prohibited.
- H. Weathertight outlet boxes and covers:
 - 1. Provide corrosion-resistant weathertight/raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners. Provide weathertight outlets for interior and exterior locations exposed to weather or moisture.
 - 2. Provide weatherproof covers that mount on a single gang horizontal or vertical (depending on application) junction box to ensure weather protection for a standard outlet.
 - 3. Provide minimal profile assemblies that are rated NEMA 3R While In Use and that employ recessed box and cover design, equal to Thomas & Betts “Red Dot” series. Provide trim color(s) to match surrounding finished wall surface.

1.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

- A. General Requirements for Handholes and Boxes: Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Provide weatherproof cover, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location. Provide nonskid cover finish, with a minimum coefficient of friction of 0.50, and with molded or embossed lettering to indicate contents.
- B. Polymer-Concrete Handholes/Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two. Design for flush burial with open bottom unless otherwise indicated.
 - 1. Outdoor junction and pull boxes for branch-circuit-scale applications: Provide flush grade-mounted junction/pull box assemblies, equal to Quazite #PG1212-BG-12, 12 inches deep, with bolted cover and open bottom. Provide larger sizes where required by NFPA 70 based on conduit quantities/sizes and wire fill.
 - 2. Outdoor handhole/pull boxes for feeder-scale applications: Provide flush grade mounted junction/pull box assemblies, equal to Quazite #PG2436-BG-24, 24” deep with bolted cover and open bottom. Provide larger sizes where required by NFPA 70 based on conduit quantities/sizes and wire fill. Provide larger sizes where required by NFPA 70 or field conditions.

PART 2 - EXECUTION

2.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed: GRC/RMC.
 - 2. Concealed Conduit, Aboveground in Dry and Noncorrosive Locations Not Subject to Physical Damage: EMT.
 - 3. Concealed Conduit, Aboveground in Damp Locations, Wet Locations, Corrosive Locations: GRC/RMC.
 - 4. Underground Conduit For Services, Feeders, branch circuits, and Similar Scale Work : RNC, Type EPC-40-PVC. See details and/or notes on drawings for applications where concrete or other encasement is required.
 - 5. Connection to Vibrating Equipment or equipment that is subject to any degree of motion in its normal operation (Including But Not Limited To Transformers, Electric Solenoids, and Motor-Driven Equipment): LFMC. Leave sufficient slack in flexible conduit to permit movement from vibration without adversely affecting conduits and connections.
 - 6. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed: EMT.
 - 2. Exposed and Subject to Physical Damage: GRC/RMC.
 - 3. Concealed in Cavities of Ceilings and Interior Walls and Partitions: EMT.
 - 4. Above-Grade Damp or Wet Locations: GRC/RMC.
 - 5. Below-Grade (and for special conditions if so noted on drawings or other Division Sections): RNC.
 - 6. Vertical Risers from Below-Grade: GRC/RMC.
 - 7. Cells of Precast Concrete Panels and/or within Movable Partitions: LFMC (Leave sufficient slack in flexible conduit to permit movement from expansion and contraction.)
 - 8. Connections From Outlet Boxes/Raceways to Systems Furniture: LFMC.
 - 9. Embedded in Concrete or Masonry: GRC/RMC.
 - 10. Final 72 inches from accessible outlet/junction boxes to recessed luminaires that are located in accessible ceiling systems: Type MC cable.
 - 11. Final 24-72 Inches at Connections to Vibrating Equipment or equipment that is subject to any degree of motion in its normal operation (Including But Not Limited To Transformers, Electric Solenoids, and Motor-Driven Equipment): LFMC. Leave sufficient slack in flexible conduit to permit movement from vibration without adversely affecting conduits and connections.
- C. Raceway Fittings: Compatible with (Listed accordingly) raceways and suitable for use and location.
 - 1. EMT: Comply with NEMA FB 2.10 and with requirements of these specifications.
 - 2. GRC/RMC and IMC: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

2.2 INSTALLATION

- A. General Installation.
 - 1. Minimum Raceway Size: 3/4-inch trade size.
 - 2. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for Conduits and raceways required by NFPA 70 as a minimum.

3. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
4. Do not install aluminum products in contact with, or near proximity to, concrete or earth.
5. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.
6. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter.
7. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
8. Locate all structural elements within concrete prior to pre-drilling anchors. Contractor is responsible for repairing all damage to structural elements resulting from the scope of this work.
9. Provide fittings as needed for a complete installation.
10. Provide flexible connections or expansion fittings where all conduits cross building expansion joints. Coordinate exact quantity & location with Architectural plans prior to installation of work.
11. Do not install boxes back-to-back in walls. Provide not less than 6" (150 mm) separation in general, not less than 16" separation for acoustically rated walls and not less than 24" separation for the following applications: fire walls, fire barriers, smoke barrier walls, and fire partitions. Where outlet boxes are shown back-to-back on common walls, offset accordingly when installed.
12. Install firestopping at penetrations of fire-rated floor and wall assemblies.
13. Neatly cut openings for boxes so that standard size (not "midway" or "jumbo") cover plates will cover all parts of the opening. Position recessed outlet boxes accurately to allow for surface finish thickness. Do not use round boxes.
14. Fasten electrical boxes firmly and rigidly to substrates and structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry as applicable. Provide box supports that are independent of conduit. Protect boxes from construction debris and damage subsequent to installation of boxes.
15. Use of synthetic or plastic "tie-wraps", "zip ties", "wire ties" and similar products are not permitted as a permanent means of anchoring, securing, supporting or otherwise installing any cables, conductors, conduits, raceways, devices, equipment or other electrical work. Do not use perforated straps.
16. Consider the outlet, junction, and pull box locations indicated on drawings approximate unless there are prevailing codes that require specific spacings or locations. Study the general construction with relation to spaces and equipment surrounding each outlet, and neatly install outlets accordingly.
17. Install wiring for different power voltages in raceway systems separate from each other. Install wiring for the various electrical systems in raceway systems that are separate from each other.
18. Provide steel conduit and steel fittings for indoor above-slab applications, as specified in this section.
19. Provide maximum of 40 percent fill for raceways, or a threshold of less if required by NFPA 70 or project conditions.
20. Keep raceways at least 12 inches away from parallel runs of flues, hot-water pipes, and other sources of heat. Install horizontal raceway runs above liquid and steam piping. Where the lines are not insulated, the clearances shall be increased until the temperature of the conduit, with no live conductors enclosed, does not rise above the ambient temperature of the installation area.
21. Level and square raceway runs, and install at proper elevations and heights.
22. Arrange stub-ups so curved portions of bends are not visible above finished grade or slab.

23. Install no more than the equivalent of three 90-degree bends in any conduit run. Support within 12 inches of changes in direction.
24. Support conduit within 12 inches of enclosures to which attached. Properly support and anchor raceways for their entire length using structural materials. Do not span any space unsupported.
25. Conceal conduit and tubing within finished walls, ceilings, and floor cavities unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
26. Install exposed conduits, and extensions from concealed conduit systems, neatly parallel and perpendicular to walls, and plumb on walls. Secure to walls at intervals not exceeding six feet, supported by approved straps and fasteners. Secure to overhead structure at intervals not exceeding six feet. Support conduit by approved straps, fasteners and hangers. Provide hangers suspended from rods. Space wall brackets supporting conduits not more than 4 feet 6 inches on center. Install exposed conduit work so there is no interference with ceiling inserts, lights, or ventilation ducts or outlets.

27. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use, using properly selected and attached manufactured cap (tape of any sort is not permissible). Provide finished wall/cover plate on unused outlet boxes.
28. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
29. Mount boxes at heights indicated on Drawings and elsewhere in Division 26 specifications. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated. In cases where using center of box for measurement would result in a switch-height device having an operable component higher than 48 inches above finished floor, install boxes lower as needed so that uppermost part of operable component is no higher than 48 inches.
30. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block (do not over-cut), and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
31. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel. Coordinate all such separations with Design Professional in advance to ensure boxes are located properly for each application.
32. Locate boxes so that cover or plate will not span different building finishes.
33. Support boxes from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
34. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
35. Do not use dissimilar metals throughout the systems to eliminate possibility of electrolysis. Where dissimilar metals will be unavoidably in contact, coat surfaces with corrosion inhibiting compound before assembling.
36. Do not use electrical "handy/handee" boxes.
37. Where moisture conditions within conduits are encountered above grade, drill a hole at the lowest point in the conduit run so that drainage will not interfere with conditions below.
38. Where conduit is capped at wall for future additions, do not extend more than threads-length past wall (maximum of 3/4-inch past wall for EMT).
39. Where conduits for outlets on waterproof walls must be installed exposed, set anchors for supporting conduit on waterproof wall in waterproof cement.
40. Requirements for exposed conduits also apply to conduits installed in space above hung ceilings, and in crawl spaces.
41. Provide a 4-inch reinforced casing of concrete (3000-PSI minimum) around conduits that are installed in cinders or cinder concrete, to protect them.
42. Support raceway components directly from structural building systems, not from ceiling suspensions systems. Provide supplemental supports for junction or pull boxes.
43. Conduit Routing: If specific routing information appears on the Drawings, route and maintain conduits as shown. Should interference or a conflict arise, consult the Design Professional before proceeding with the Work. If specific routing information does not appear on the Drawings, or if routing shown on Drawings is schematic in nature, determine the best route for the conduit in accordance with code and other project guidelines.

44. Conduit bends: Bends shall be made so that the conduit will not be flattened or kinked and so that the internal diameter of the conduit is not reduced. The radius of the curve of the inner edge of any bend shall not be less than indicated by the National Electrical Code and TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces. Constructing an outside entrance to a building from buried conduit to penetrate above the ceiling line will allow an exception for a 4 inches LB fitting at one end to allow placement of the conduit flat to the building outside wall; apply this only if conduit could not be concealed.
 45. Install above-ceiling conduits as high as possible, with a minimum of 8 inches above ceiling tiles so as to permit ceiling tile removal.
 46. Install each branch of power in separate raceways from each other.
- B. Stub-ups To Above Accessible Ceilings (TAAC):
1. Use EMT, or GRC/RMC for raceways as applicable for respective locations.
 2. Provide sweep bends and drag line for each application.
 3. Use a conduit bushing or insulated-throat fitting to terminate stub-ups.
 4. Extend conduits to joist space above an accessible ceiling system.
 5. Permanently identify the purpose of the conduit stub at the end of the conduit above the ceiling.
- C. Pull Boxes and Junction Boxes:
1. Provide each pull box indicated on the Drawings.
 2. Provide additional pull boxes: Every 180 degrees of raceway bend; Every 100 feet of raceway; As additionally required by Code.
 3. Provide pull and junction boxes in areas that will be accessible after installation. Accessible areas include spaces above removable tile ceilings and behind access doors that are installed expressly for this purpose. Do not install pull-boxes in locations that will not be accessible after construction is complete and is not accessible after permanently installed work is complete.
 4. Size boxes in accordance with the NFPA 70 (NEC). Use larger boxes where so specified.
 5. Support boxes rigidly. Land conduits on the boxes so that conduits enter and exit across from each other on opposite sides of the box so as to facilitate straight line pulling of cable through the box. Do not use pull boxes in lieu of conduit bends, except as necessary by design or to meet constructability constraints.
 6. When directional transition of the cables is necessary through a box, land conduits on the box so that they permit the largest possible bending radius for those cables that will pass through the box.
 7. Coordinate all work with all other trades prior to commencement of the work. Do not use access doors unless special prior written permission is granted from the Owner's Representative. Install pull boxes, junction boxes, etc. in areas that are accessible after construction. Do not install pull boxes or junction boxes above gypsum board, plaster or similar ceiling systems, nor above ductwork or equipment that renders them inaccessible.
 8. Record junction and pull boxes on record drawings. Permanently mark and label (using methods approved by Owner's Representative) junction/pullboxes as to which types of electrical services are within.
- D. Repair and Patching: Holes and other penetrations into building surfaces or structure that are created to facilitate pathway installation but that are not ultimately used shall be filled, repaired, and restored to their original strength, appearance and integrity. Damage to building or property that occurs during the course of pathway installation shall be repaired and restored to its original condition prior to damage. Obtain review and approval of penetration sizes, means and methods

from Design Professional and Owner's Representative for all proposed penetrations of structural elements prior to commencing with any related work.

- E. Seals for Common Conduit and Raceways in Dissimilar Environments: Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points: Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces; Where an underground service raceway enters a building or structure; Where otherwise required by NFPA 70.
- F. Insulation for Common Conduit and Raceways in Dissimilar Environments: Provide insulation on the exterior of conduit on the warm side of penetrations between dissimilar environments to prevent condensation from forming. Insulate with 1.5-inch polyisocyanurate closed cell pipe insulation with an overall PVC jacket for a minimum distance of 48" from the penetration. Applications include, but are not limited to, the following: Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces; Where otherwise required by NFPA 70.
- G. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semi-recessed luminaires, for equipment subject to vibration, noise transmission, or movement, and for transformers and motors. Use LFMC in damp or wet locations.

2.3 INSTALLATION OF EXPOSED CONDUIT/RACEWAY SYSTEMS

- A. General:
 - 1. Review proposed installation materials, methods, routing, etc. case-by-case and area-by-area for each application with the Design Professional and Owner prior to installation. Accordingly, prepare installation drawings and submit to Design Professionals for review and comment. Revise and resubmit as required based on comments from Design Professionals. Coordinate with all trades while preparing the installation drawings. Show elevations and routes relative to adjacent work of all trades.
 - 2. Group conduits together in tight banks when routed in the same direction in a given space. Coordinate with mechanical trades and route the conduit banks along common paths wherever possible, and at common elevations unless the conduit banks can be installed directly above or below the mechanical work. Review proposed routes and elevations with Design Professionals prior to installation.
 - 3. Install conduits that peel off from banks in a manner that results in the conduits being progressively taken off from the sides of the banks, one at a time without crossing over or under other conduits in the bank. Rise and drop conduits at the same elevation in areas with common visibility.
 - 4. Provide clean, tight and uniform bends and offsets for all conduits and conduit banks.
 - 5. Route overhead work perpendicular and parallel to architectural and structural building lines in the respective surrounding space. Do not install work below skylight assemblies or in front of clerestory window assemblies.
 - 6. Provide surface conduit and raceway for wall-mounted applications only where it is impossible to fish or cut/patch, or only where specifically indicated on drawings, or only where specifically directed by Design Professional. Improper sequencing of work at walls shall not be used as a reason to surface-mount conduit, boxes or raceways; install all such work concealed as the walls are constructed. Provide conduit in areas that are exclusively utilitarian, such as dedicated mechanical or electrical rooms. Provide finished surface raceway systems for applications in all other areas. Consult with Design Professionals in

advance of any installation for final direction on where to use conduit versus surface raceway systems.

7. Install conduits and raceways in a manner that minimizes detrimental effects on room aesthetics. For instance, as applicable, rise from below for wall switches, general receptacle outlets and communications wall outlets; drop from above for wall mounted lights, and other system outlets that are installed high on wall; make drops near corners, window casings, door casings, etc.).
8. Install conduits and raceways as out-of-site as reasonably possible. For instance if an receptacle outlet needs to be installed at the center of a wall and there is no possibility of feeding from below the floor, route the drop in a corner of the room then transition and run horizontally to the outlet location.
9. Install conduit and raceway with a minimum 2-inch radius control at bend points.
10. Secure conduit and raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight section. Support according to manufacturer's written instructions.
11. Utilize supports for wall-mounted applications that cleanly conform to the shape of the conduit or raceway and do not in any way protrude out past the outer contours of the conduit or raceway. As an example, install wall-mounted conduit using two-hole straps instead of conduit hangers. Tape, glue, tie-wraps, clips, wedges, etc. are not acceptable support methods.
12. Review all proposed mounting means and methods with Design Professionals for luminaires, devices, outlets, equipment, etc. that will be suspended overhead.
13. Do not use “trapeze” mounting methods for suspensions unless case-by-case permission is granted by Design Professionals.

2.4 INSTALLATION OF EXPOSED CONDUIT OUTDOORS

- A. Only install conduit exposed outdoors when it is impossible to do otherwise, or only if specifically indicated for such installation case-by-case elsewhere in documents. Installation convenience, financial considerations, lack of coordination with other trades and similar rationale are not sufficient reasons for doing so. In cases where conduits must be installed at outdoor locations, de-rate conductors and modify conduit sizes per NFPA 70 (National Electrical Code, NEC). Provide expansion fittings, which are Listed and labeled for the respective applications, at all building expansion joints and at maximum distances of 100 feet. Paint all such conduits with at least two coats of UV-resistant weatherproof paint. Provide colors to match respective surrounding surfaces; submit colors to Design Professional for review in advance of procuring paint.

2.5 INSTALLATION OF EXPOSED CONDUIT ON ROOFS

- A. Only install conduit exposed on rooftops when it is impossible to do otherwise, or only if specifically indicated for such installation case-by-case elsewhere in documents. Installation convenience, financial considerations, lack of coordination with other trades and similar rationale are not sufficient reasons for doing so. In cases where conduits must be installed on rooftops, de-rate conductors and modify conduit sizes per NFPA 70 (National Electrical Code, NEC). Provide expansion fittings, which are Listed and labeled for the respective applications, at all building expansion joints and at maximum distances of 100 feet. Paint all such conduits with at least two coats of UV-resistant weatherproof paint. Provide white paint on flat rooftops that have finishes white in color, and for otherwise-colored roof finishes that are not visible from the building interior or from the ground outdoors. Elsewhere select colors to match surrounding surfaces; submit colors to Design Professional for review in advance of procuring paint.

2.6 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Coordinate trench locations in reference to other underground utilities. Ensure no other utilities are placed directly above or below, when parallel to conduits.
2. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
3. Excavate trench bottom to provide firm and uniform support for conduit. Also see details and/or notes on drawings for additional trench-related information and for applications where concrete (or other) encasement is required.
4. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
5. Install manufactured RNC duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Provide GRC/RMC for risers, beginning below grade or slab and excluding the 90 degree fittings that connect to horizontal conduits below grade or slab, to above grade and slab except where terminating at utility poles, in utility pad-mounted transformer enclosures and cable pits, and in utility company pedestals. Couple GRC/RMC conduits to RNC ducts with adapters designed for this purpose.
6. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."
7. Provide underground conduits at minimum of 24" below grade, slab or pavement as applicable (deeper where required by local utility company or prevailing codes and regulations), securely mounted on chairs when banked, with base in newly disturbed earth. Properly align ducts on chairs before backfilling. Provide heavy nylon pull-cord/drag-line (200 pound minimum strength) in empty conduits. Do not embed in slabs or pavement. Do not "scratch-in" just below slab or pavement.
8. Properly support and anchor raceways for their entire length with factory bases and intermediate spacers. Provide spacers at each coupling location, at each termination location, and at maximum five foot intervals between. Do not span any space unsupported. Provide end bells with rounded pulling surfaces at manholes, pull boxes and other end points of underground raceways.
9. Apply corrosion inhibiting compound before couplings are assembled for applications where metallic raceways are installed underground, in floors below grade, or outside. Draw up couplings and conduits sufficiently tight to ensure water-tightness. Provide steel rigid metallic conduit for applications where metallic conduits are installed below grade or slab.
10. Extend underground conduits that are capped at wall for future additions five feet beyond building.
11. Arrange excavation for exterior conduits so that:
 - a. The lines are straight and true
 - b. Grades required for drainage are maintained
 - c. The tops of buried raceways are not less than 24" below finished grade
12. Seal PVC joints with product equivalent to Carlon Cement. Make solvent cemented joints in accordance with recommendations of manufacturer.
13. Install work in accordance with NFPA 70 and in compliance with local utility practices.
14. Provide full parity size green insulated ground wire in PVC runs, except for those used exclusively for optical fiber cables.

15. Encasement: See details and/or notes on drawings for applications where encasement is required.
16. Pressure or vacuum test below-grade conduits before and after concealing the conduits to ensure resistance to moisture ingress.

2.7 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth. Install so cover surfaces will be flush with finished grade or pavement as applicable. Install service/feeder scale handholes with bottom below frost line below grade. Field-cut openings for conduits in closed-bottom units and in walls of units according to enclosure manufacturer's written instructions. Cut enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

END OF SECTION

SECTION 260537 - J-HOOK PATHWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
1. For J-hook pathways for electrical systems.

1.2 GENERAL

- A. Conduit/Raceway/Pathway: “Conduit”, “raceway”, “pathway” and similar terms shall be taken to mean “conduit” unless specifically indicated otherwise in project manual documents, or unless specifically directed otherwise in field by Owner or Design Professionals. All such terms shall be considered synonymous for the general purposes of installation means and methods.
- B. Provide J-Hook pathway systems only for the following limited applications: Class 2 (“low-voltage”) control wiring, except for fire alarm system wiring.

PART 2 - PRODUCTS

2.1 J-HOOK PATHWAYS

- A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below, or equivalent NRTL listed and labeled equivalent.
1. Cooper B-Line (basis of design, model numbers as specified further below)
 2. Mono-Systems, Inc.
- B. Materials Description:
1. Provide J-Hook system components that are plenum-rated (regardless of whether air plenum ceilings exist on the project). Provide J-Hooks, not Cable Fasteners, and not Bridle Rings. Provide open-top hooks, so cables can be laid into the J-Hooks rather than threaded through. Provide tool-less cable retainer clips (do not use cable ties). Provide hooks sized for maximum 40% fill (in cross section) based on outside diameter of cables. Accordingly, provide multiple sets of J-Hooks along any given pathway as applicable.
 2. Provide necessary factory hooks, cable retainers, fasteners, attachment kits, etc. as required for complete installations, including and equal to the following:
- | <u>Part</u> | <u>Cooper B-Line, Inc.#</u> |
|--|--|
| 1-5/16” Hooks | BCH21 (30 4-pair UTP) |
| 2” Hooks | BCH32. (70 4-pair UTP) |
| 4” Hooks | BCH64 (280 4-pair UTP) |
| 1-5/16” Cable Retainers | BCHR21 |
| 2” Cable Retainers | BCHR32 |
| 4” Cable Retainers | BCHR64 |
| J-Hook to Beam Fasteners (spring-clip) | BCH__-U (select hook size, flange thickness) |
| J-Hook to Beam Fasteners (spring-clip) | BCH__-E (select hook size, flange thickness) |
| J-Hook to Beam Fasteners (set-screw) | BCH__-C (select hook size, flange thickness) |
| J-Hook to Flange Fasteners (spring-clip) | BCH__-F (select hook size, flange thickness) |
| J-Hook to Strut Fasteners | BCH__-SM series |
| J-Hook to ATR (all-thread rod) Fasteners | BCH__-AB series |
| J-Hook Angle Bracket Fasteners | BCH__-RB series |
| J-Hook to Floor Support Fasteners | BCH__-L1410 series (select for hook size) |
| Multi-Tier Attachment Kits | BCHK series |
| Double-Sided Multi-Tier Fasteners | BCH__-1D or BCH__-2D series as required |

Single-Sided Multi-Tier Fasteners

BCH__-2S3S/4S/5S/6S series as required

2.2 MATERIALS AND FINISHES

- A. Provide steel units with rolled hook edges to prevent damage to cable jackets and insulation
- B. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.
- C. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide J-Hook support along “free-air” cable pathway routes. Provide J-Hooks at four-foot intervals and at offsets. Route J-Hooks above ceilings through corridors and similar open areas wherever possible to minimize above-ceiling wall penetrations.
- B. Layout and install all electrical work in strict compliance with Chapter 1, Part B, Section 110.26 of the latest adopted edition of NFPA 70.
- C. Keep pathways at least 24 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal runs above liquid and steam piping. Level and square runs, and install at proper elevations and heights. Do not begin installation of cables until J-Hook pathway installations are complete and until installation locations (end to end) are in a weatherproof environment. Install pathways so that they are accessible for cable installation after construction is complete. Install pathways with enough workspace to permit access for installing cables. Strictly adhere to factory load capacities and fill capacity. Provide factory cable retainers, fasteners, attachment kits, and other accessories as required for a complete installation.
- D. Securely anchor (mechanical, not adhesive) J-Hooks directly to structural components of the building. Do not anchor J-Hooks to ductwork, conduit, piping, fixtures, equipment, ceiling supports (rods, wires, t-bars), etc. Comply with requirements in Section 260529 and related sections for hangers and supports. Support using factory-approved methods. Fasten cables on horizontal runs with factory cable clamps, retainers, fasteners, attachment kits or flexible Velcro-secured wraps compliant with to NEMA VE 2. Tighten clamps/wraps only enough to secure the cable, without indenting the cable jacket. Use of synthetic or plastic “tie-wraps”, “zip ties”, “wire ties” and similar products are not permitted as a permanent means of anchoring, securing, supporting or otherwise installing any cables, conductors, conduits, raceways, devices, equipment or other electrical work. Do not use perforated strap.
- E. Coordinate work prior to rough-in with respective equipment and cable installers, and with Owner's Representative. Carefully coordinate proposed routing, including elevations, with affected installers and entities prior to rough-in. Neatly route paths parallel and perpendicular to building architectural lines, plumb on walls, and at a consistent elevation wherever possible. Install paths in a uniform plane/elevation wherever possible. Keep horizontal and vertical offsets to an absolute minimum. Route paths so that a minimum of 24 inches exists between cables and potential EMI sources such as lighting ballasts, motors, power wiring, dimmer circuits, etc.
- F. Provide a minimum of two (2) 4-inch bushed conduit sleeves where pathway is routed above inaccessible ceilings, and at penetrations of floors, masonry walls, fire rated walls, smoke-tight partitions, smoke-rated partitions, and similar elements. Provide smoke and fire stopping at such penetrations as applicable in (see Section 260502). Provide EMT conduit for “drops” from paths to outlets and equipment, with sweep bends, insulated throat fittings and 200-pound pull string.

**FESTUS READINESS CENTER –
PROJECT # T2330-01**

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FACILITY # 56377

END OF SECTION

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - PRODUCTS

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For underground ducts and raceways for electrical systems.

1.2 MISCELLANEOUS MATERIALS

- A. Backfill and Fill Materials: Use excavated or borrowed material for backfill. Prior to backfilling, remove rock and gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetable matter, and other deleterious matter. Use gravel or stone where so specified on details on drawings, or otherwise included in specifications.
- B. Non-shrink, Nonmetallic Grout: Provide premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout, recommended for interior and exterior applications.
- C. Subbase: Subbase refers to the compacted layer used in pavement systems between the subgrade and the pavement base course material. Provide subbase consisting of graded mixture of crushed gravel, crushed stone, crushed slag, or sand.

1.3 CONTROLLED LOW STRENGTH MATERIAL (CLSM – “FLOWABLE BACKFILL”)

- A. Description: Controlled-Low-Strength-Material (CLSM) is a material that has a specified compressive strength of 1200 pounds per square inch (PSI) at 28 days. This material is not concrete and is in a flowable state at the time of placement.
- B. Materials: Provide CLSM mixture consisting of water, Portland Cement (Type I or II conforming to ASTM C-150, Type "F" fly ash, and fine aggregate. If fly ash is not used, provide CLSM using high dosages of an air entraining admixture to help flowability and lower strength for removability. Non-standard materials may be used only after receiving special permission from Owner's Representative. Provide water used in mixing and curing that is as clean and free of oil, salt, acid, alkali, sugar, vegetable, and other substances injurious to the finished product as possible. Test water in accordance with the requirements to AASHTO T 26. Water known to be of potable quality may be used without testing. Use fine aggregates conforming to ASTM C 33 in CLSM.
- C. Mix Design: Provide proportion of materials used in CLSM as follows.
 - 1. Cement: 50-100 pounds (lbs) per cubic yard (cy)
 - 2. Type "F", Fly Ash: 250-300 lbs/cy
 - 3. Sand: 2700-2800 lbs/cy
 - 4. Water: 400-500 lbs/cy
 - 5. Other proportions may be used only after receiving special permission from Owner's Representative.
 - 6. Conform to the following flowability test: Fill a 3-inch diameter by 6-inch long open-ended cylinder with the mixture, then strike off to level. Remove the cylinder by pulling straight up and ensure the diameter of the CLSM, after spreading, is a minimum of 8-inches.

1.4 CONCRETE MATERIAL

- A. Reinforcement: Provide the following where reinforcement is specified or if reinforcement is deemed necessary by Owner's Representative due to special field conditions.
 - 1. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.

2. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40.
3. Joint Dowel Bars: Plain steel bars, ASTM A 615, Grade 40.
- B. Concrete Mix, Design and Testing: Design mix to produce normal-weight concrete consisting of Portland Cement, aggregate, air-entraining admixture, and water to produce the following properties.
 1. Aggregate: 3/8"
 2. Compressive Strength: 3000 PSI, minimum at 28 days.
 3. Slump Range: 7" to 8" (provide just enough slump to flow to the bottom of the formation and yet not be so wet as to cause the ducts to float).
 4. Air Content: 5% to 8%.
 5. Portland Cement: ANSI/ASTM C 150, Type I.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Subsurface conditions may have been investigated during the design of the project. If so, review reports of these investigations. Follow recommendations of these reports. Locate existing underground utilities in excavation areas, which are to remain. Support and protect these services during excavation operations. Contact utility owner immediately for instructions if uncharted or incorrectly charted utilities are encountered.
- B. General Installation.
 1. Coordinate trench locations in reference to other underground utilities. Ensure no other utilities are placed directly above or below, when parallel to conduits.
 2. Locate junction and pull boxes so they remain accessible after all construction work is complete. Coordinate all work with all other trades prior to commencement of the work.
 3. Layout and install all electrical work in strict compliance with Chapter 1, Part B, Section 110.26 of the latest adopted edition of NFPA 70. Locations and routing that may be shown on plans are schematic and diagrammatic in nature.
 4. Use of synthetic or plastic "tie-wraps", "zip ties", "wire ties" and similar products are not permitted as a permanent means of anchoring, securing, supporting or otherwise installing any cables, conductors, conduits, raceways, devices, equipment or other electrical work.
- C. Pathway Evacuation and Protection: Seal and protect raceways and boxes from moisture infiltration. Provide watertight fittings. Pressure or vacuum test below-grade conduits before and after concealing the conduits to ensure resistance to moisture ingress.
- D. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations. Properly restore streets, sidewalks, concrete and blacktop surfaces that were broken for installing piping.
- E. Comply with codes in jurisdiction.
- F. Where subsidence occurs at electrical installation excavations during a period of 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

2.2 EXCAVATION

- A. Protection: Protect excavated openings with substantial railings, fencing, signage, shoring, and steel roadway plates in strict compliance with OSHA/NIOSH, with local Department of

Transportation (DOT) standards, with authorities having jurisdiction, and as directed by Owner's Representative in field. Provide traffic detours per DOT standards during active construction work shift time periods. Provide related barricades, signage, portable flashing lights, etc. (per DOT standards) at specific locations as determined in field. Provide steel roadway plates, properly installed and anchored per DOT standards, over roadway cuts during inactive periods (i.e. between construction work shifts, while concrete is curing, and while flowable backfill is curing). Finish work affecting the roadways, and restore/pave roadway cuts, as quickly as possible after starting those segments of work. Carefully coordinate scheduling for roadway related work to allow adequate time for inspections and curing, while keeping overall related time to a minimum.

- B. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation. Remove shoring and bracing when no longer required. Install sediment and erosion control measures in accordance with local codes and ordinances.
- C. Dewatering: Prevent surface water, subsurface water, and ground water from flowing into excavations and from flooding project site and surrounding area. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting/run-off areas. Do not use trench excavations as temporary drainage ditches.
- D. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage. Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees. Remove from site, and legally dispose of, excess excavated materials and materials not acceptable for use as backfill or fill.
- E. Trenching: Excavate trenches to the uniform width, sufficiently wide to provide ample working room. Excavate trenches to depth indicated or otherwise necessary to full project requirements. All trench widths indicated on drawings are minimum required widths.
- F. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees Fahrenheit.
- G. Backfilling and Filling: Place soil materials in layers to required elevations for each area classification listed below, using materials specified in Part 2 of this Section. Backfill excavations as promptly as work permits.
- H. Placement and Compaction: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, that are frozen, that contain frost, or that contain ice. Compact each layer of backfill or fill material to 95 percent standard compaction.
- I. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve

required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.

- J. Separately stockpile excavated topsoil adjacent to the excavated areas and trenches and utilize it in the final stage of backfilling operation. Grade exposed earth and other erodible areas to a reasonably uniform, and satisfactory, cross section and slope, as soon as practicable.
- K. Excavation for Underground Electrical Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot, plus a sufficient distance to permit placing and removal of concrete formwork, installation of services, other construction, and inspections. Excavate by hand areas within drip-line of large trees. Protect the root system from damage and dry-out. Maintain moist conditions for root system and cover exposed roots with burlap. Paint root cuts of 1 inch in diameter and larger with emulsified asphalt tree paint. Take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed.

2.3 INSTALLATION OF CLSM AND CONCRETE

- A. General: See details and/or notes on drawings for applications where encasement is required for underground conduits/duct banks. Transport product by mixer truck. Provide continuous agitation from mixing to placement. Retain records of all mixes, tests, etc. and include in Operation and Maintenance Manuals. Submit copies during construction if requested.
- B. Forms: In general, unless directed otherwise in field or required otherwise by OSHA and/or other prevailing codes, regulations and standards, the sides of the excavated trenches may be used as forms for encasement. Otherwise, provide forms made of steel, wood, or other suitable material of size and strength to resist movement during encasement product placement, and to retain horizontal and vertical alignment until removal. Do not remove forms for at least 48 hours after encasement product has been placed.
- C. Expansion Joints: Provide pre-molded joint filler for expansion joints abutting any structure, and as otherwise recommended by concrete supplier.
- D. Placement: Remove loose material from subbase surface immediately before placing concrete. Check subbase and forms for line and grade before placing concrete. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Place product directly from the truck chute or pump it. Place product using methods that prevent segregation of mix. Use splash boards to divert the flow of product away from the trench sides, and to avoid dislodging soil and stones. Do not backfill until a minimum of 48 hours have passed. Exclude traffic over affected areas for at least 14 days after placement.

END OF SECTION

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - EXECUTION

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For sleeves and sleeve seals for electrical raceways and cabling

1.2 GENERAL DIRECTION

- A. Cutting and Patching:
 - 1. Hold cutting and patching to a minimum by arranging with other trades for sleeves and openings before construction is started.
 - 2. Cut and drill all openings in roofs, walls, and floors required to perform the work. Neatly patch all openings cut. Hold cutting and patching to a minimum by arranging with other contractors for all sleeves and openings before construction is started. When drilling / cutting concrete slabs, utilize ground penetrating radar (GPR) and/or X-ray scanning equipment to verify the location is free from obstruction, including but not limited to: structural rebar / strands / tendons and electrical conduit / wiring. Repair all damage to structural elements that may occur. Provide temporary partitions, dust barriers, vacuums to keep all dust to a minimum. Allow inspection by owner's rep and inspection by authority having jurisdiction prior to concealing any work or uncover and restore work to allow for observation.
- B. Fire Caulking:
 - 1. Fire stopping requirements/locations are not indicated on electrical drawings. Review architectural and other drawings to determine where there will be fire/smoke rated walls, floors, membranes, etc. and rating requirements of same. Provide required fire stopping work associated with electrically related penetrations. Patching through fire rated walls and enclosures shall not diminish the rating of wall or enclosure. Patch shall be equal to rockwool, firestop, caulk or approved "rated" patch / sealant / pillow / grommet / compound / etc. Clean affected surfaces, joints, etc. immediately before applying fire stopping and only apply under recommended temperature and humidity. Apply primer as required by manufacturer. Properly tool sealants for clean look. Subject to compliance with requirements, provide products by one of the following:
 - a. Fire Stop Pillows: Nelson PLW, STI, Hilti, 3M
 - b. Fire Stop Putty: Nelson FSP, STI, Hilti, 3M
 - c. Latex Intumescent Sealant: Nelson LBS3, STI, Hilti, 3M
 - d. Outlet boxes: Nelson FSP, STI, Hilti, 3M
- C. Access Panels:
 - 1. Provide all access panels required for proper servicing of equipment or access to junction boxes as a last resort after first searching out locations for equipment and junction boxes in accessible areas. All access panel locations and sizes must be coordinated with and approved by design team and owner's representative. Provide fire rated and smoke rated access panels where required. Provide frame as required for finish. Coordinate installation with General Contractor as they may elect to install access panel. Exact location(s) must be approved by the Architect. Minimum size to be 12" x 12" for junction boxes and 22" x 22" for equipment, units to be 16-gauge steel, primed for paint, door opens beyond 90 degrees and locking device shall be screwdriver cam locks.
 - 2. For equipment or junction boxes above gypsum board or "hard ceilings", provide equipment access panels sized to permit complete holistic removal of the unit in its

entirety. Access panel shall also be sized to accommodate removal of the largest piece of equipment in the case where such access panel is used as a removal pathway for multiple pieces of equipment. Subject to compliance with requirements, provide products by one of the following:

- a. Bar-Co., Inc.
- b. J.L. Industries.
- c. Karp Associates, Inc.
- d. Milcor Div. Inryco, Inc.
- e. Nystrom, Inc.

D. Conduit Sleeves:

1. Aboveground, exterior wall penetrations: rigid steel pipe sleeve.
2. Below grade, exterior wall and floor penetrations: schedule 40 cast iron pipe sleeve
3. PVC Pipe Sleeves where allowed: ASTM D 1785, Gray, Schedule 40.
4. Rectangular opening sleeves: Galvanized Sheet Steel, thickness min 0.1 inches.
5. Sleeve Seal Systems: Provide modular sealing device designed for field assembly, EPDM, Nitrile or Silicone based on installation environment with stainless steel bolts and polymer pressure plates. Install type and number recommended by manufacturer for a water tight seal. Provide by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
 - f. OZ/Gedney
 - g. Link-Seal
6. Sleeve Seal Fittings: Provide manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Install in wall or slab as constructed and grout area around fitting. Provide by one of the following:
 - a. Presealed Systems
 - b. Bio FireShied
 - c. MetaCaulk
7. Sleeves shall be cut flush with both faces of wall. Deburr all sleeves. Floor sleeves shall extend one inch above floor top elevation. Maintain all fire ratings. Use joint compound for around gypsum sleeves. Roof penetrations shall be with flexible boot-type flashing unit or within a pipe curb assembly equal to Pate Co. Curb and flashing per roofing manufacturer's requirements to maintain warranty.

E. Grout:

1. Provide non-shrink grout, recommended for sealing openings in non-fire-rated walls or floors, ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout. Provide 5000-psi strength design mix, premixed and factory packaged.

F. Silicone Sealants:

1. Provide single-component, silicone-based, neutral-curing elastomeric sealant for exterior work. Provide pourable (self-leveling) grade formulation for openings in non-fire rated floors and other horizontal surfaces. Install only in temperature and humidity as recommended by manufacturer. Colors of all visible sealants to be clear or color approved by owner's rep or design team.

G. Acrylic Sealants:

1. Provide one-part, non-sag, mildew-resistant, paintable recommended for exposed applications of interior and protected exterior locations

END OF SECTION

SECTION 260548 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For vibration and seismic controls for electrical systems.

1.2 SUBMITTAL REQUIREMENTS

- A. Shop Drawings
 - 1. Provide performance requirements and design criteria, including analysis data signed and sealed by the qualified engineer responsible for their preparation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. The contractor shall subcontract a licensed structural engineer for the design of all seismic restraint systems required by the presiding jurisdiction. The structural engineer shall provide engineered stamped and signed drawings of seismic design and submit as deferred submittal to supplement the permit drawings.

3.2 SEISMIC BRACING

- A. Provide seismic bracing of electrical components where required by code.

3.3 QUALITY ASSURANCE

- A. The contractor shall provide seismic restraint systems to meet total design lateral force requirements for support and restraint of conduit, cable trays, equipment, and other similar systems and equipment where required by the applicable building code.

3.4 DELEGATED DESIGN

- A. Seismic restraint designer shall coordinate all attachments with the structural engineer of record. Provide engineered stamped and signed drawings of seismic design.
- B. Seismic restraint designer shall provide visual inspection after installation and approve installation of seismic design components.
- C. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
- D. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.
- E. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.
- F. Friction from gravity loads shall not be considered resistance to seismic forces.

END OF SECTION

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For electrical systems identification.

1.2 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 (and IEEE C2 as or if applicable). Comply with NFPA 70. Comply with 29 CFR 1910.144 and 29 CFR 1910.145. Comply with ANSI Z535.4 for safety signs and labels. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- B. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

PART 2 - PRODUCTS

2.1 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

- A. Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing ends of legend label. Provide black letters on an orange field, and indicate voltage and system or service type.

2.2 CABLE IDENTIFICATION MATERIALS

- A. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the cable diameter such that the clear shield overlaps the entire printed legend.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide (where permitted by NEC for large feeder and sub-feeder conductors).
- B. Self-Adhesive, Self-Laminating Polyester Labels: Preprinted, 3-mil thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.
- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed using indelible process.

2.4 UNDERGROUND-LINE WARNING TAPE

- A. Tape:
 - 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
 - 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
 - 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
 - 4. Provide tape with printing that most accurately indicates respective type of service of buried cable.

- B. Color and Printing:
 - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
 - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
 - 3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

2.5 SELF-ADHESIVE LABELS

- A. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated, installed level and plumb.

2.6 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes, installed level and plumb.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 EQUIPMENT AND FIELD NAMEPLATE IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting, black letters on a white background for normal applications, minimum letter height shall be 3/8 inch, installed level and plumb. Provide 1/16" thickness for units up to 20 sq. in. or 8" length; provide 1/8" thickness for larger units.
- B. Provide white letters on a black background for normal power distribution system equipment.

2.8 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Arc-Flash Hazard Warning Labels: Provide pre-printed "as-built" labels on power distribution and like equipment to warn of potential electric arc flash hazard. Provide in compliance with Article 110.16 of NFPA 70.
- C. Warning labels and signs shall also include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning for 0-150 volts to ground equipment: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
 - 3. Workspace Clearance Warning for 151-600 volts to ground equipment: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 48 INCHES."

2.9 FIELD IDENTIFICATION LABELS

- A. Identification of Disconnecting Means: Provide pre-printed "as-built" nameplate identification labels at all service equipment, power distribution equipment, and each disconnecting means to indicate the maximum available fault current and exact source of the power supply that serves the respective equipment. Provide in compliance with Articles 408.4 (B), 110.22(A) and 110.24 (A) of NFPA 70.

- B. Circuit Directory/Identification: Provide pre-printed “as-built” identification at circuit sources, using directory cards intended for the purpose, for all circuits. Provide in compliance with Article 408.4 (A) of NFPA 70.
- C. In addition to other labelling required herein or by NFPA 70, provide pre-printed “as-built” identification of the following at all service entrance equipment.
 - 1. Potential Electric Arc Flash Hazards compliant with Article 110.16(A) of NFPA 70.
 - 2. Nominal System Voltage.
 - 3. Single-Phase, Three-Phase/Three-Wire or Three-Phase/Four-Wire as applicable.
 - 4. Available fault Current at Overcurrent Protective Devices.
 - 5. The Clearing Time of Service Overcurrent Protective Devices based on the available fault current at the service equipment.
 - 6. The Date that the label was applied.

2.10 CABLE TIES

- A. UV-Stabilized Cable Ties
 - 1. Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 2. Minimum Width: 3/16 inch.
 - 3. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 4. Temperature Range: Minus 40 to plus 185 deg F.
 - 5. Color: Black.
- B. Plenum-Rated Cable Ties
 - 1. Self -extinguishing, UV stabilized, one piece, self locking.
 - 2. Minimum Width: 3/16 inch.
 - 3. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 - 4. UL 94 Flame Rating: 94V-0.
 - 5. Temperature Range: Minus 50 to plus 284 deg F.
 - 6. Color: Black.

2.11 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All equipment & system identification nomenclature shown on drawings and listed herein may be shown for general design and installation reference only. Field-verify the actual nomenclature prior to fabrication. Prepare record documents accordingly.
- B. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- C. System Identification Color-Coding Bands for Raceways and Cables: Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- D. Cable Ties: For attaching tags. Cut off excess lengths after installing ties. Use general-purpose type, except the following: Outdoors, UV-stabilized nylon; Indoors: Plenum rated.

- E. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or envelope/encasement exceeds 16 inches overall. Install line marker for every buried cable, regardless of whether direct-buried or installed in conduit.
- F. In accessible ceiling spaces and where exposed in unfinished areas, label conduit with panel and circuit numbers of conductors routed through the conduit. Label conduit at all wall penetrations and connections to all panels, junction boxes, and equipment served.

3.2 IDENTIFICATION DEFINITION

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less: Identify with self-adhesive vinyl label. Locate at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas. Do not install in finished occupied areas.
- B. Accessible Raceways and Cables within Buildings: Identify raceways, cables, junction and pull boxes of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows: Power.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in pull and junction boxes, and handholes, use color-coding to identify the phase. Color shall be factory applied to conductor insulation or field applied for sizes No. 4 AWG and larger, if authorities having jurisdiction permit. These colors apply for factory-assembled cables as well as for individual insulated conductors. Use colors listed below for conductors.
 - 1. Colors for 208/120-V Circuits:
 - a. Phase A: Black
 - b. Phase B: Red
 - c. Phase C: Blue
 - d. Neutral: White
 - 2. Color for Equipment Grounding: Green
- D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- E. Locations of Underground Lines: Identify with underground-line warning tape. Install underground-line warning tape for both direct-buried cables and cables in raceway. Install detectable tape at trenches containing empty conduits and conduits containing optical fiber cable.
- F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels. Comply with 29 CFR 1910.145. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access. For equipment with multiple power or control sources, apply to door or cover of equipment including.
- G. Operating and Warning Instruction Signs: Provide pre-manufactured operating and warning signage if indicated on drawings and where required by NEC or local authority having jurisdiction. Install instruction signs to facilitate proper operation and maintenance of electrical

systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

- H. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual.
- I. Fire Alarm Systems: Provide permanent identification for boxes, enclosures, etc. that are associated with fire alarm system work. Paint and identify fire alarm system pull boxes, junction boxes, and other access/pull points (boxes and covers) in accordance with NEC/NFPA. Provide red color on jacket of all fire alarm cables associated with the fire alarm system. Provide red-colored breaker handle and red-colored lock-on device at source circuit breakers that feed fire alarm related equipment. Provide red coloring for all fire alarm system junction boxes, along with identification.

END OF SECTION

SECTION 260584 - MECHANICAL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Refer to documents of other divisions for further requirements associated with equipment and devices that are addressed in this section. This section includes supplemental information related to electrical work associated with mechanical equipment and other equipment furnished and/or installed under all other divisions or by others. Information included in this section applies not only to traditional mechanical equipment, but also to equipment of any kind that is furnished and/or installed by any supplier or installer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Common Requirements:
1. Provide all necessary electrically related work as required to render all mechanical equipment (including plumbing, heating, ventilating and air conditioning equipment) fully operational and fully compliant with NEC.
 2. Refer to Coordination Schedules on drawings. Provide disconnects, controllers, starters, accessories, wiring, connections, services, etc. where defined as “EC” in the schedule. Information in this section supplements the information in the HECS.
 3. Provide power wiring and connections for all equipment (including motor dampers, accessories, etc. as applicable) as required to render equipment fully operational.
 4. Install local disconnects and/or controllers at 48 inches to top of outlet box or enclosure as applicable above finished floor/slab/grade; provide flush mounted units in finished areas. Provide key operated controllers where accessible to general staff and/or general public.
 5. Drawn locations of equipment and devices are shown only for schematic indication of wiring requirements. Coordinate with locations and rough-in requirements as required to determine actual locations and termination requirements. Refer to all contract documents for additional electrical requirements and concerns, and for further representation of this work.
 6. Provide disconnect switch ahead of all equipment, including controls, unless the mechanical equipment comes with integral NEC-compliant disconnect(s). Provide NEMA 3R enclosures where installed outdoors and where installed indoors in areas subject to moisture. Where mechanical equipment lugs cannot accommodate conductor sizes shown on drawings, provide ILSCO ClearTap Insulated Multi-Tap Connectors.
 7. Sizes, electrical ratings, etc. of equipment and wiring shown on drawings are based on the respective equipment design base manufacturers. If different manufacturer(s) or model(s) are actually supplied, provide necessary coordination in field (prior to ordering materials and prior to rough-in) and provide the necessary size of related electrical equipment, wiring, conduit, etc.
 8. Coordinate in field with the respective trades and determine case by case, which equipment is factory listed for use with Heating and Air Conditioning Rated (HACR) breakers. In an effort to minimize requirements for stocking of fuses by the Owner, utilize HACR breakers at the source panelboards as the NEC required overcurrent protection wherever possible (in lieu of fusing local disconnect switches).
 9. Disconnect Switch and/or Starter Locations: Locations shown on drawings are indicated for schematic purposes only. Determine exact locations in field so that they are compliant with NEC Article 110.26.

10. Supplemental Work for Aluminum Conductor Electrical Equipment Connections (regardless of who furnishes the equipment): Provide local disconnect at or near equipment (external to the equipment) and terminate aluminum conductors to the line-side lugs/terminals of the disconnect switch. Provide copper conductors from load-side lugs/terminals of the disconnect switch to the respective equipment factory disconnect or lugs/terminals as applicable. Coordinate all related work with all affected installers.
- B. Maintenance Receptacles for Equipment: Provide duplex receptacle within 25 feet of all electrically operated equipment of any nature that requires periodic testing or maintenance. Provide Type WR duplex GFCI weatherproof receptacle for outdoor applications (including rooftops) and for applications subject to high humidity or moisture.
- C. Equipment and Systems:
 1. Split System Air Conditioning Systems: Provide (1) 3/4 inch empty conduit (with drag line) from each air handling segment to each condensing unit. Provide control conduit between pair to follow refrigerant piping routing wherever practical.
 2. Control Wiring:
 - a. General: Unless specifically indicated as empty conduit on drawings or herein, provide electrical control and interlock work as shown on drawings. Provide additional control work as specifically indicated herein. Coordinate HVAC thermostat and sensor locations in field (case by case) with Design Professionals, Owner's Representative and equipment installer to ensure that they are placed in locations that will not interfere with furniture, equipment, artwork, wall-hung specialties, room finishes, etc. Field-verify these wall locations case by case, prior to rough-in, since locations shown on drawings are schematic only.
 - b. Schematic Thermostat and Sensor Locations: Refer to HVAC drawings and documents to determine locations and quantities if locations are not shown on electrical drawings, and to confirm locations and quantities even if locations are shown on electrical drawings.
 - c. Low Voltage Thermostats and Sensors: Provide 4-inch square by 2-1/8 inch deep wall outlet boxes at 46 inches above finished floor to center of outlet box (with single-gang rings) for each unit. Provide one 3/4-inch empty conduit from each location, turned out above accessible ceilings (in joist space or against overhead slab/deck). Identify conduit in ceiling cavity; provide sweep bends, bushings and drag line.
 - d. Line Voltage Thermostats and Sensors: Provide 4-inch square by 2-1/8 inch deep wall outlet boxes at 46 inches above finished floor to center of outlet box (with single-gang rings) for each unit. Provide line voltage power wiring, in 3/4-inch conduit, and connections from thermostats and sensors to respective equipment that is to be controlled by same. Install thermostats and sensors.
 - e. Motor Operated Dampers: Provide wiring associated with interlock of motors to associated motor dampers for exhaust fans. Provide local disconnect at each motor damper if fan is not furnished with one. Where HVAC equipment or exhaust fans are controlled by VFC/VFD units, wire motor operated dampers (MOD's) back to the respective VFC/VFD unit separately from the respective exhaust fan power wiring, with (2) #12 AWG in 3/4 inch conduit. Provide local disconnect for each such MOD.
 3. Domestic Water Heaters (Gas): Provide electrical 120VAC power connection. Provide interlock wiring with circulating pumps, flow switches and aquastat controls as applicable. Refer to wiring diagrams on drawings for further definition where applicable.

4. Domestic Hot Water Circulating Pumps (Return Line): Provide manual starter with pilot light, and wire pump to operate through the aquastat. Refer to wiring diagrams on drawings for further definition.
5. Electric Water Coolers (Surface): Provide 120V duplex receptacle. Provide GFCI circuit breaker to feed the circuit that serves electric water coolers, even if not indicated on panelboard schedule. Install at height and location as directed by water cooler installer. Conceal outlet within water cooler enclosure if enclosure is designed for such an installation. Assemble and connect cord if needed. Coordinate all specifics with water cooler installing contractor prior to rough-in of related work.

END OF SECTION

SECTION 260800 - COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. The requirements of this Section apply to all sections of Division 26.
- B. Copies of all commissioning documentation shall be given to the Owner and made available to the code official upon request in accordance with the Preliminary Commissioning Report and Documentation Requirements.

1.2 DESCRIPTION

- A. As a quality process, commissioning provides tools to the Owner and to the Code Official to verify that building systems meet the design and code Requirements and that the systems, components, and equipment to be commissioned have been installed and operate within the performance guidelines identified in the design documents and applicable energy codes.
- B. The commissioning process shall not remove or reduce the responsibility of the design team, contractors, subcontractors, vendors, manufacturers, or suppliers to provide a finished product.

1.3 SYSTEMS AND EQUIPMENT TO BE COMMISSIONED

- A. The following systems, components, and equipment are the focus of the commissioning process for the Project:
 - 1. Electrical Lighting and Controls

1.4 COMMISSIONING PLAN

- A. The Commissioning Plan is developed by the Commissioning Agent (CxA) and includes the following:
 - 1. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.
 - 2. Lists the specific equipment and systems to be tested and a description of the tests.
 - 3. Functions to be tested.
 - 4. Conditions under which the test will be performed.
 - 5. Measurable criteria for performance.

1.5 SUBMITTALS

- A. The commissioning process requires review of Submittals for equipment and systems that are part of the commissioning scope of work. The Construction Manager will be responsible for delivering these submittals to the CxA for their review.
- B. The commissioning process requires Submittal review simultaneously with engineering review.

PART 3 - EXECUTION

3.1 FUNCTIONAL PERFORMANCE TESTING

- A. The systems and equipment to be commissioned shall be tested through different modes of operation to verify that the systems function within the performance criteria identified in the Contract Documents.
- B. Before functional performance test procedures are finalized, the contractors shall provide to the CxA all requested documentation and a current list of changes affecting equipment or systems. The CxA will provide the Commissioning Team members and others, as required, the functional performance testing checklists electronically. The functional performance testing

provides all team members with documentation to verify the operation of the systems and equipment at turnover. This testing process will be documented utilizing functional performance testing checklists.

1. Equipment functional performance testing will demonstrate the installations and operation of components, systems, and system to system interfacing relationships such that operation, function and maintenance serviceability for each of the commissioned systems is confirmed.
 2. Testing will include all modes, sequences of operation, and emergency conditions.
- C. Prior to passing final inspection, the registered design professional shall provide evidence that the lighting control systems have been tested to ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's instructions. Functional testing shall be in accordance with adopted energy code for the applicable control type.
- D. Where occupant sensor controls are provided, the following procedures shall be performed:
1. Certify that the occupant sensor has been located and aimed in accordance with manufacturer recommendations.
- E. For occupant sensor controls to be tested, verify the following:
1. Where occupant sensor controls include status indicators, verify correct operation.
 2. The controlled lights turn off or down to the permitted level within the requested time.
 3. For auto-on occupant sensor controls, the lights turn on to the permitted level when an occupant enters the space.
 4. For manual-on occupant sensor controls, the lights turn on only when manually activated.
 5. The lights are not incorrectly turned on by movement in adjacent areas or by HVAC operation.
- F. Where time-switch controls are provided, the following procedures shall be performed:
1. Confirm that the time-switch control is programmed with accurate weekday, weekend and holiday schedules.
 2. Provide documentation to the owner of time-switch controls programming including weekday, weekend, holiday schedules, and set-up and preference program settings.
 3. Verify the correct time and date in the time switch.
 4. Verify that any battery back-up is installed and energized.
 5. Verify that the override time limit is set to not more than 2 hours.
 6. Simulate occupied condition. Verify and document the following:
 - a. All lights can be turned on and off by their respective area controls switch.
 - b. The switch only operates lighting in the enclosed space in which the switch is located.
 7. Simulate unoccupied condition. Verify and document the following:
 - a. Nonexempt lighting turns off.
 - b. Manual override switch allows only the lights in the enclosed space where the override switch is located to turn on or remain on until the next scheduled shutoff occurs.
 8. Additional testing as specified by the registered design professional.
- G. Where daylight responsive controls are provided, the following shall be verified:
1. Controls devices have been properly located, field calibrated and set for accurate set points and threshold light levels.
 2. Daylight controlled lighting loads adjust to light level set points in response to available daylight

3. The locations of calibration adjustment equipment are readily accessible only to authorized personnel.
- H. Contractors shall provide 2 weeks' notice to the CxA regarding the completion of equipment and system installation to schedule installation verification and functional performance testing. The commissioning team shall oversee, direct, witness, and document the performance of equipment and systems to be commissioned. Functional performance testing shall be conducted after startup of all equipment and systems have been satisfactorily completed and Controls have been completed.
- I. Contractors are required to provide the CxA with a signed equipment/system readiness form before the CxA will visit the site to perform Functional Performance Testing (FPT). All time and expenses for FPT visits when equipment or systems are not ready to be tested will be invoiced to the responsible party.
- J. Skilled technicians shall be provided by the appropriate contractors familiar with the system, components, equipment, and the facility in order to execute the functional performance testing of the system, subsystems, associated systems, components, and equipment. Each contractor shall be responsible to operate the systems to be commissioned and assist the CxA who will be verifying the functional performance testing procedures.
- K. During the functional performance testing, each responsible contractor or subcontractor, at the discretion of the CxA, may address minor problems discovered as may be necessary in order to successfully complete the testing procedure. In such cases, the deficiency and resolution shall be documented on the procedure form or an attached sheet.
- L. Contractors are responsible to resolve, correct, and retest deficiencies or other issues discovered during functional performance testing.

3.2 DOCUMENTATION REQUIREMENTS

- A. The documents below specifying that the installed lighting controls meet documented performance criteria shall be provided to the building owner within 90 days of the date of receipt of the certificated of occupancy.
- B. Manuals
 1. The commissioning process requires detailed operations and maintenance manuals and shall include the following information:
 - a. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
 - b. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.
 - c. Name and address of at least one service agency.
 - d. A narrative of how each system is intended to operate, including recommended set points.
 - e. Submittal data indicating all selected options for each piece of lighting equipment and lighting controls.
 - f. Operation and maintenance manuals for each piece of lighting equipment. Required routine maintenance actions, cleaning and recommended relamping shall be clearly identified.
 - g. A schedule for inspecting and recalibrating all lighting controls
 2. For equipment and systems in the commissioning scope of work, operation and maintenance manual information shall be submitted to the CxA in electronic format by the contractor responsible for the respective equipment and systems.

- C. A report of test procedures and results identified as “Final Commissioning Report” shall be delivered to the building owner and shall include:
1. Results of functional performance tests.
 2. Disposition of deficiencies found during testing, including details of corrective measures used or proposed.
 3. Functional performance test procedures used during the commissioning process including measurable criteria for test acceptance, provided herein for repeatability.
 - a. Exception: Deferred tests that cannot be performed at the time of report preparation due to climatic conditions.

END OF SECTION

SECTION 260919 - ENCLOSED CONTACTORS

PART 1 - PRODUCTS

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For each type of enclosed contractors.

1.2 ENCLOSED CONTACTORS

- A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below.
 - 1. Allen-Bradley Co.
 - 2. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 3. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 4. Siemens Energy & Automation, Inc.
 - 5. Square D; a brand of Schneider Electric.
- B. Enclosed Contactors:
 - 1. Provide NEMA standard equipment, rating as indicated on drawings or application dependent, including those incorporated as an integral part of a factory/shop pre-fabricated piece of equipment. Do not use IEC standards for equipment.
 - 2. Provide units as indicated on drawings and as indicated under Division 26 sections.
 - 3. Provide contactors equipped with externally-visible pilot lights and externally-operated Hand-Off-Automatic (HOA) selector switches in front cover of enclosure.
 - 4. Wire contactors for lighting applications so that the "AUTO" position is the normal activated condition (i.e. photocell controlled, photocell/time-clock controlled, remote switch controlled, BAS controlled, etc.); so that the "OFF" position is manual override to turn lighting off; and so that the "HAND" position is manual override to turn lighting on.
 - 5. Provide contactors with field convertible N.O./N.C. contacts and descriptive nameplates.
 - 6. Provide lugs, lug kits and related accessory work as required to accommodate the conductor sizes and quantities needed for each application. Coordinate with associated installers, single-line diagram, field conditions, etc.
 - 7. Electrically Held Contactors
 - a. Provide contactors equal to Square D Class 8903 (or Allen-Bradley Bul. 500L-BA*94 series) for small resistance heating loads. Provide contactors that are electrically operated and electrically held (EOEH). Provide contactors in factory NEMA 1 minimum enclosures, with 120V coils (unless indicated otherwise elsewhere or otherwise required to render controls fully operable).
 - b. Provide "dry" contacts rated at 30A, unless otherwise indicated on drawings, minimum 250V (600V if required by application). Provide number of poles (minimum of three poles) and number of contactors as required for each application or as indicated on drawing, whichever is larger. Determine coil voltage ratings in field.
 - 8. Mechanically Held Contactors
 - a. Provide magnetic (mechanically latched) contactors equal to Square D Class 8502 (or Allen-Bradley Bul. 500-BA*930 series) for heating loads, capacitor loads, transformer loads, motor loads, and similar loads. Provide contactors with factory enclosures, with 120V coils (unless indicated otherwise elsewhere or otherwise required to render controls fully operable). Provide starters with holding circuit contacts (provide related interlock wiring). Provide magnetic contactors in enclosures that are NEMA Size 1 minimum.

- b. Provide "dry" contacts rated at 30A, unless otherwise indicated on drawings, minimum 250V (600V if required by application). Provide number of poles (minimum of three poles) and number of contactors as required for each application or as indicated on drawing, whichever is larger. Determine coil voltage ratings in field.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Provide units with horsepower ratings suitable to the loads. Size units according to load being served or as noted on drawings, whichever requirement is larger.
- B. Provide NEMA 3R enclosures for units that are installed outdoors, in moist areas, and in other atmospheres subject to similar moisture or exposure. Provide other NEMA enclosure types if indicated on drawings.

END OF SECTION

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - PRODUCTS

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For each type of lighting control device.

1.2 MANUAL LIGHTING CONTROL DEVICES – SEE SECTION 262726.00

1.3 AUTOMATED LIGHTING CONTROL

- A. Photocells
 - 1. Provide Tork #2107 (for 120/277 volt applications) and Tork #2104 (for 208/277 volt applications) photocells or equal by Intermatic, 2000W tungsten rated, 1800VA ballast rated, -40 to 140 degree F rated, fail-on, with contacts that remain closed from dusk to dawn (on at 1 to 5fc, off at 3 to 15fc). Provide delay of up to two minutes to prevent false switching due to vehicular lights or lightning. Provide mobile light level selector. Provide gasketed heavy duty die cast zinc housing and base. Determine exact mounting locations and adjustment requirements in field relative to structural and site conditions. Aim northward wherever not conflicting with artificial light sources.
 - 2. Provide Sensor Switch #CM-PC-ADC or equal. Provide all required low voltage wiring and necessary power packs, relays, etc. for a complete system. Coordinate installation location and setting with manufacturer recommendations for daylight harvesting.
- B. Digital Timer Switches: Provide Standard of Quality equal to WattStopper TS-400. Provide time range as indicated on drawings or as directed in field based on specific applications. Provide wall plates and finish colors to match color and style specified in section 262726 “Wiring Devices.”
- C. Multi-Purpose Time Clock (365 Day): Provide Intermatic #ET90415CR series Multi-Purpose Time Clock (or equal by Tork), which is programmable 365-day/24-hour with override controls. Provide four-channel unit. Provide required external contactors, relays, etc. to render the control systems fully operational. Verify zone control requirements in field prior to rough-in. Provide 100-hour carryover carryover. Provide Ethernet module.

1.4 OCCUPANCY SENSORS

- A. General
 - 1. Provide labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of completely operational occupancy sensor lighting controls, as described herein.
 - 2. Provide products supplied from a single manufacturer that has been continuously involved in manufacturing of occupancy sensors for a minimum of five (5) years.
 - 3. Provide occupancy sensors for entire project that are all made by the same manufacturer, regardless of where the materials are specified in Division 26 documents. Provide components that are all made by the same manufacturer in cases where occupancy sensor components are also connected to a building lighting control system, regardless of where the materials are specified in Division 26 documents.
 - 4. Provide components that are U.L. listed, offer a five (5) year warranty and meet state and local applicable code requirements.
 - 5. Provide products manufactured by an ISO 9002 certified manufacturing facility with a defect rate of less than one-third of one percent.

6. Provide sensors with coverage that remains constant after sensitivity control has been set. Automatic reduction in coverage due to the cycling of air conditioner or heating fans is not permitted.
 7. Provide sensors with readily accessible, user adjustable settings for time delay and sensitivity. Locate settings on the sensor (not the control unit) and recess to limit tampering.
 8. Provide bypass manual override on each sensor to accommodate failures. Configure so that when bypass is utilized, lighting remains on constantly or control diverts to a wall switch until sensor is replaced. Recess this control to prevent tampering.
 9. Provide sensors with an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.
 10. Where specified, provide sensor with internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Do not use sensors that utilize separate components or specially modified units to achieve this function.
 11. Provide sensors with UL rated, 94V-0 plastic enclosures.
- B. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below. If not listed, submit as substitution.
1. Cooper Greengate CA
 2. Hubbell
 3. LC&D
 4. Leviton
 5. Lutron
 6. Sensor Switch
 7. Phillips
 8. Wattstopper
- C. Ceiling Sensors: Provide Standard of Quality equal to WattStopper: DT-300, DT-305, or DT-355, series.
- D. Wall Switch Sensors: Provide Standard of Quality equal to WattStopper: PW-100, PW-100-24, PW-200, DW-100, DW-100-24 or DW-200 series. Provide wall switch products that utilize Zero Crossing Circuitry to increase relay life, protect from the effects of inrush current, and increase sensor's longevity. Provide wall switch sensors that have no leakage current to load, in manual or in Auto/Off mode for safety purposes, and that have voltage drop protection. Where specified, provide wall switch sensors with field selectable option to convert sensor operation from automatic-ON to manual-ON. Where specified, provide vandal resistant wall switch sensors that utilize hard lens with minimum 1.0mm thickness. Do not provide products that utilize a soft lens.
- E. Power and Auxiliary Packs: Provide Standard of Quality equal to WattStopper: B120E-P, B277E-P, or BZ-100 series.
- F. Momentary-Contact Toggle Switches: Provide Standard of Quality equal to Legrand: LVS-1, 3 Amp, 24 VAC/VDC, single-pole, double-throw with center rest, designed to fit conventional toggle switch openings.

PART 2 - EXECUTION

2.1 GENERAL

- A. Installation: Provide grounded (“neutral”) conductor in all lighting control device (switch, dimmer, occupancy sensor, etc.) wall outlet boxes, even if not immediately used.
- B. Occupancy Sensors
 - 1. Locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Provide ninety (90) to one hundred (100) percent coverage in rooms to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the rooms. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. Provide additional sensors if required to properly and completely cover the respective room.
 - 2. Arrange a pre-installation meeting with manufacturer's factory authorized representative, at Owner's facility, to verify placement of sensors and installation criteria.
 - 3. Exercise proper judgment in executing the installation to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components.
 - 4. Provide, at the Owner's facility, the training necessary to familiarize the Owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing controls.
 - 5. Upon completion of the installation, provide complete commissioning for controls by the manufacturer's factory authorized technician who will verify adjustments and sensor placement to ensure trouble-free occupancy-based lighting controls. Provide the Owner and Design Professionals with ten working days written notice of the scheduled commissioning date. Upon completion of related work, including fine tuning, provide factory authorized technician training to the Owner's personnel in the adjustment and maintenance of the sensors.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1 - PRODUCTS

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For each type of wiring device.

1.2 GENERAL

- A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below.
 - 1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper)
 - 2. FSR Inc. (FSR)
 - 3. Hubbell Incorporated (Hubbell)
 - 4. Hubbell Incorporated; Wiring Device-Kellems (Hubbell)
 - 5. Hubbell Incorporated; Wiring Device-Bryant (Hubbell)
 - 6. Legrand
 - 7. Leviton Mfg. Company Inc. (Leviton)
 - 8. Lutron Electronics, Inc. (Lutron)
 - 9. Pass & Seymour/Legrand (Pass & Seymour)
 - 10. Wiremold/Legrand (Wiremold)
- B. For receptacle circuits protected with 15A breakers, provide NEMA 5-15R equivalents for the devices specified in this section.
- C. Provide equivalent quality devices by manufacturers listed in subparagraphs hereafter for cases where voltage, amperage and/or NEMA configurations that are indicated on drawings or, are otherwise required based on project conditions, differ from those specified herein.
- D. Provide Weather-Resistant Receptacles with UL “WR” marking, compliant with NEC 406.8, for all applications in wet or damp locations.
- E. Where GFI protected receptacles are shown on drawings, provide a separate GFI receptacle for each one shown. Do not feed downstream receptacles from load-side (GFI-protected) terminals of upstream receptacles.
- F. Provide corrosion-resistant versions of receptacles specified below for industrial applications and applications in corrosive or potentially-corrosive environments.
- G. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions: Connectors shall comply with UL 2459 and shall be made with stranding building wire; connectors are NRTL listed for intended use; connectors comply with the requirements in this Section; connectors are permitted by Authorities Having Jurisdiction.

1.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R (20A) or 5-15R (15A), UL 498, and FS W-C-596. Provide duplex and single specification grade receptacles, 2-pole, 3-wire grounding, self-grounding, green grounding screw, ground terminals and poles internally connected to mounting yoke, color coded base, 20-amperes, 125-volts, with metal plaster ears, back & side wiring, NEMA configuration 5-20R. Subject to compliance with requirements, provide one of the following (catalog numbers in subparagraphs below are for 20-A, heavy-duty, specification-grade, nylon-face devices; revise catalog numbers to require other configurations and ratings):
 - 1. Cooper; 5351 (single), CR5362 (duplex)

2. Hubbell; HBL5351 (single), HBL5352 (duplex)
 3. Bryant; 5351 (single), 5352A (duplex)
 4. Leviton; 5351 (single), 5362 (duplex)
 5. Pass & Seymour; 5351 (single), 5362 (duplex)
- B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596. Subject to compliance with requirements, provide one of the following:
1. Cooper; TR8300
 2. Hubbell; HBL8300
 3. Bryant; 8300IL
 4. Leviton; 5262
 5. Pass & Seymour; TR63
- C. GFCI Receptacles, 125V, 20A: Straight blade, feed-through or non-feed-through type depending on application. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596. Subject to compliance with requirements, provide one of the following:
1. Cooper; VGF20
 2. Hubbell; GF20#LA
 3. Bryant; GF20#LA
 4. Pass & Seymour; 2097
 5. Leviton; 6490
- D. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A: Catalog numbers in list below are for feed-through types, arranged to protect receptacles downstream on the same circuit; revise catalog numbers if non-feed-through types are required. Subject to compliance with requirements, provide one of the following:
1. Hubbell; GFTR20
 2. Bryant; GFTR20
 3. Leviton; T7899
 4. Pass & Seymour; 2097TR
- E. Combination USB Type A Charger, USB Type C Charger and Tamper-Resistant Convenience Receptacles: Square/rectangular face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943 Class A, and UL 1310. Provide one 20 Amp, 125 Volt, Decora Tamper-Resistant Receptacle, NEMA 5-20R. Provide one Type A USB Charger, and one Type C USB Charger, minimum 15.5W 5VDC power supply. Provide grounding, and Side-Wired and Back-Wired features. Provide integral smart chip that recognizes and optimizes the charging power of the plugged-in device. Label to comply with NFPA 70, "Receptacles, Cord Connectors, and Attachment Plugs (Caps)" Article, "Tamper-Resistant Receptacles in Dwelling Units" Section. Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following.
1. Legrand; PTTR20ACUSB series
 2. Leviton equivalent
 3. Hubbell equivalent
- F. SPD Receptacles:
1. General Description: Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 1449, and FS W-C-596, with integral SPD in line to ground, line to neutral, and neutral to ground.
 - a. SPD Components: Multiple metal-oxide varistors; with a nominal clamp-level rating of 400 V and minimum single transient pulse energy dissipation of 240 J, according to IEEE C62.41.2 and IEEE C62.45.

- b. Active SPD Indication: Visual and audible, with light visible in face of device to indicate device is "active" or "no longer in service."
- 2. Duplex SPD Convenience Receptacles: Straight blade, 125 V, 20 A; NEMA WD 6 Configuration 5-20R. Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5362BLS
 - b. Hubbell; HBL5362SA
 - c. Bryant; SP53LBLUA
 - d. Leviton; 5380
 - e. Pass & Seymour; 5362BLSP

1.4 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected; Rubber-insulated cord with stranded-copper conductors, Type SOW-A jacket, green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating; Nylon body plug with integral cable-clamping jaws (match cord and receptacle type for connection).

1.5 TOGGLE SWITCHES

- A. General: Comply with NEMA WD 1, UL 20, and FS W-S-896.
- B. Switches, 120/277 V, 20 A: Subject to compliance with requirements, provide one of the following:
 - 1. Single Pole:
 - a. Cooper; AH1221.
 - b. Hubbell; HBL1221.
 - c. Bryant; 1121.
 - d. Leviton; 1221-2.
 - e. Pass & Seymour; CSB20AC1.
 - 2. Three Way:
 - a. Cooper; AH1223.
 - b. Hubbell; HBL1223.
 - c. Bryant; 4903.
 - d. Leviton; 1223-2.
 - e. Pass & Seymour; CSB20AC3.

1.6 WALL-BOX DIMMERS

- A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters. Provide continuously adjustable slider control, with single-pole or three-way switching equal to Lutron "Diva" series. Comply with UL 1472. Do not break off side heat-sink sections when ganging. Provide dimmer and wall plate colors that match other wiring devices in the respective room. Multiple wall-box dimmers may be used sporadically throughout the project on common circuits; provide compatible dimmers accordingly. Provide dedicated neutrals for circuits serving loads controlled by dimmers. Subject to compliance with requirements, provide one of the following manufacturers':
 - 1. Lutron
 - 2. Cooper
 - 3. Hubbell
 - 4. Leviton
 - 5. Wattstopper

- B. Install dimmers within terms of their listing. Verify that dimmers used for fan speed control are listed for that application. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions. Provide low-voltage control wiring, where applicable, as required to render all dimming functionality fully operational.
- C. LED Dimmer Switches: Specification grade; modular; thin profile; compatible with dimming drivers; dimmer-driver combination capable of consistent full-range dimming. Provide low-voltage control wiring, in addition to branch circuit wiring, as required to render dimming fully operational.

1.7 COMMUNICATION, INFORMATION TECHNOLOGY AND SIMILAR OUTLETS

- A. Provide the following for communication, information technology and similar outlets that are shown on electrical drawings.
 - 1. Provide 4-inch square by minimum 2-1/8 inch deep outlet box with single-gang ring.
 - 2. Provide single-gang blank wall plate of material and color to match wiring devices in the respective room/area.
 - 3. Provide at least one 3/4" empty conduit from outlet box to accessible ceiling cavity, or to overhead joist/structure space in areas with no finished ceilings. Provide sweep bends and insulated throat fittings (or plastic bushings) at each end of the conduit
 - 4. Provide 200-pound pull string within conduits, easily accessible at both ends.
 - 5. Provide neat permanent marking at the end of the overhead stub that clearly states the purpose of the conduit and the room where the respective outlet is located.
 - 6. Coordinate all locations, heights and other specifics with the respective device/system installers and provide all work accordingly.

1.8 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices. Provide metal plate-securing screws with head color to match plate finish. Provide factory markings on faces of receptacles that are controlled for energy management or building automation that are compliant with Article 406.3(E), including symbol and the word "Controlled". Provide engraved wall plates where required by prevailing codes, indicated on drawings or indicated in Division 26 specifications.
 - 1. Material for Finished Spaces: Smooth, high-impact thermoplastic
 - 2. Material for Unfinished Spaces with surface-mounted outlet boxes: Galvanized steel
 - 3. Material for Indoor Kitchens, Bar Areas, Damp Locations: Gasketed satin finish stainless steel, equal to Leviton Type 430 series, with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant. Refer to Section 26 05 33.00.

1.9 FLOOR OUTLETS

- A. Refer to "FLOOR OUTLET DEVICE SCHEDULE" on drawings for specifications for floor boxes.
- B. Products: Floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application. Comply with UL 514 and NFPA 70 scrub water exclusion requirements. Provide UL listed and labeled rating(s) for fire and smoke rating of floor (and ceiling-below where applicable) assembly.

1.10 PREFABRICATED MULTIOUTLET ASSEMBLIES (“PLUGSTRIPS”)

- A. Provide two-piece surface metal raceway, with factory-wired multioutlet harness. Components shall be products from single manufacturer designed for use as a NRTL listed complete, matching assembly of raceways and receptacles. Provide metal construction, with manufacturer's standard finish. Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Incorporated; Wiring Device-Kellems
 - 2. Wiremold/Legrand
- B. Multioutlet Harness:
 - 1. Receptacles: 15-A, 125-V, NEMA WD 6 Configuration 5-15R receptacles complying with NEMA WD 1, UL 498, and FS W-C-596.
 - 2. Receptacle Spacing: 6 inches.

1.11 FINISHES AND INDICATORS

- A. Device Color (unless otherwise indicated or required by NFPA 70 or device listing):
 - 1. General Wiring Devices Connected to Normal-Utility Branch of Power System: Verify with Architect and Owner .
- B. Wall Plate Color: For plastic covers, match device color.
- C. Illuminated Indication: Provide illuminated face or indicator light versions of wiring devices specified herein where indicated as such on drawings and/or where required by prevailing code(s), to indicate that there is power to the device.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Coordination with Other Trades: Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall. Install wiring devices after all wall preparation, including painting, is complete.
- B. Conductors: Provide grounded (“neutral”) conductor in all lighting control device (switch, dimmer, occupancy sensor, etc.) wall outlet boxes, even if not immediately used. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails. Pig-tailing existing conductors is permitted, provided the outlet box is large enough.
- C. Device Installation:
 - 1. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 2. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 3. Use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
 - 4. Use a torque screwdriver when a torque is recommended or required by manufacturer.
 - 5. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 6. Tighten unused terminal screws on the device.
 - 7. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

8. Consider locations indicated on the drawings to be approximate (unless specifically dimensioned on drawings, or unless spacings must comply with prevailing codes). Study the general construction with relation to spaces and equipment surrounding each outlet.
9. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry. Support boxes independent of conduit.
10. Provide feed-through-type GFCI receptacles where downstream receptacles are fed from the line side of the GFCI receptacle.
11. Adjust locations of outlets, devices, etc. to suit arrangement of partitions and furnishings.
12. Arrangement of Devices: Group adjacent switches under single, multigang wall plates. Unless otherwise indicated, mount flush, with long dimension vertical. Install receptacles so that the ground pin is oriented in a consistent manner throughout the facility, so that the orientation is compliant with all prevailing codes and regulations, and so that the orientation is acceptable to the electrical inspector. Where there is no existing building standard or other project requirement, install receptacles with ground pin up. Where receptacles are installed horizontally, install so that neutral connection faces up.
13. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

2.2 TAMPER-RESISTANT RECEPTACLES

- A. Provide tamper-resistant receptacles in compliance with NEC Article 406.12 for all applications. Install in all publicly-accessible spaces.

END OF SECTION

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For each type of fuse.

1.2 EXTRA MATERIALS

- A. Fuses: Furnish fuses equal to 10% of project quantity not exceeding (10) for each fuse size and type. Furnish no fewer than (2) for single phase applications and (3) for three phase applications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work:
 - 1. Cooper Bussmann, Inc.
 - 2. Edison Fuse, Inc.
 - 3. Mersen, Inc.
 - 4. Littelfuse, Inc.

2.2 GENERAL REQUIREMENTS

- A. Characteristics:
 - 1. 50 through 60 Hz., with 200,000 RMS symmetrical interrupting current rating.
 - 2. Voltage: Rate based on voltage of protected feeders, circuits and loads.
 - 3. Provide rejection type fuses for fuses 1 ampere through 600 amperes.
 - 4. Provide Hi-Cap, bolt type fuses for fuses 601 amperes through 6000 amperes.
 - 5. Cartridge Fuses: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.
 - 6. Provide each fuse with clear factory markings indicating classification, characteristics, ampere ratings, voltage ratings, etc.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

- A. For protecting transformers, motors, circuit-breakers, service entrances, and distribution feeders above 600 amperes: Provide UL Class L Current-Limiting/Time-Delay Fuses. Provide fuses that are current-limiting, time-delay, dual-element type (with pure silver links), equal to Bussman #KRP-C (low peak).
- B. For protecting service entrances, and distribution feeders 600 amperes and below: Provide UL Class RK-1 Current-Limiting/Time-Delay fuses. Provide fuses that are current-limiting, time-delay, dual-element type (with pure silver links), equal to Bussman #LPS-RK1 (600V) or Bussman #LPN-RK-1 (250V) as applicable.
- C. For protecting general duty motors: Provide UL Class RK-5 Current-Limiting/Time-Delay fuses. Provide fuses that are time-delay, dual-element type (with pure silver links), equal to Bussman #LPS-RK5 (600V) or Bussman #LPN-RK-5 (250V) as applicable. Provide fuses that are rated 60 Hz, with 200,000 RMS symmetrical interrupting current rating.

3.2 INSTALLATION

- A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION

SECTION 262816 - ENCLOSED SWITCHES

PART 1 - PRODUCTS

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For each type of enclosed switch.

1.2 SWITCHES

- A. Acceptable Manufacturers: Subject to being equivalent and subject to compliance with requirements, provide product by one of the manufacturers listed below. If not listed, submit as substitution.
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Industry, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Characteristics:
 - 1. 50 through 60 Hz., with 200,000 RMS symmetrical interrupting current rating.
 - 2. 250VAC rated, for projects with service-entrance line to line voltage not exceeding 240V.
 - 3. 600VAC rated, for projects with service-entrance line to line voltage not exceeding 600V.
- C. Type HD, Heavy Duty: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate required fuses where applicable, lockable handle with capability to accept three padlocks, interlocked with cover in closed position, single or double throw as indicated on drawings.
- D. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
 - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
 - 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
 - 4. Lugs: Mechanical type, suitable for number, size, and conductor material.
 - 5. Service-Rated Switches: Labeled for use as service equipment.

1.3 ENCLOSURES

- A. Enclosed Switches: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location. Refer to drawings for NEMA type. Provide the following enclosure types if not noted on drawings, or if not noted otherwise on drawings.
 - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
 - 2. Outdoor Locations: NEMA 250, Type 3R.
 - 3. Commercial Kitchen Areas: NEMA 250, Type 4X, Stainless Steel.
 - 4. Other Wet or Damp, Indoor Locations: Type 3R.
 - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 2 - EXECUTION

2.1 INSTALLATION

- A. Install individual wall-mounted units with tops at uniform height unless otherwise indicated, or unless units must be stacked vertically, or unless field conditions otherwise dictate.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.

- D. Comply with NECA 1.
- E. Install disconnect switches within sight of controller position unless otherwise indicated.
- F. Size units according to load being served or as noted on drawings, whichever requirement is larger. Provide units with horsepower ratings suitable to the loads where applicable. Install fuses and accessories as necessary to fulfill requirements of each application as applicable.
- G. Subsequent to completion of installation of equipment, energize circuits and demonstrate capability and compliance with requirements. Begin by demonstrating switch operation through six opening/closing cycles with circuit unloaded. Open each switch enclosure and inspect interiors, inspect mechanical and electrical connections, inspect fuse installations, and verify accuracy of type and rating of fuses installed. Correct deficiencies then retest to demonstrate compliance. Remove and replace defective units with new units and retest.
- H. Provide fuses of types specified in Section 262813.00, and of ratings as indicated on drawings.

END OF SECTION

SECTION 265100 - LIGHTING

1.1 SUBMITTAL REQUIREMENTS

- A. Product Data
 - 1. For each type of light fixture.

1.2 GENERAL

- A. Provide all labor, materials, equipment, equipment, programming, services, etc. as required for complete and fully operational lighting and lighting control systems.
- B. Definitions:
 - 1. BF: Ballast factor.
 - 2. CCT: Correlated color temperature.
 - 3. CRI: Color-rendering index.
 - 4. LER: Luminaire efficacy rating.
 - 5. Lumen: Measured output of lighting source, luminaire, or both.
 - 6. Luminaire: Complete lighting unit consisting of lighting source or sources, and some or all of the following components: optical control devices, contacts, mechanical components to support or attach the luminaire, and electrical and electronic components to start, operate, dim or control and maintain the operation of lighting source, and driving and transformation components.
 - 7. Lighting Source: LED boards or equivalent LED assembly or, lamp (“bulb”) for insertion into compatible socket, etc.
 - 8. THD: Total harmonic distortion

1.3 QUALITY ASSURANCE

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for all Emergency Lighting Batteries: five years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining years.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR LUMINAIRES AND COMPONENTS

- A. Products: Subject to compliance with requirements, provide products indicated on Drawings. Provide products of one of the manufacturers listed in this section for products that are not defined on the Luminaire Schedule. Provide specification grade luminaires that comply with minimum requirements as stated therein. If a particular “type” does not include basis of design manufacturer or model number, provide "pre-approved equivalent" manufacturer's and model numbers compliant with, and equivalent to: quality, performance, dimensions, and aesthetics as the respective basis of design for Design Professional review no less than five business days prior to bid due date.
- B. Luminaires designated by letters are defined as indicated on the Luminaire Schedule.
- C. Provide luminaires, of sizes, types and ratings indicated; complete with, but not limited to, housings, energy-efficient light sources, contacts, reflectors, wiring, etc.. Ship luminaires factory-assembled, with components required for a complete operating installation.
- D. Recessed Luminaires:

1. Comply with NEMA LE 4 for ceiling compatibility for recessed luminaires.
 2. Provide recessed luminaires with necessary gypsum board, plaster frames, and surface trim.
 3. Provide recessed luminaires that are constructed without rolled edges and that are post-painted.
 4. Provide door frames on troffer style luminaires with spring latches on door frames.
 5. Provide static air function for luminaires unless otherwise noted.
 6. Provide luminaires that are non-IC constructed unless otherwise noted.
 7. Provide junction boxes and serviceable components (driving and transformation component types, thermal protection devices, fuses, etc.) for recessed luminaires that are accessible for service and replacement from below the ceiling, without removing ceiling components.
 8. Where plaster frames are inferred for luminaires (either by narrative, or by catalog number, or by application) interpret the actual function to mean for mounting within gypsum board, wet plaster or similar type inaccessible ceiling system. Field verify related requirements and provide required accessories, such as frames, accordingly.
 9. Provide UL approved (listed and labeled) thermal protection per latest edition of NFPA/NEC for recess mounted luminaires.
- E. Surface Luminaires: Install surface mounted luminaires with air spaces between luminaire and surface per latest edition of NFPA/NEC. Provide factory luminaire wiring that is per NEC, #16 AWG minimum. Wire luminaires having medium base and mogul base sockets with not smaller than No. 16 or No. 14 wire respectively in accordance with the latest requirements of the National Electric Code.
- F. Review drawings and specifications of other trades to verify ceiling types, modules, and suspension systems appropriate to installation.
- G. Luminaires: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5, 5A, 5B, etc. as applicable.
- H. Metal Parts: Free of burrs and sharp corners and edges.
- I. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- J. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit replacing lighting source(s) without use of tools. Design to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during servicing and when secured in operating position. Fabricate luminaires with concealed hinges and catches, with metal parts grounded as common unit, and so constructed as to dampen generated noise.
- K. Diffusers and Globes: Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation, UV stabilized. Provide at least 0.125 inch minimum lens thickness unless otherwise indicated. Glass: Annealed crystal glass unless otherwise indicated.
- L. Factory-Applied Labels: Comply with UL 1598. Include recommended lighting sources, and driving and transformation components. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lighting sources are in place.
1. Label shall include the following characteristics:
 - a. "USE ONLY" and include specific lamp type.

2.2 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
 - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.3 EMERGENCY LIGHTING UNITS

- A. General Requirements for Emergency Lighting Units:
 - 1. Self-contained units complying with UL 924.
 - 2. Battery: Sealed, maintenance-free, lead-acid type.
 - 3. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - 4. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - 5. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - 6. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.4 LIGHT EMITTING DIODE (LED) SYSTEMS

- A. Light Emitting Diode (LED) Systems
 - 1. LED Sources: Provide factory installed LED modules that are specifically designed for, and matched and mated to, the respective luminaire in which they are used. Provide LED modules that can easily be replaced in the field and are readily accessible for replacement. Provide color temperature as indicated in Luminaire Schedule.
 - 2. LED Drivers; Provide factory installed driver(s) for the LED source utilized that are specifically coordinated to the LED source and luminaire in which they are used. Provide driver(s) having specific operating characteristics defined in the Luminaire Schedule. Provide driver(s) that can easily be replaced in the field and are readily accessible for replacement. Provide specification sheet for the specific driver as part of the Luminaire Submittal.
 - 3. Total Harmonic Distortion (THD) Rating: Less than 20 percent. Provide factory-installed integral filtering system to ensure THD does not exceed 20 percent regardless of quantities and/or mixes with other manufactured LED systems.

2.5 LUMINAIRE SUPPORT COMPONENTS

- A. Support fixtures in compliance with NEC. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single luminaire. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod. Hook Hangers: Integrated assembly matched to luminaire and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- E. For open ceiling spaces where fixtures are suspended and subject to damage or impact, provide an additional air craft cable support securely fastened to luminaire and structure to act as a safety chain providing a redundant support. Select cable based on manufacturer's recommendations, accounting for weight of luminaire assembly, external forces that could be applied, minimum 200% factor of safety, etc. Decorative pendants in finished spaces are exempt from this requirement.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Luminaires: Set level, plumb, and square with ceilings and walls unless otherwise indicated. Install lighting sources in each luminaire.
- B. Temporary Lighting: If it is deemed necessary, and permitted by Owner's Representative and Design Professionals, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is substantially complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- C. Remote Mounting of Driving and Transformation Components: Distance between the driving and transformation components and luminaire shall not exceed that recommended by the luminaire and driving and transformation components manufacturer. Verify, with manufacturers, maximum distance between driving and transformation components and luminaire.
- D. Lay-in Ceiling Luminaires Supports: Unless required otherwise under other sections or unless project requirements and conditions require otherwise, grid may be used as a support element, subject to coordinating installations with ceiling system installer to ensure the ceiling system installer accounts for the weights of each luminaire and of all luminaires collectively, and installs specially marked and designated ceiling support components.
 - 1. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each luminaire. Locate not more than 6 inches from luminaire corners.
 - 2. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for the application.
 - 3. Luminaires of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support luminaires independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

- E. Suspended Luminaire Support:
 - 1. Pendants and Rods: Where longer than 48 inches brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers.
 - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of luminaire chassis, including one at each end.
 - 4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
- F. Install surface and recessed ceiling luminaires on grid and tile ceilings to agree with module of ceiling either displacing a tile, or unit on center of tile, or centered on grid lines. Install flush mounted luminaires properly to eliminate light leakage between luminaire frame and finished surface.
- G. Do not locate splice or tap within an arm, stem, or chain. Provide wiring continuous from splice in outlet box of the building wiring system to driving and transformation component terminals in luminaires.
- H. Provide Type MC Cable or wiring in minimum 1/2" diameter flexible metal conduit (with full parity sized green insulated equipment ground wire) for "drops" from building wiring system junction boxes to suspended ceiling mounted luminaires. Limit the length of these "drops" to 72". Install "drops" to luminaires in gypsum board, and similar inaccessible ceiling systems, from identified accessible junction boxes.
- I. Connect luminaires utilized for emergency egress lighting and exit signage ahead of switching and other controls. The only exceptions to this are photocell-only controls for outdoor emergency egress luminaires.
- J. Provide luminaires and luminaire outlet boxes with hangers to properly support luminaire weight. Submit design of hangers, method of fastening, other than indicated or specified herein, for review by Owner's Representative and review by ceiling installer. Anchor luminaires installed in, or on, suspended ceiling systems in strict compliance with NEC, including advance coordination with the ceiling installer. Support surface mounted luminaires greater than 2 feet in length at a point in addition to the outlet box luminaire stud. Fasten electrical luminaires and brackets securely to structural supports. Install luminaires level and plumb.
- K. Where special mounting conditions are encountered, such as mounting to rounded columns or similar special circumstances, provide special custom factory-fabricated mounting means (i.e., brackets designed to conform with curvature of rounded columns, or to conform with similar special surfaces).
- L. Provide stems and chains for luminaires as designated by the Owner's Representative where deemed necessary by the Owner's Representative to achieve a functional and neat installation. Contact Owner's Representative to determine pendant, stem, and chain lengths if mounting height is not indicated.
- M. Provide plaster frames, or gypsum board frames, or similar kits for recessed luminaires installed in other than suspended grid type acoustical ceiling systems. Brace frames temporarily to prevent distortion during handling.
- N. Wear clean white cotton gloves when handling the luminaires reflective and diffusing surfaces. Clean surfaces including dust, finger prints, paint, etc. with a clean dry cheesecloth after interior work has been completed. Remove plastic shipping bags from luminaires only after work in the respective area is complete.
- O. Where applicable, verify that measured illuminance values comply with respective isolux (or equivalent) plot diagram values.

- P. Provide full assembly for luminaires that are shipped with any loose components, regardless of who furnishes the luminaires.
- Q. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to emergency source and retransfer to normal.
- R. Burn-in all light sources that require specific aging period to operate properly, prior to occupancy by Owner.
- S. Make adjustments and perform settings/programming to lighting controls and control systems so that all luminaires are fully operational compliant with design requirements and to the satisfaction of the Owner and Design Professionals.
- T. Train Owner's maintenance personnel to adjust, operate, clean, re-lamp and maintain equipment, devices, controls, instrumentation, and accessories, and to use and reprogram lighting control systems as applicable.

END OF SECTION