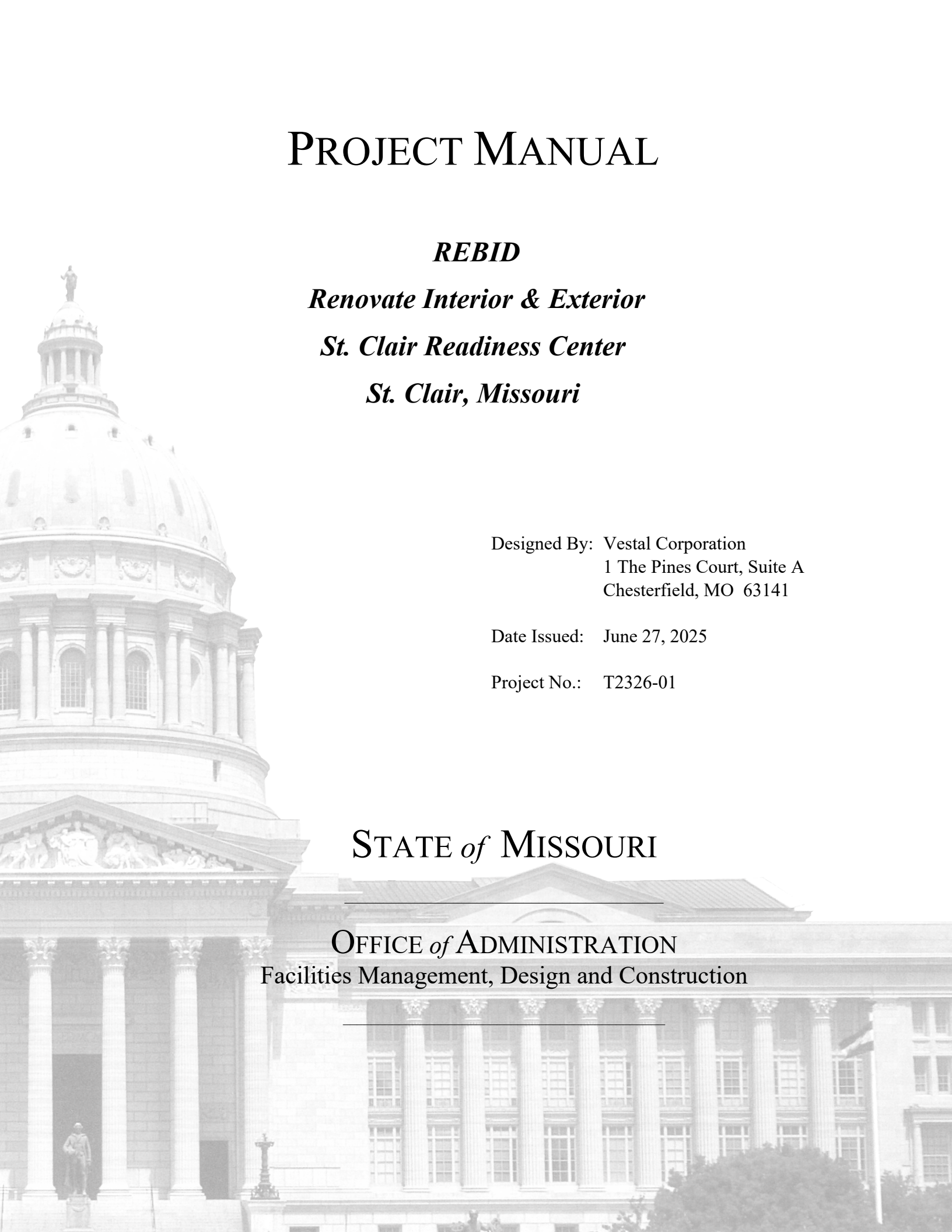




PROJECT MANUAL

REBID

Renovate Interior & Exterior

St. Clair Readiness Center

St. Clair, Missouri

Designed By: Vestal Corporation
1 The Pines Court, Suite A
Chesterfield, MO 63141

Date Issued: June 27, 2025

Project No.: T2326-01

STATE *of* MISSOURI

OFFICE *of* ADMINISTRATION
Facilities Management, Design and Construction

SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: T2326-01

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:



6-27-25



06/27/2025



06/27/2025
EXP. DATE
12/31/2026



6/27/2025
EXP. DATE
12/31/2025



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NOTICE TO BIDDERS

The following procurement forms can be found on our website at:
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 and shall be submitted with your bid to FMDCBids@oa.mo.gov

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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

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

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14.	REFLECTED CEILING PLAN	Sheet A120	6/27/2025	A120
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37.	OVERALL ROOF PLAN – HVAC			
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END OF SECTION

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. REBID
Renovate Interior & Exterior
St. Clair Readiness Center
St. Clair, Missouri
Project No.: T2326-01

3.0 BIDS WILL BE RECEIVED:

- A. Until: 1:30 PM, October 2, 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 consists of interior and exterior renovation of the Missouri National Guard's St. Clair Readiness Center (SCRC).
- B. MBE/WBE/SDVE Goals: MBE 10%, WBE 10%, and SDVE 3%. **NOTE: Only MBE/WBE firms certified by the State of Missouri Office of Equal Opportunity as of the date of bid opening, or SDVE(s) meeting the requirements of Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE participation goals for this project.**

5.0 PRE-BID MEETING:

- A. Place/Time: 10:00 AM, September 10, 2025, at St. Clair Readiness Center, 375 S. Commercial Avenue, St. Clair, MO.
- 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: Vestal Corp., Ali Badran, (314) 439-9900, email: alibadran@vestalcorporation.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.

SECTION 002113 – INSTRUCTIONS TO BIDDERS

1.0 - SPECIAL NOTICE TO BIDDERS

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

2.0 - BID DOCUMENTS

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

3.0 - BIDDERS' OBLIGATIONS

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

4.0 - INTERPRETATIONS

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

5.0 - BIDS AND BIDDING PROCEDURE

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

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

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

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

6.0 - SIGNING OF BIDS

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

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

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

7.0 - RECEIVING BID SUBMITTALS

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

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

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

9.0 - AWARD OF CONTRACT

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

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

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

10.0 - CONTRACT SECURITY

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

11.0 - LIST OF SUBCONTRACTORS

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

12.0 - WORKING DAYS

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

13.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

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

14.0 – ANTI-DISCRIMINATION AGAINST ISRAEL ACT CERTIFICATION:

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

15.0 – MBE/WBE/SDVE INSTRUCTIONS

A. Definitions:

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

B. MBE/WBE/SDVE General Requirements:

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

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

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

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

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

D. Certification of MBE/WBE/SDVE Subcontractors:

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

E. Waiver of MBE/WBE/SDVE Participation:

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

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

F. Contractor MBE/WBE/SDVE Obligations

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

DOCUMENT 003119 - EXISTING CONDITION INFORMATION

1.1 EXISTING CONDITION INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. Existing drawings that include information on existing conditions including previous construction at Project site are available for viewing at the office of Owner.

END OF DOCUMENT

DOCUMENT 003126 - EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. An existing asbestos report for Project, prepared by St. John Environmental Consulting LLC, dated January 22, 2024, is available for viewing at the office of Owner.
- C. An existing lead report for Project, prepared by St John Environmental Consulting LLC, dated January 22, 2024, is available for viewing at the office of Owner.
- D. Related Requirements:
 - 1. Section 024119 "Selective Structure Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.

END OF DOCUMENT



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: **REBID**
Renovate Interior & Exterior
St. Clair Readiness Center
St. Clair, Missouri

Project Number: **T2326-01**

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 **200 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



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

PROJECT NUMBER

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

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

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

DOES HEREBY:

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

DATED this day of , 20 .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents



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

MBE/WBE/SDVE PROGRESS REPORT

Remit with **ALL** Progress and Final Payments

(Please check appropriate box) ☐CONSULTANT ☐CONSTRUCTION

PAY APP NO.	PROJECT NUMBER
CHECK IF FINAL ☒ 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

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- 1.5. Anti-Kickback
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- 1.9. Separate Contracts and Cooperation
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- 1.11. Indemnification
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- 3.3. As-Built Drawings
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6.1. Bond

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SECTION 007213 - GENERAL CONDITIONS

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

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

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

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

ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

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

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

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

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

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

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

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

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

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

ARTICLE 1.5 - ANTI-KICKBACK

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

ARTICLE 1.6 - PATENTS AND ROYALTIES

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

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

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

ARTICLE 1.8 - COMMUNICATIONS

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

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

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

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

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

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

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

ARTICLE 1.11 - INDEMNIFICATION

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

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

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

ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES

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

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

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

ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES

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

ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS

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

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

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

ARTICLE 3.2 -- SUBMITTALS

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

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

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

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

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

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

ARTICLE 3.3 – AS-BUILT DRAWINGS

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

ARTICLE 3.4 – GUARANTY AND WARRANTIES

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

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

B. Extended Warranty

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

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

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

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

ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES

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

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

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

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

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

ARTICLE 3.7 -- SUBCONTRACTS

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

ARTICLE 4 -- CHANGES IN THE WORK

4.1 CHANGES IN THE WORK

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

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

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

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

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

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

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

ARTICLE 4.2 – CHANGES IN COMPLETION TIME

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

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT

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

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

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

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

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

ARTICLE 5.2 -- PROJECT CONSTRUCTION

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

with the requirements outlined in Section 013200 – Schedules.

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

ARTICLE 5.3 -- PROJECT COMPLETION

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

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

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

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

DEFAULT AND BE GROUNDS FOR CONTRACT TERMINATION AND DEBARMENT.

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

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

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

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

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

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

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

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

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

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

ARTICLE 6 -- INSURANCE AND BONDS

ARTICLE 6.1 -- BOND

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

ARTICLE 6.2 – INSURANCE

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

B. Minimum Scope and Extent of Coverage

1. General Liability

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

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

2. Automobile Liability

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

3. Workers' Compensation and Employer's Liability

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

4. Builder's Risk or Installation Floater Insurance

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

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

C. Minimum Limits of Insurance

1. General Liability

Contractor

\$2,000,000	combined single limit per occurrence for bodily injury, personal injury, and property damage

\$2,000,000	annual aggregate

2. Automobile Liability

\$2,000,000	combined single limit per occurrence for bodily injury and property damage

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: Ali Badran
Vestal Corporation
1 The Pines Court, Suite A
Chesterfield, Missouri 63141
Telephone: (314) 439-9900
Email: alibadran@vestalcorporation.com

MONG Project Manager: Gary Rice
Missouri National Guard-CFMO Office
6819A North Boundary Rd.
Jefferson City, Missouri 65109
Telephone: (573) 638-9500 ext.39740
Email: gary.d.rice18.nfg@army.mil

Construction Representative: Michael Howard
Division of Facilities Management, Design and Construction
119 Olympic Way
St. Peters, Missouri 63376
Telephone: (636) 524-8503
Email: mike.howard@oa.mo.gov

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: Paul Girouard
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: (573) 751-4797
Email: Paul.Girouard@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.

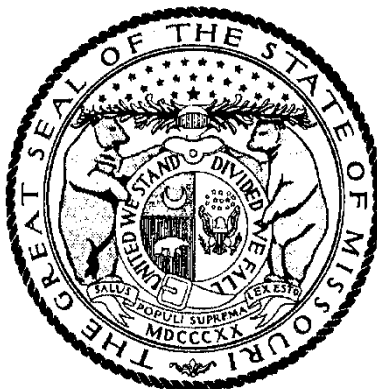
6.0 ENVIRONMENTAL MANAGEMENT SYSTEM (eMS):

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.

Missouri

Division of Labor Standards

WAGE AND HOUR SECTION



MIKE KEHOE, Governor

Annual Wage Order No. 32

Section 036
FRANKLIN 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	\$47.80
Boilermaker	\$81.61
Bricklayer-Stone Mason	\$65.80
Carpenter	\$67.06
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$60.05
Plasterer	
Communication Technician	\$29.87*
Electrician (Inside Wireman)	\$79.10
Electrician Outside Lineman	\$72.01
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$29.87*
Glazier	\$69.00
Ironworker	\$72.39
Laborer	\$52.37
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$29.87*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$73.95
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$55.36
Plumber	\$80.82
Pipe Fitter	
Roofer	\$60.36
Sheet Metal Worker	\$76.65
Sprinkler Fitter	\$70.74
Truck Driver	\$29.87*
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.

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$67.22
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$72.01
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$54.40
General Laborer	
Skilled Laborer	
Operating Engineer	\$72.92
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$45.86
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

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

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

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

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

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

OVERTIME and HOLIDAYS

OVERTIME

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

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

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

HOLIDAYS

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

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

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of Interior and Exterior Renovation of The Missouri National Guard's St. Clair Readiness Center (SCRC).
 - 1. Project Location: 375 Commercial Avenue, St. Clair, Missouri 63077.
 - 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 October, 10th 2023, were prepared for the Project by Vestal Corporation, 1 The Pines Court, Suite A Chesterfield, MO 63141.
- C. The Work consists of repair or replacement of the following:
 - 1. Doors/Hardware
 - 2. HVAC System
 - 3. Plumbing System
 - 4. Water Heater and Water Softener
 - 5. Fire Alarm System
 - 6. Electricity (Power & Lighting)
 - 7. Kitchen Renovation
 - 8. Restrooms Renovation
 - 9. Classroom & Offices renovation
 - 10. Roofing
 - 11. Exterior Renovation
 - 12. Abatement Works
 - 13. Communication with FMDC
- D. The Work will be constructed under a single prime contract.

1.3 DESIGNER'S ESTIMATE OF CONSTRUCTION COST RANGE

- A. N/A

1.4 WORK UNDER OTHER CONTRACTS

- A. N/A

1.5 FUTURE WORK

- A. N/A

1.6 WORK SEQUENCE

- A. The Work will be conducted in 1 phase.
 - 1. Total Project to be completed in 200 days from notice to proceed.

1.7 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..

1.8 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.

1.9 OWNER-FURNISHED PRODUCTS

- A. The Work includes providing support systems to receive Owner's equipment, and mechanical and electrical connections.
 - 1. The Contractor is responsible for receiving, unloading and handling Owner furnished items at the site.
 - 2. 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.

1.10 MISCELLANEOUS PROVISIONS

A. N/A

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF PRODUCTS ORDERED IN ADVANCE

END OF SECTION

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 PROCEDURES

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Food Services Equipment's

END OF SECTION

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 REQUESTS FOR INFORMATION

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

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

1.4 MINOR CHANGES IN THE WORK

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

1.5 PROPOSAL REQUESTS

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

1.6 CHANGE ORDER PROCEDURES

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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 are 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

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.
 - 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)

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.

PART 3 - EXECUTION (Not Applicable.)

END OF SECTION

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

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. The contractor shall submit information for materials and equipment to be provided under this contract.

SPEC SECTION	TITLE	CATEGORY
013200	Schedules	Construction Schedule
013200	Schedules	Schedule of Values
013200	Schedules	List of Subcontractors
013200	Schedules	Major Material Suppliers
031000	Concrete Forming and Accessories	Product Data
031000	Concrete Forming and Accessories	Shop Drawings
032000	Concrete Reinforcing	Product Data
032000	Concrete Reinforcing	Shop Drawings
032000	Concrete Reinforcing	Certification
032000	Concrete Reinforcing	Test Report
033000	Cast-In-Place concrete	Shop Drawings
033000	Cast-In-Place concrete	Product Data
035300	Concrete Topping	Product Data
035413	Gypsum Cement Underlayment	Product Data
040120.64	Brick Masonry Repointing	Product Data
040120.64	Brick Masonry Repointing	Sample
055000	Metal Fabrications	Shop Drawings
055000	Metal Fabrications	Product Data
061000	Rough Carpentry	Product Data
061000	Rough Carpentry	Certification
061000	Rough Carpentry	Test Report
066400	Plastic Paneling	Product Data
072100	Thermal Insulation	Product Data
075423	Thermoplastic-Polyolefin (TPO) Roofing	Shop Drawings
076200	Sheet Metal Flashing and Trim	Product Data
076200	Sheet Metal Flashing and Trim	Shop Drawings
077100	Roof Specialties	Product Data
079200	Joint Sealants	Product Data
079200	Joint Sealants	Sample
081113	Hollow Metal Doors and Frames	Product Data
081113	Hollow Metal Doors and Frames	Shop Drawings
081113	Hollow Metal Doors and Frames	Schedule of Values
081213	Hollow Metal Frames	Product Data
081213	Hollow Metal Frames	Shop Drawings
081213	Hollow Metal Frames	Schedule of Values
081416	Flush Wood Doors	Product Data
081416	Flush Wood Doors	Sample
081416	Flush Wood Doors	Schedule of Values
087100	Door Hardware	Product Data
087100	Door Hardware	Shop Drawings
087100	Door Hardware	Sample
087100	Door Hardware	Door Hardware Schedule
087100	Door Hardware	Keying Schedule
088000	Glazing	Product Data

088700	Window Film	Product Data
088700	Window Film	Sample
092216	Non-Structural Metal Framing	Product Data
092900	Gypsum Board	Product Data
092900	Gypsum Board	Sample
095123	Acoustical Tile Ceilings	Product Data
096513	Resilient Base and Accessories	Product Data
096513	Resilient Base and Accessories	Sample
096519	Resilient Vinyl Composition Tiles	Product Data
096519	Resilient Vinyl Composition Tiles	Sample
096519	Resilient Vinyl Composition Tiles	Schedule of Values
096713	Elastomeric Liquid Flooring	Product Data
096713	Elastomeric Liquid Flooring	Sample
096713	Elastomeric Liquid Flooring	Schedule of Values
096713	Elastomeric Liquid Flooring	Operation / Maintenance Manual
096723	Resinous Flooring	Product Data
096723	Resinous Flooring	Sample
096723	Resinous Flooring	Schedule of Values
096723	Resinous Flooring	Operation / Maintenance Manual
096813	Tile Carpeting	Product Data
096813	Tile Carpeting	Sample
099123	Interior Painting	Sample
099123	Interior Painting	Product Data
102113.19	Plastic Toilet Compartments	Product Data
102113.19	Plastic Toilet Compartments	Shop Drawings
102113.19	Plastic Toilet Compartments	Sample
102113.19	Plastic Toilet Compartments	Operation / Maintenance Manual
102800	Toilet, Bath, and Laundry Accessories	Product Data
102800	Toilet, Bath, and Laundry Accessories	Sample
102800	Toilet, Bath, and Laundry Accessories	Operation / Maintenance Manual
114000	Food Service Equipment	Product Data
114000	Food Service Equipment	Shop Drawings
114000	Food Service Equipment	Operation / Maintenance Manual
220000	Fixtures	Product Data
		Shop Drawings
223100	Water Softeners	Product Data
		Shop Drawings
223400	Water Heaters	Product Data
		Shop Drawings
221000	Piping	Product Data
220000	Insulation	Product Data
220000	Drains	Product Data
		Shop Drawings
230529	HVAC Seismic Requirements	Product Data
230000	HVAC Controls	Shop Drawings
237000	Wall unit heater	Product Data
235400	Gas unit heaters	Product Data

237400	Split System	Product Data
230700	Duct Insulation	Product Data
230000	Ductwork	Product Data
230000	Exhaust Fans	Product Data
237000	VAV	Product Data
231332	Gas Piping	Product Data
230000	Air Devices	Product Data
237400	RTU	Product Data
260519	Low Voltage Electrical Power Conductors	Product Data
260526	Grounding	Product Data
260529	Hangers and Supports	Product Data
260533.13	Conduits	Product Data
260923	Lighting Controls	Shop Drawings
		Product Data
262213	Low Voltage Transformers	Shop Drawings
		Product Data
262416	Panelboards	Shop Drawings
		Product Data
262726	Wiring Devices	Product Data
		Warranty
262816	Enclosed switches	Product Data
265000	Lighting	Product Data
		Warranty
284621.13	Fire Alarm System	Shop Drawings
		Product Data
329200	Turf and Grasses	Product Data

END OF SECTION 13300

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

that an additional background check is requested by FMDC does not indicate that the employee has a criminal record.

3.4 DISRUPTION OF UTILITIES

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

3.5 PROTECTION OF PERSONS AND PROPERTY

A. SAFETY PRECAUTIONS AND PROGRAMS

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

B. SAFETY OF PERSONS AND PROPERTY

- 1. The Contractor shall take reasonable precautions for safety of, and shall provide protection to prevent damage, injury, or loss to:
 - a. clients, staff, the public, construction personnel, and other persons who may be affected thereby;
 - b. the Work and materials and equipment to be incorporated therein, whether in storage

- on or off the site, under care, custody, or control of the Contractor or the Contractor's Subcontractors of any tier; and
- c. other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.
2. The Contractor shall give notices and comply with applicable laws, standards, codes, ordinances, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury, or loss.
 3. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, safeguards for safety and protection, including, but not limited to, posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.
 4. When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise the highest degree of care and carry on such activities under supervision of properly qualified personnel.
 5. The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in this Section caused in whole or in part by the Contractor, a Subcontractor of any tier, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable, and for which the Contractor is responsible under this Section, except damage or loss attributable solely to acts or omissions of Owner or the Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's other obligations stated elsewhere in the Contract.
 6. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents, and the maintaining, enforcing and supervising of safety precautions and programs. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner's Representative and Architect. The Contractor shall hold regularly scheduled safety meetings to instruct Contractor personnel on safety practices, accident avoidance and prevention, and the Project Safety Program. The Contractor shall furnish safety equipment and enforce the use of such equipment by its employees and its subcontractors of any tier.
 7. The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.
 8. The Contractor shall promptly report in writing to the Owner all accidents arising out of or in connection with the Work which cause death, lost time injury, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately.
 9. The Contractor shall promptly notify in writing to the Owner of any claims for injury or damage to personal property related to the work, either by or against the Contractor.
 10. The Owner assumes no responsibility or liability for the physical condition or safety of the Work site or any improvements located on the Work site. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time concerning any failure by the Contractor or any Subcontractor to comply with the requirements of this Paragraph.
 11. In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority

- granted the Owner in the Contract Documents.
12. The Contractor shall maintain at his own cost and expense, adequate, safe and sufficient walkways, platforms, scaffolds, ladders, hoists and all necessary, proper, and adequate equipment, apparatus, and appliances useful in carrying on the Work and which are necessary to make the place of Work safe and free from avoidable danger for clients, staff, the public and construction personnel, and as may be required by safety provisions of applicable laws, ordinances, rules regulations and building and construction codes.

END OF SECTION

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
- D. Security and protection facilities include, but are not limited to, to following:
 - 1. Temporary fire protection
 - 2. Barricades, warning signs, and lights
 - 3. Sidewalk bridge or enclosure fence for the site
 - 4. Environmental protection

1.3 SUBMITTALS

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

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

1.4 QUALITY ASSURANCE

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

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide new materials. If acceptable to the Designer, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.
- B. Lumber and Plywood: Comply with requirements in Division 6 Section “Rough Carpentry”.
 - 1. For job-built temporary office, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.

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

2.2 EQUIPMENT

- A. General: Provide new equipment. If acceptable to the Designer, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Water Hoses: Provide ¾" (19mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100' (30m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110 to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage rating.

- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixture where exposed to moisture.
- F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.
- G. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.
- H. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated re-circulation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.
- I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
 - 1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
 - 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 - 3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
 - 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Designer. Neither the Owner nor Designer will accept cost or use charges as a basis of claims for 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 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.
- 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 Contractor 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. Temporary Elevator Use: Refer to Division 14 for Elevators.
- O. Temporary Elevator Use: The Owner will allow use of elevators within the building. All construction personnel will be allowed access only to those specific elevators designated by the Construction Representative.
- P. 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.
- Q. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.
- R. 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.
- S. Rodent Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- T. 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

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

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

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

3.2 FINAL CLEANING

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

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

END OF SECTION 017400

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 042000 "Unit Masonry" for disposal requirements for masonry waste.

1.2 DEFINITIONS

- A. Construction Waste: Building, structure, and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.
- C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
- E. Waste Management in Historic Zones or Areas: Transportation equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings, by 12 inches or more.

3.2 RECYCLING DEMOLITION WASTE

- A. Asphalt Paving: Grind asphalt to maximum 4-inch size.
- B. Asphalt Paving: Break up and transport paving to asphalt-recycling facility.
- C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
1. Pulverize concrete to maximum 4-inch size.
- D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
1. Pulverize masonry to maximum 4-inch size.
 2. Clean and stack undamaged, whole masonry units on wood pallets.
- E. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- F. Metals: Separate metals by type.
1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.
- H. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.
- J. Metal Suspension System: Separate metal members, including trim and other metals from acoustical panels and tile, and sort with other metals.
- K. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- L. Carpet Tile: Remove debris, trash, and adhesive.
 1. Stack tile on pallet and store clean, dry carpet in a closed container or trailer provided by carpet reclamation agency or carpet recycler.
- M. Piping: Reduce piping to straight lengths and store by material and size. Separate supports, hangers, valves, sprinklers, and other components by material and size.
- N. Conduit: Reduce conduit to straight lengths and store by material and size.
- O. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.3 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
 2. Polystyrene Packaging: Separate and bag materials.
 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.
 1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
- D. Paint: Seal containers and store by type.

END OF SECTION

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 INFORMATIONAL SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

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

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

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.
- C. 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

SECTION 024119 - SELECTIVE DEMOLITION SECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. The Work of this Section Includes:
 - 1. Demolition and removal of selected portions of exterior or interior of building or structure and site elements.
 - 2. Removal and salvage of existing items for delivery to Owner and removal of existing items for reinstallation.

1.2 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.3 FIELD CONDITIONS

- A. Owner will occupy portions of the 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:
 - 1. Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is included in Section 003126 "Existing Hazardous Material Information" for review and use. Examine report to become aware of locations where hazardous materials are present.
 - a. Owner will provide material safety data sheets for hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

- E. On-site sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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/ASSP 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.

3.2 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to 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. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

3.3 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction. and recycle or dispose of them in accordance with Section 017419 "Construction Waste Management and Disposal."

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.4 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

SECTION 028213 – ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 SCOPE

- A. This specification covers the removal of asbestos materials as identified in Section 003126- Summary of Work. The abatement contractor is responsible for field verifying quantities and site conditions. This work shall be done in strict accordance with the specifications. Compliance with all applicable Federal, State, and local regulations and the use of the best available technology, procedures, and methods for preparation, execution, cleanup, disposal, and safety are absolutely required. This compliance is the sole responsibility of the Abatement Contractor.

1.2 DESCRIPTION

- A. Furnish all labor, materials, services, insurance, and equipment in accordance with the most stringent requirements of Franklin County Health Department, MDNR, EPA and OSHA and all other applicable regulatory agencies, to complete the isolation of asbestos-containing materials as described in the Summary of Work.

1.3 SUBMITTAL REQUIREMENTS

- A. Manufacturer's Catalog data:
 - 1. Vacuums
 - 2. Respirators
 - 3. Amended water
 - 4. Material Safety Data Sheets
 - 5. Encapsulants
 - 6. Wastewater Filtration Systems
- B. Statements:
 - 1. Health and Safety Pan - Submit a detailed plan of the safety precautions and OSHA compliance program for the project. The plan shall include, but not be limited to lockout/tagout, fall protection and confined space entry procedures. The health and safety plan shall also include both fire and medical emergency response plans.
 - 2. Testing laboratory - Submit the name, address, and telephone number of each testing laboratory selected for the analysis and reporting of personal air samples. Furnish evidence that the selected laboratory is an accredited participant in the AIHA PAT programs for airborne asbestos analysis.
 - 3. Approval of waste disposal site and transporter - Submit copies of permits for the waste disposal site, transfer station and the waste transporter. If the Contractor plans to utilize in-state disposal facilities, prior approval may be required from the MDNR.
 - 4. Worker training certificates - Submit copies of each employee's certification cards/diplomas.
 - 5. Medical certification - Provide a written certification for each Worker and "Competent Person", signed by a licensed physician indicating that the employee has met or exceeded all the medical prerequisites listed herein and in 29 CFR 1926.1101 and 29 CRF 1926.103.

6. Respiratory protection program - Submit a written program manual or operating procedure including methods of compliance with regulatory statutes.
- C. Field Reports - The contractor shall submit the following Field Reports, on a daily basis during the course of the asbestos abatement work:
1. Personal Air Sampling Results - The contractor shall provide copies of laboratory reports for personal air samples to the Project Monitor for review within 24 hours of the "time off" of the sample pump. Notify the Project Monitor immediately of any airborne levels of asbestos fibers more than the Asbestos Permissible Exposure Limits. Post a copy of the personal air sample results at a location accessible to the affected employees. Failure to comply with these requirements may result in all work being stopped until compliance is achieved.
 2. Work Area Entry Log - The contractor shall maintain and provide to the Project Monitor a log of all employees and authorized visitors who enter asbestos work areas. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.
 3. Daily Performance Log - The project "Competent Person" shall document all work performed on site at a minimum of five (5) times every day. Entries shall include, but not be limited too, job progress, amount of material removed, containment inspections, project issues, etc. and shall be logged into a bound logbook with non- washable, permanent ink.
- D. Project Close-out Submittals - Within forty-five (45) days of project completion, the Contractor shall submit three (3) copies of the documents listed below for review and approval prior to the Contractor's final payment.
1. Originals of all waste disposal manifests, seals and disposal logs.
 2. OSHA compliance air monitoring records, conducted during work.
 3. Daily progress log, including the entry/exit log.
 4. All list of all workers used in the performance of the project, including name, social security number, current and original training certificate.
 5. Disposal Site/Landfill permit from applicable regulatory agency.

1.4 TERMINOLOGY (Definitions)

- A. AIR MONITORING: The process of measuring the fiber content of a specific volume of air in a stated period of time. For this project, NIOSH Analytical Method 7400 shall be used.
- B. AMENDED WATER: Water to which a surfactant has been added to reduce water surface tension and thereby provide a more rapid penetration.
- C. AUTHORIZED VISITOR: The Building Owner, the Building Owner's representative, PSI's personnel, or a representative of any regulatory or other agency having jurisdiction over the project.
- D. BUILDING OWNER: A representative of the City of Crestwood or their authorized representative.
- E. CURTAINED DOORWAY: Device to allow ingress or egress from one room to another while permitting minimal air movement between the rooms, typically constructed by placing three overlapping sheets of opaque 6-mil polyethylene over an existing or

temporarily framed doorway, securing each along the top of the doorway, securing the vertical edge of one sheet along one vertical side of the doorway, and securing the vertical edge of the other sheet along the opposite vertical side of the doorway.

- F. HEPA FILTER: A high efficiency particulate air (HEPA) filter capable of trapping and retaining 99.97% of asbestos fibers greater than 0.3 microns.
- G. HEPA VACUUM EQUIPMENT: High efficiency particulate air filtered vacuuming equipment with a filter system capable of collecting and retaining asbestos fibers. Filters should be of 99.97% efficiency for retaining fibers greater than 0.3 microns.
- H. NIOSH: National Institute for Occupational Safety and Health.
- I. ON-SITE REPRESENTATIVE: PSI's full-time representative responsible for air monitoring and enforcement of the specifications.
- J. PLASTICIZING: Procedures necessary using polyethylene sheeting, adhesives, and/or taping to seal an area airtight.
- K. SURFACTANT: A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.
- L. WET CLEANING/WIPING: The process of eliminating contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water, and by afterwards disposing of these cleaning tools as asbestos-contaminated waste.

1.5 EXISTING CONDITIONS

- A. Building Owner and Contractor shall agree on building conditions prior to commencement of work. It shall be the Contractor's responsibility to replace or repair to the Owner's satisfaction, prior to closeout of the project, all damaged items caused by the Contractor and not proven otherwise. All items damaged prior to abatement shall be noted during preconstruction walk-through.

PART 2 - EQUIPMENT AND MATERIALS

2.1 PERSONNEL PROTECTION REQUIREMENTS

- A. Prior to commencement of work, the workers shall be instructed and shall be knowledgeable on the hazards of asbestos, lead, and other environmental exposures, use and fitting of respirators, protective clothing, decontamination procedures, and all aspects of asbestos/lead work procedures; workers shall have medical examinations.
- B. The Contractor acknowledges that he alone is responsible for enforcing personnel protection requirements and that these specifications provide only a minimum acceptable standard for each phase of operation.
- C. Provide workers with personally issued and marked respiratory equipment approved by NIOSH and accepted by OSHA.
- D. WHERE NOT IN VIOLATION OF NIOSH AND OSHA REQUIREMENTS, THE CONTRACTOR SHALL PROVIDE, AS A MINIMUM, THE FOLLOWING RESPIRATOR PROTECTION FOR EACH PHASE OF OPERATION:

1. Gross Asbestos/Lead Cleanup: NIOSH half-face dual cartridge respirators equipped with HEPA cartridges.
 2. Plastic Removal: NIOSH half-face dual cartridge respirators equipped with HEPA cartridges.
- E. The above schedule is the minimum respiratory protection acceptable. Should any condition, for any reason, be encountered where the exposure level, after application of the appropriate protection factor of the respiratory equipment in use, exceeds 0.01 f/cc, substitute respiratory equipment with protection factors which reduce worker exposure levels below 0.01 f/cc. Should any such condition come to PSI's attention, the right is reserved to require the use of respiratory equipment with higher protection factors for any or all phases of the work.
- F. No visitors shall be allowed in work areas, except as authorized. Provide authorized visitors with suitable respirators with fresh cartridges, whenever they are required to enter the work area, to a maximum of four (4) for the project.
- G. During clean-up of asbestos debris/lead contamination and the removal of the isolation barrier, provide workers with sufficient sets of disposable protective full-body clothing. Such clothing shall consist of full-body coveralls, footwear, and head gear, one-piece coveralls or equal. Provide eye protection and hard hats as required by applicable safety regulations. Disposable clothing shall not be allowed to accumulate and shall be disposed of as contaminated waste.
- H. Provide authorized visitors with suitable protective clothing, headgear, footwear, and gloves as described above whenever they are required to enter the work area.

2.2 MATERIALS

- A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name
1. Store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient to prevent damage or contamination.
 2. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes contaminated with asbestos shall be disposed of in accordance with applicable regulations.
- B. PLASTIC SHEETING: A minimum 6-mil (or as specified) for walls and 6-mil (or as specified) for critical seals/barriers, in sizes to minimize the frequency of joints.
- C. TAPE: Capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheets to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water, duct tape, poly prep tapes or approved equal.
- D. ADHESIVES: Capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.
- E. CAULKS: As specified or approved.
- F. SURFACTANT: Shall consist of 50% polyoxyethylene ether and 50% of polyoxyethylene ester, or equivalent, and shall be mixed with water to provide a

concentration of one ounce of surfactant to 5 gallons of water. Prior to using, the Contractor shall be responsible for verifying that this surfactant is compatible with the materials to be reinsulated and their substrates. If found to be incompatible, the Contractor shall supply suitable wetting agents at no extra cost to the Owner.

- G. IMPERMEABLE CONTAINERS: Suitable to receive and retain any asbestos- containing or contaminated materials until disposal at an approved site. The containers shall be labeled in accordance with OSHA Regulation 29 CFR 1926.1101. Containers must be both air and water tight and must be resistant to damage and rupture. The containers shall be of two parts: (1) a pair of 6-mil polyethylene bags of size to fit within the drum listed hereafter and capable of being sealed; (2) 30, 40, or 55 gallon capacity steel or fiber drums with tightly fitting lids.
- H. WARNING LABELS AND SIGNS: As required by OSHA regulations 29 CFR 1926.1101.
- I. ENCAPSULANTS: Must be EPA approved and formulated for asbestos and lead abatement work.
- J. OTHER MATERIALS: Provide all other materials, such as, but not limited to lumber, plywood, nails, and hardware, which may be required to properly prepare and complete this project.

2.3 TOOLS AND EQUIPMENT

- A. Provide suitable tools for isolation barrier installation.
 - 1. Water Sprayer: Airless or a low pressure sprayer for amended water application as applicable.
 - 2. Vacuums: Use HEPA type from a known manufacturer.
 - 3. Other tools and equipment as necessary.

PART 3 – EXECUTION OF ABATEMENT

3.1 POSTING OF THE PROJECT

- A. Post caution signs in and around the work area to comply with OSHA regulation 29 CFR 1926.1101 and in compliance with all other Federal, State, and local requirements.

3.2 WORK AREA PREPARATION – OWNER

- A. The Contractor may use existing electrical service to the building for temporary electrical power during abatement work so long as Ground Fault Circuit Interrupters (GFCIs) are utilized.
- B. The Contractor, in coordination with the Owner, shall shut down or isolate heating, cooling, and ventilating air systems to the work areas.

3.3 ASBESTOS REMOVAL WORK AREAS - WORK BY CONTRACTOR

- A. Work Area Preparation
 - 1. Install a mini containment, consisting of 6-mil polyethylene sheeting on the walls, ceiling and floors to separate the work area from other areas of the building. A 6-mil polyethylene drop cloth shall also be placed on the ground under where each window is to be removed.

- B. Maintain and mark emergency exits from the work areas, or establish alternate exits satisfactory to the local Fire Marshall.
- C. After completion of the window removal and the area has passed a visual inspection, the Contractor shall install a hard barrier into the window opening, ensuring a weather tight condition and secured in such a way to ensure the integrity of the building. This hard barrier will be left in place and removed by others.

3.4 DECONTAMINATION ENCLOSURE SYSTEMS

- A. GENERAL: The Contractor shall use decontamination units acceptable to Franklin County Health Department, MDNR, EPA and OSHA, connected to work area with framed-in tunnels, and line tunnels with plastic, sealed with tape at all joints in the plastic, or shall construct decontamination units on-site.
- B. ACCESS: In all cases, access between contaminated rooms or areas shall be through an air lock. In all cases, access between any two rooms within the decontamination enclosure systems shall be through an air lock.
- C. WORKER DECONTAMINATION ENCLOSURE SYSTEM: Construct a worker decontamination enclosure system consisting of three totally enclosed chambers, to be utilized as a remote decontamination unit as follows:
 - 1. An equipment room with two curtained doorways, one to the work area and one to the shower room, via an air lock. Negative pressure ventilation equipment shall be attached and exhausted to the exterior.
 - 2. A shower room with two curtained doorways, one to the equipment room and one to the clean room, via air locks. The shower room shall contain at least one shower with hot and cold or warm water with individual shut-off valves inside the showers. Careful attention shall be paid to the shower enclosure to insure against leakage of any kind. Ensure a supply of soap at all times in the shower room. Drainage from showers shall be disposed of as contaminated water or filtered as specified below.
 - 3. Waste water containing asbestos, including drainage from decontamination showers, shall be either disposed of as contaminated waste or filtered in accordance with the following requirements prior to introduction into the sanitary sewer system. It is the abatement contractor's responsibility to obtain approval from the appropriate agencies for disposal into the sanitary sewer system.
 - a. Filter water using three in-line filter cartridges with 2" inlets and outlets. The outlet of each filter cartridge shall be connected in series to the inlet of the next cartridge. The first cartridge shall contain 100-micron prefilters and the second cartridge shall contain 25-micron filters and the final cartridge shall contain a minimum of 5-micron filters.
 - b. Spare filters of all three sizes shall be maintained at the site at all times to replace prefilters during cleaning.
 - c. When the prefilters become clogged, replace with spares, dispose of accumulated debris as contaminated waste, and wash out the prefilters in the shower, allowing the drainage from the cleaning operation to go through the filtration system.
 - d. When the final filters become clogged, remove the filters, replace with new, and dispose of the clogged filters as contaminated waste.
 - e. Provide a holding tank for contaminated waste water as required to prevent backup of water into shower when the amount of water generated exceeds the flow rate of the filters.

4. A clean room with one curtained doorway into the shower (via an air lock) and one entrance or exit to non-contaminated areas of the building. The clean room shall have sufficient space for storage of the workers' street clothes, towels, and other non-contaminated items.
5. IF REQUESTED, EQUIPMENT DECONTAMINATION ENCLOSURE SYSTEM:
If requested, a separate equipment decontamination enclosure system shall be constructed for the removal of waste from the containment. This equipment decontamination enclosure system shall be constructed in accordance with normal practices in the asbestos industry.

3.5 SEPARATION OF WORK AREAS FROM NONWORK AREAS

- A. Visual separation shall be accomplished at all "see-through" locations using opaque polyethylene. This separation shall not be incorporated within the other seals involved on this project.

3.6 MAINTENANCE OF DECONTAMINATION ENCLOSURES

- A. At the beginning of each work shift and throughout removal, all seals and curtained doorways shall be inspected, and if not found in proper condition, repaired immediately.
- B. Respiratory equipment shall be cleaned, repaired, and sanitized after each use.
- C. Soap and shampoo shall be in the shower at all times.
- D. Fresh towels shall be available at all times.
- E. All areas shall be kept clean and in order.
- F. Provide a disposal bag for contaminated filters in the shower room.
- G. Provide storage for wet and dry towels.
- H. Ensure that the drainage filtering systems are kept clean and operable at all times.
- I. At the end of each decontamination period, the shower, air locks, and clean room shall be cleaned and dried.
- J. At the end of each work shift: the two air locks and the shower shall be thoroughly disinfected; the filter bag (if applicable) shall be returned to the equipment room for disposal; the equipment room and first air lock shall be thoroughly HEPA vacuumed and wet cleaned.

3.7 WORKER PROTECTION - TO BE POSTED IN CLEAN AND EQUIPMENT ROOMS

- A. All workers and authorized personnel, in order to enter the work area, shall:
 1. Remove all clothing, unless it is to remain in the equipment room for disposal.
 2. Don protective clothing (gloves, boots, etc.),
 3. Don the appropriate respiratory protection, following all training procedures and manufacturer's instructions. Hood shall be worn over respirator straps.
- B. All workers and authorized personnel, in order to leave the work area, shall:

1. Remove gross (visible) contamination from themselves and their equipment. Clean the bottoms of protective footwear immediately prior to entering the equipment room.
2. Enter the equipment room and, keeping respirator in place, remove all protective clothing, including gloves and boots. Place contaminated clothing in the bag(s) provided. Store gloves and/or boots in their respective areas.
3. Still wearing the respirator, proceed naked to the first air lock. Once inside, ensure all curtained doorways behind are properly closed.
4. With respirator still in place, move into the shower room and rinse off thoroughly. If wearing dual cartridge respirators, make sure the cartridges are completely soaked before removing the respirator and disposing of cartridges in the container provided.
5. Complete showering, thoroughly soaping, and shampooing.
6. Proceed to the clean room, dry off, dress, and return respirator to the storage area.
7. No smoking, eating, or drinking shall be allowed inside decontamination enclosures.

3.8 FIRE EXITS

- A. Designate and maintain emergency and fire exits from the work area in accordance with local codes and regulations. All exits shall be clearly marked with fluorescent tape or red paint and shall be clearly visible from any part of the work area.

3.9 SECURITY

- A. The Contractor shall be responsible for maintaining security of the abatement areas throughout the contract period.

3.10 LOCATION AND ACTIVATION OF NEGATIVE AIR PRESSURE

- A. Maintain HEPA-filtered negative air machines in the work areas during all asbestos abatement work for which abatement techniques are specified or required.
- B. Comply with Paragraph J.2 of the EPA document, Guidance for Controlling Friable Asbestos-Containing Materials in Buildings, June 1985.
- C. Provide one spare negative air machine for each work area. Spare negative air machines should be of the same size and capacity as the largest operating units.
- D. Suspend electrical cords off the floor and out of workers' way to protect the cords from damage from traffic, sharp objects, and pinching. Do not fasten cords with staples, and do not hang cords from nails or suspend with wire.
- E. Provide a sufficient number of HEPA-filtered negative air machines so that a slight negative pressure is maintained inside the containment at all times.
- F. Locate units so that make-up air enters the work area primarily through the decontamination facility and traverses the work area as much as possible. Use Section J.3 of the referenced EPA document as a guide.
- G. Vent all negative air machines to the outside of the building, where possible. Due to security issues, the abatement contractor may have to request a waiver and exhaust to the interior of the building into a second HEPA filtered negative air machine. Provide flexible or rigid duct as necessary to provide exterior venting and proper location of negative air machines. Ducts shall be completely sealed, in good repair, and protected

from possible damage within the work area. Ducts shall be firmly secured in all passages to the exterior.

- H. After the work area has been prepared, the decontamination facility set up, and the negative air machines installed, start the units (one at a time if more than one is provided). Visually check the direction of air movement through the openings in the barriers, and verify movement of air in all locations of the work areas by use of ventilation smoke tubes. Adjust the location of the negative air machines, or provide additional negative air machines for the work area if the test indicates inadequate or improper air movement.
- I. After removal has begun, maintain operation of negative air machines continuously to maintain adequate negative pressure until decontamination of the work area is complete. Do not turn units off at the end of the work shift or when removal operations temporarily stop.
- J. Change filters in negative air machines in accordance with manufacturer's recommendations and Paragraph J.3.2.2.1 of the reference EPA document or when there is obvious loss of negative pressure.
- K. When a final inspection and the results of the initial final air monitoring tests indicate an acceptable level of airborne fibers, remove and dispose of pre-filters and shut off the negative air machines. Seal all intake openings to the unit to prevent contamination due to asbestos fibers collected on the final filter.
- L. If dismantling operations result in visible dust on surfaces, replace filters, restart exhaust units, reclean surfaces and perform additional area air monitoring (at Contractor's expense) until the level of airborne fibers is acceptable as specified.
- M. Dispose of all pre-filters as asbestos-contaminated waste material as specified.

3.11 PREWORK INSPECTIONS

- A. Upon completion of all work area preparation and before work is to begin, notify on-site representative that the work area is ready for inspection.
- B. The Contractor shall not begin abatement work until the on-site representative has inspected the area and any deficiencies have been corrected.

3.12 ASBESTOS REMOVAL OPERATIONS

- A. REMOVE ASBESTOS-CONTAINING MATERIAL in small sections from all areas. Do not allow material to dry out. As it is removed, simultaneously pack material while still wet into disposal bags or double wrap in polyethylene sheeting. Evacuate air from disposal bags with a HEPA filtered vacuum cleaner before sealing. Twist neck of bags, bend over and seal with minimum three wraps of duct tape. Clean outside and move to Wash Down Station adjacent to Material Decontamination Unit.
- B. ACM waste shall be placed into two 6-mil plastic bags for disposal or wrapped in polyethylene sheet, and shall be disposed of as asbestos-containing waste as per all Federal, State and local regulations in accordance with Paragraph 3.13.
- C. Maintain work areas free of accumulated asbestos-containing materials at all times. Keep waste materials wet until enclosed in sealed plastic bags or polyethylene sheeting.

- D. Seal polyethylene bags/wraps air-tight. Ensure that all contaminated materials are double-bagged to yield a minimum covering of 12 mils before removal from the work area. Move the bagged material to the wash-down station adjacent to the equipment decontamination enclosure. Once inside the wash room, the bags shall be wet cleaned or HEPA vacuumed and passed into the holding room. Single bagged material shall be placed in a clean bag or into a lined drum. At no time shall a removal worker pass the curtained doorway between the holding room and the exterior.
- E. After completion of the window removal and the area has passed a visual inspection, the Contractor shall install a hard barrier into the window opening, ensuring a weather tight condition and secured in such a way to ensure the integrity of the building. This hard barrier will be left in place and removed by others.

3.13 DISPOSAL OF ASBESTOS-CONTAINING MATERIAL AND ASBESTOS CONTAMINATED WASTE

- A. As the work progresses, and to prevent exceeding available storage capacity on-site, workers from uncontaminated areas in full protective clothing and dual cartridge respirators shall enter the equipment decontamination unit and place the appropriate supply of specified containers within the container room. Workers in the holding room shall be passed empty containers for receiving bagged material. Full sealed containers from the holding room shall be passed back into the container room for storage. Ensure all curtained doorways are closed. Ensure that all containers are sealed properly before removing for transport and disposal. Drums will not be required if Contractor uses sealed bins or enclosed trucks to store and transport double-bagged waste.
- B. Vehicles used for transporting asbestos-containing materials to disposal sites shall have a completely enclosed, lockable storage compartment if drum requirement is to be deleted. Storage compartments shall be plasticized and sealed with a minimum of one (1) layer of 6-mil polyethylene on the sides and top and floor. The compartments shall be thoroughly wet cleaned and/or HEPA vacuumed following the disposal of each load of material at the dump site. At the conclusion of the project (or before transport vehicles are used for other purposes), the polyethylene shall be properly removed and disposed of as contaminated waste. After this is accomplished, compartments shall once again be wet cleaned and/or HEPA vacuumed in order to eliminate all debris prior to reuse of the vehicles. All plastic sheeting, tape, cleaning material, including mops and sponges, clothing, filters, and all other contaminated disposable materials shall be packaged, labeled, and disposed of as asbestos-containing waste.
- C. Dispose of materials at an EPA approved disposal site in accordance with the requirements of federal, state, and local disposal authorities.
- D. Contractor shall insure a representative of their firm is on-site during waste removal to complete waste manifest and ensure that waste leaving the project site shall be delivered directly to the authorized disposal site.

3.14 CLEANING

- A. Remove all visible accumulations of asbestos-containing materials and debris by HEPA vacuums, sponging, etc. Wet clean all surfaces within the work area.
- B. Contractor will remain in required respiratory equipment until enough information has been gathered to justify moving to lower protection. (Visuals, test data, etc.)
- C. The entire work area shall be totally, visibly clean and all bagged waste shall have been removed from the work area and placed in the disposal dumpster.

- D. Upon completion of cleaning operations, a visual inspection is to be requested.

3.15 TESTS FOR FINAL CLEARANCE FOR ASBESTOS CONTAINMENTS

- A. Upon completion of the cleaning and if all surfaces are dry and no visible residue is observed, final air clearance testing will be performed in the first few containments to establish that the methods being utilized, are acceptable and will not cause elevated fiber counts, in accordance with the AHERA guidelines, which consists of final clearance air samples to be analyzed by Phase Contrast Microscopy (PCM).
- B. If final air testing produces results of less than the required levels (<0.01 f/cc), the containment may be dismantled and properly disposed.

3.16 INSPECTION REPORTS

- A. See Appendix 1 for Asbestos and Lead Inspection Reports.

END OF SECTION

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Form-facing material for cast-in-place concrete.

1.2 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Form ties.
4. Waterstops.
5. Form-release agent.

B. Sustainable Design Submittals:

1. Product Certificates: For regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project, means of transportation, and cost for each regional material.
2. Environmental Product Declaration: For each product.
3. Laboratory Test Reports: For liquid floor treatments and curing and sealing compounds, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
 - a. Location of construction joints is subject to approval of the Architect.
3. Indicate location of waterstops.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.
 - 1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
 - 2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.
 - a. For architectural concrete specified in Section 033300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes and Section 033300 "Architectural Concrete".
- C. Limit concrete surface irregularities as follows:
 - 1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
 - 2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
 - 3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.

- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
 - 1. Provide and secure units to support screed strips.
 - 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
 - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Do not chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkage's, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
 - 1. Determine sizes and locations from trades providing such items.
 - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- L. Construction and Movement Joints:
 - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 3. Place joints perpendicular to main reinforcement.
 - 4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
 - a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 6. Space vertical joints in walls as indicated on Drawings.
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.
 - 1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.

2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.
- N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF 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.
 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
 3. 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.
 4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
 5. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.
 1. Install in longest lengths practicable.
 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 033000 "Cast-In-Place Concrete."
 4. Secure waterstops in the correct position at 12 inches on center.
 5. Field fabricate joints in accordance with manufacturer's instructions using heat welding.
 - a. Miter corners, intersections, and directional changes in waterstops.
 - b. Align center bulbs.
 6. Clean waterstops immediately prior to placement of concrete.
 7. Support and protect exposed waterstops during progress of the Work.

- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.
1. Install in longest lengths practicable.
 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 3. Protect exposed waterstops during progress of the Work.

END OF SECTION

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of steel reinforcement.
- B. Shop Drawings: Comply with ACI SP-066:
 - 1. Include placing drawings that detail fabrication, bending, and placement.
 - 2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.
- C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.
 - 1. Location of construction joints is subject to approval of Architect.

1.2 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Epoxy-Coated Reinforcement: CRSI's "Epoxy Coating Plant Certification."
- B. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Steel Reinforcement:
 - a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
 - 2. Mechanical splice couplers.
- C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 FABRICATING REINFORCEMENT

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

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. 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 reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.
 - 3. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.

4. Lace overlaps with wire.

3.3 JOINTS

- A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 1. Place joints perpendicular to main reinforcement.
 2. Continue reinforcement across construction joints unless otherwise indicated.
 3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

END OF SECTION

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete standards.
 - 2. Concrete materials.
 - 3. Admixtures.
 - 4. Curing materials.
 - 5. Concrete mixing.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at The Missouri National Guard's St. Clair Readiness Center (SCRC), 375 Commercial Avenue, St. Clair, Missouri 63077>.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified Installer who employs Project personnel qualified as an ACI-certified Concrete Flatwork Associate and Concrete Flatwork Finisher and a supervisor who is a certified ACI Advanced Concrete Flatwork Finisher/Technician or an ACI Concrete Flatwork Finisher with experience installing and finishing concrete.
 - 1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.
- B. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing that performs duties on behalf of the Architect/Engineer.
- C. Field Quality-Control Testing Agency Qualifications: An independent agency,(acceptable to authorities having jurisdiction), qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

- A. Indigenous Materials: Concrete shall be manufactured within 500 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

2.3 CURING MATERIALS

- A. Water: Potable water that does not cause staining of the surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not proceed until unsatisfactory conditions have been corrected.

3.2 TOLERANCES

- A. Comply with ACI 117.

3.3 INSTALLATION OF 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.

3.4 INSTALLATION OF CAST-IN-PLACE CONCRETE

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
- 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.

3.5 INSTALLATION OF JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
 - 1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 - 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 - 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - 1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: 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 on Drawings.
 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 Section 079200 "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:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.
- F. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.6 APPLICATION OF FINISHING FLOORS AND SLABS

- A. Scratch Finish:
1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
 2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
 3. Apply scratch finish to surfaces to receive concrete floor toppings and to receive mortar setting beds for bonded cementitious floor finishes.
- B. Float Finish:
1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
 2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
 3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo
- C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighthen until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface. Use of an approved finishing aid is acceptable.
5. Do not apply troweled finish to concrete, which has a total air content greater than 3 percent.
6. 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.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

a. Slabs on Ground:

- 1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
- 2) Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.
- 3) Specified overall values of flatness, F_F 45; and of levelness, F_L 35; with minimum local values of flatness, F_F 30; and of levelness, F_L 24.
- 4) Specified overall values of flatness, F_F 50; and of levelness, F_L 35; with minimum local values of flatness, F_F 40; and of levelness, F_L 24.

b. Suspended Slabs:

- 1) Specified overall values of flatness, F_F 25; and of levelness, F_L 20; with minimum local values of flatness, F_F 17; and of levelness, F_L 15.
- 2) Specified overall values of flatness, F_F 35; and of levelness, F_L 20; with minimum local values of flatness, F_F 24; and of levelness, F_L 15.
- 3) Specified overall values of flatness, F_F 45; and of levelness, F_L 35; with minimum local values of flatness, F_F 30; and of levelness, F_L 24.

- D. Trowel and Fine-Broom Finish: First apply a trowel finish to surfaces indicated on Drawings where ceramic or quarry tile is to be installed by either thickset or thinnest method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with a fiber-bristle broom perpendicular to main traffic route.
 - 2. Coordinate required final finish with Architect before application.
- F. Slip-Resistive Finish: Before final floating, apply slip-resistive finish to concrete stair treads, platforms, and ramps, as indicated on Drawings.
 - 1. Apply in accordance with manufacturer's written instructions and as follows:
 - a. Uniformly spread [25 lb/100 sq. ft.] of dampened slip-resistive [aggregate] [aluminum granules] over surface in one or two applications.
 - b. Tamp aggregate flush with surface, but do not force below surface.
 - c. After broadcasting and tamping, apply float finish.
 - d. After curing, lightly work surface with a steel wire brush or an abrasive stone and water to expose slip-resistive [aggregate] [aluminum granules].
- G. Dry-Shake Floor Hardener Finish: After initial floating, apply dry-shake floor hardener to surfaces in accordance with manufacturer's written instructions and as follows:
 - 1. Uniformly apply dry-shake floor hardener at a rate of [100 lb/100 sq. ft.] unless greater amount is recommended by manufacturer.
 - 2. Uniformly distribute approximately two-thirds of dry-shake floor hardener over surface by hand or with mechanical spreader, and embed by power floating.
 - 3. Follow power floating with a second dry-shake floor hardener application, uniformly distributing remainder of material, and embed by power floating.
 - 4. After final floating, apply a trowel finish.
 - 5. Cure concrete with curing compound recommended by dry-shake floor hardener manufacturer and apply immediately after final finishing.

3.7 APPLICATION OF FINISHING FORMED SURFACES

- A. As-Cast Surface Finishes:
 - 1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
 - a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
 - b. Remove projections larger than 1 inch.
 - c. Tie holes do not require patching.
 - d. Surface Tolerance: ACI 117, Class D.
 - e. Apply to concrete surfaces for metal lap pan deck formed surfaces and those surfaces that are buried or covered with subsequent installed surfaces.
 - 2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

- a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
- b. Remove projections larger than 1/4 inch.
- c. Patch tie holes.
- d. Surface Tolerance: ACI 117, Class B.
- e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

3. ACI 301 Surface Finish SF-3.0:

- a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
- b. Remove projections larger than 1/8 inch.
- c. Patch tie holes.
- d. Surface Tolerance: ACI 117 Class A.
- e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

B. Rubbed Finish: Apply the following to as-cast surface finishes where indicated on Drawings:

1. Smooth-Rubbed Finish:

- a. Perform no later than one day after form removal.
- b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
- c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
- d. Maintain required patterns or variances as shown on Drawings or to match [design reference sample] [field sample panels] [mockups].

2. Grout-Cleaned Rubbed Finish:

- a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
- b. Do not clean concrete surfaces as Work progresses.
- c. Mix 1 part Portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white Portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
- d. Wet concrete surfaces.
- e. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.
- f. Maintain required patterns or variances as shown on Drawings or to match [design reference sample] [field sample panels] [mockups].

C. Abrasive-Blast Finish: Apply the following to as-cast surface finishes where indicated on Drawings:

1. Perform abrasive blasting after compressive strength of concrete exceeds 2000 psi.
 2. Coordinate with formwork removal to ensure that surfaces to be abrasive blasted are treated at the same age.
 3. Surface Continuity:
 - a. Perform abrasive-blast finishing as continuous operation, maintaining continuity of finish on each surface or area of Work.
 - b. Maintain required patterns or variances in depths of blast to match [design reference sample] [field sample panels] [mockups].
 4. Abrasive Blasting:
 - a. Abrasive-blast corners and edges of patterns carefully, using backup boards to maintain uniform corner and edge lines.
 - b. Determine type of nozzle pressure and blasting techniques required to match field sample.
 - c. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match field sample, as follows:
 - 1) Brush Texture: Remove cement matrix to dull surface sheen and expose face of fine aggregate, with no significant reveal.
 - 2) Light Texture: Expose fine aggregate with occasional exposure of coarse aggregate and uniform color, with maximum reveal of 1/16 inch.
 - 3) Medium Texture: Generally, expose coarse aggregate with slight reveal and with a maximum reveal of 1/4 inch.
 - 4) Heavy Texture: Expose and reveal coarse aggregate to a maximum projection of one-third its diameter, with reveal range of 1/4 to 1/2 inch.
 - d. Maintain required patterns or variances in reveal projection to match [design reference sample] [field sample panels] [mockups].
- D. High-Pressure Water-Jet Finish: Apply the following to as-cast surface finishes where indicated on Drawings:
1. Perform high-pressure water jetting on concrete that has achieved a minimum compressive strength of 4500 psi.
 2. Coordinate with formwork removal to ensure that surfaces to be high-pressure water-jet finished are treated at same age for uniform results.
 3. Surface Continuity: Perform high-pressure water-jet finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work.
 4. Maintain required patterns or variances in reveal projection to match [design reference sample] [field sample panels] [mockups].
- E. Bushhammer Finish: Apply the following to as-cast surface finishes where indicated on Drawings:

1. Perform bushhammer finish to concrete that has achieved a minimum compressive strength of 4500 psi.
2. Surface Continuity:
 - a. Perform bushhammer finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work.
3. Surface Cut:
 - a. Maintain required depth of cut and general aggregate exposure.
 - b. Use power tool with hammer attachments for large, flat surfaces, and use hand hammers for small areas, at corners and edges, and for restricted locations where power tools cannot reach.
4. Remove impressions of formwork and form facings with exception of tie holes.
5. Maintain required patterns or variances of cut as shown on Drawings or to match [design reference sample] [field sample panels] [mockups].
6. Maintain control of concrete chips, dust, and debris in each Work area, limiting migration of airborne materials and dust by use of tarpaulins, windbreaks, or similar devices.

3.8 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

- A. Filling in:
 1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
 2. Mix, place, and cure concrete, as specified, to match color and texture with in-place construction exposed to view.
 3. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations:
 1. Coordinate sizes and locations of concrete bases with actual equipment provided.
 2. Construct concrete bases high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
 3. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
 4. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
 5. Prior to pouring concrete, place and secure anchorage devices.

- a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.
 - 1. Cast-in inserts and accessories, as shown on Drawings.
 - 2. Screed, tamp, and trowel finish concrete surfaces.

3.9 APPLICATION OF CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - 1. Comply with ACI 301 for cold weather protection during curing.
 - 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 - 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305R, before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
 - 1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 - 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 - 3. If forms remain during curing period, moist cure after loosening forms.
 - 4. If removing forms before end of curing period, continue curing for remainder of curing period as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - d. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
 - 1. Begin curing after finishing concrete.
 - 2. Interior Concrete Floors:

- a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following not in cold weather:
 - a) Water.
 - b) Continuous water-fog spray.
- b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
 - 1) 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
 - 1) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- d. Floors To Receive Chemical Stain:

- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
 - 2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
 - 3) Butt sides of curing paper tight; do not overlap sides of curing paper.
 - 4) Leave curing paper in place for duration of curing period, but not less than 28 days.
- e. Floors To Receive Urethane Flooring:
- 1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - 2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
 - 3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
 - 4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.
- f. Floors To Receive Curing Compound:
- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Maintain continuity of coating, and repair damage during curing period.
 - 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
- g. Floors To Receive Curing and Sealing Compound:
- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
 - 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.10 APPLICATION OF LIQUID FLOOR TREATMENTS

- A. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller in accordance with manufacturer's written instructions.

3.11 INSTALLATION OF JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

3.12 INSTALLATION OF CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
 - 1. Repair and patch defective areas when approved by Architect.
 - 2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks in excess of 0.01 inch spalls, air bubbles exceeding surface finish limits, honeycombs, rock pockets, fins and other projections on the surface exceeding surface finish limits, 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.
 - a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and match surrounding surface.
 - 3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance, as determined by Architect.
- D. Repairing Unformed Surfaces:
 - 1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.

- b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
- 2. Repair finished surfaces containing surface defects, including 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.
- 3. After concrete has cured at least 14 days, correct high areas by grinding.
- 4. Correct localized low areas during, or immediately after, completing surface-finishing operations by adding patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
- 5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
 - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - b. Feather edges to match adjacent floor elevations.
- 6. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
- 7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
 - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
 - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
 - d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
- 8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
 - a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. 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.

3.13 PROTECTION

- A. Protect concrete surfaces.
- B. Protect from petroleum stains.
- C. Prohibit vehicles from interior concrete slabs.
- D. Prohibit placement of steel items on concrete surfaces.

END OF SECTION

SECTION 033543 - POLISHED CONCRETE FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polished concrete surface finish requirements.

PART 2 - PRODUCTS

2.1 POLISHED CONCRETE SURFACE FINISH REQUIREMENTS

- A. Aggregate Exposure Class: Class A Cement Fines 85 to 95 percent fines; 5 to 15 percent fine aggregate.
- B. Polish Concrete Appearance Levels: Level 1: Flat (Ground) up to 100-grit polish; DOI 0 to 9; Haze Reading less than 10 .
- C. Slip Resistance: Minimum Dynamic Coefficient of Friction (DCOF) of 0.42. Provide required slip resistance based on final gloss level and determined by the Concrete Polishing Council.

2.2 ACCESSORIES

- A. Repair Materials: As recommended in writing by manufacturer to repair and fill cracks, and repair surfaces compatible with polishing materials.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Provide polished concrete finishing to comply with approved mockup.
- B. Machine grind floor surfaces progressively to receive aggregate and polish appearance levels indicated to match approved mockup.
- C. Scoring: Score decorative jointing in concrete surfaces 1/16 inch deep with diamond blades to match pattern indicated. Rinse until water is clear. Score before staining.
 1. Joint Width: 3/8 inch.

- D. Apply penetrating stain densifier treatment for polished concrete in polishing sequence and in accordance with manufacturer's written instructions, allowing recommended drying time between successive coats.
- E. Apply reactive color stain for polished concrete in polishing sequence and in accordance with manufacturer's written instructions.
- F. Apply color dyes for polished concrete in polishing sequence and in accordance with manufacturer's written instructions.
- G. Apply sealers to polished concrete in polishing sequence and in accordance with manufacturers' written instructions.
- H. Continue progressively polishing to aggregate and polish appearance levels to match approved mockup for final finish appearance.
- I. Visually inspect to remove defects and repolish areas that are defective. Repolish those areas that do not meet specified aggregate and polish levels per approved mockup.
- J. Complete edges of floor finish that adjoins surrounding floor areas in a sharp and clean manner.
- K. Neutralize and clean polished floor surfaces.
- L. Protect installed polished concrete surfaces from damage during construction in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 035300 - CONCRETE TOPPING

PART 1 - GENERAL

1.1 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 RELATED MATERIALS

- A. Water: Potable.
- B. Crack and Joint Repair:
 - 1. Crack repair materials as recommended in writing by concrete topping manufacturer.
 - 2. Joint sealant materials as recommended in writing by concrete topping manufacturer.
- C. Concrete Hardener and Dustproofer: Chemical clear liquid hardener which produces a dense, hard and dustproof concrete surface.
- D. Moisture Control System: As required for Project, and as recommended by manufacturer.
- E. Low Viscosity Rigid Polyurethane Crack and Joint Repair: As recommended in writing by manufacturer.
- F. Semi-Rigid Joint Sealant: As recommended in writing by manufacturer.
- G. Topical Color: As selected by Architect.
- H. Resilient Emulsion: As recommended in writing by manufacturer.
- I. Integral Color: As selected by Architect. Pigment type as recommended in writing by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for conditions affecting performance of the Work.

3.2 PREPARATION

- A. Existing Concrete: Remove existing surface treatments and deteriorated and unsound concrete. Mechanically abrade base slabs to produce a heavily scarified surface profile with an amplitude of 1/4 inch.
 - 1. Prepare and clean existing base slabs in accordance with concrete floor topping manufacturer's written instructions. Fill voids, cracks, and cavities in base slabs.
 - 2. Saw cut contraction and construction joints in existing concrete to a depth of 1/2 inch and fill with semirigid joint filler.
 - 3. To both sides of joint edges and at perimeter of existing base slab, install concrete nails in manufacturer's recommended staggered pattern.
- B. Install joint-filler strips where topping abuts vertical surfaces.
- C. Primers: Provide priming as recommended in writing by manufacturer.

3.3 APPLICATION OF FLOOR TOPPING

- A. Begin floor topping application in presence of manufacturer's technical representative.
- B. Monolithic Floor Topping: After textured-float finish is applied to fresh concrete of base slabs installed in accordance with Section 033000 "Cast-in-Place Concrete," place concrete floor topping while concrete is still plastic.
- C. Deferred Floor Topping: Within 72 hours of placing base slabs, mix and scrub bonding slurry into dampened concrete to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while slurry is still tacky.
- D. Existing Concrete: Apply epoxy-bonding adhesive, mixed in accordance with manufacturer's written instructions, and scrub into dry base slabs to a thickness of 1/16 to 1/8 inch, without puddling. Place floor topping while adhesive is still tacky.
- E. Aggregate Concrete Topping: Place concrete floor topping continuously in a single layer, tamping and consolidating to achieve tight contact with bonding surface. Do not permit cold joints or seams to develop within pour strip.
 - 1. Screed surface with a straightedge and strike off to correct elevations.
 - 2. Slope surfaces uniformly where indicated.
 - 3. Begin initial floating, using bull floats to form a uniform and open-textured surface plane free of humps or hollows.
- F. Overlay or Micro-Topping: Apply in strict compliance with manufacturer's written installation instructions. Mix and spread material on to the surface with recommended squeegees and trowels.
- G. Finishing: Consolidate surface with power-driven floats as soon as concrete floor topping can support equipment and operator. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until concrete floor topping surface has a uniform, smooth, granular texture.

1. Hard Trowel Finish: After floating surface, apply first trowel finish and consolidate concrete floor topping by power-driven trowel without allowing blisters to develop. Continue troweling passes and restraighen until surface is smooth and uniform in texture.
- H. Construction Joints: Construct joints true to line with faces perpendicular to surface plane of concrete floor topping, at locations indicated or as approved by Architect.
 1. Coat face of construction joint with epoxy adhesive at locations where concrete floor topping is placed against hardened or partially hardened concrete floor topping.
- I. Contraction Joints: Form weakened-plane contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete floor topping when cutting action will not tear, abrade, or otherwise damage surface and before random contraction cracks develop.
 1. Form joints in concrete floor topping over contraction joints in base slabs unless otherwise indicated.
 2. Construct contraction joints for a combined depth equal to topping thickness and not less than one-fourth of base-slab thickness.
 3. Construct contraction joints for a depth equal to one-half of concrete floor topping thickness, but not less than 1/2 inch deep.

3.4 PROTECTING AND CURING

- A. General: Protect freshly placed concrete floor topping from premature drying and excessive cold or hot temperatures.
- B. Begin curing immediately after finishing concrete floor topping. Cure by one or a combination of the following methods, in accordance with concrete floor topping manufacturer's written instructions:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for not less than seven days.
 3. Curing Compound: Apply uniformly in two coats in continuous operations by power spray or roller in accordance with manufacturer's written instructions.

3.5 JOINT FILLING

- A. Prepare and clean contraction joints and install semirigid joint filler, in accordance with manufacturer's written instructions, once topping has fully cured.
- B. Install semirigid joint filler full depth of contraction joints. Overfill joint and trim semirigid joint filler flush with top of joint after hardening.

3.6 REPAIR

- A. Defective Topping: Repair and patch defective concrete floor topping areas, including areas that have not bonded to concrete substrate.

END OF SECTION

SECTION 035413 - GYPSUM CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Self-leveling, gypsum cement underlayment for application below interior floor coverings.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum cement underlayment.
2. Reinforcement.
3. Primer.
4. Surface sealer.

1.3 FIELD CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place gypsum cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

PART 2 - PRODUCTS

2.1 GYPSUM CEMENT UNDERLAYMENTS

A. Gypsum Cement Underlayment: Self-leveling, gypsum cement product that can be applied in minimum uniform thickness of 1/8 inch to match adjacent floor elevations.

1. Cement Binder: Gypsum or blended gypsum cement as defined by ASTM C219.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F.

- D. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.
- E. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
 - 1. Emissions Requirements: Coating shall comply with either of the following:
 - a. Low-Emitting Materials: VOC emissions 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."
 - b. VOC Content: Provide coating with VOC content of 100 g/L or less.
- F. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare and clean substrate according to manufacturer's written instructions.
 - 1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
 - 2. Fill substrate voids to prevent underlayment from leaking.
- B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
 - 1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft. and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous calcium chloride test, ASTM F1869: Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 85 percent relative humidity level measurement, or as recommended by gypsum cement underlayment manufacturer.
- C. Wood Substrates: Mechanically fasten loose boards and panels to eliminate substrate movement and squeaks. Sand to remove coatings that might impair underlayment bond and remove sanding dust.

1. Install underlayment reinforcement recommended in writing by manufacturer.

- D. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond; prepare surfaces according to manufacturer's written instructions.
- E. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.2 INSTALLATION

- A. Mix and install underlayment components according to manufacturer's written instructions.
 - 1. Close areas to traffic during underlayment installation and for time period after installation recommended in writing by manufacturer.
 - 2. Coordinate installation of components to provide optimum adhesion to substrate and between coats.
 - 3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

- C. Install underlayment to produce uniform, level surface.
 - 1. Install a final layer without aggregate to product surface.
 - 2. Feather edges to match adjacent floor elevations.
- D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during installation and curing processes.
- E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
- F. Apply surface sealer at rate recommended by manufacturer.
- G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.3 INSTALLATION TOLERANCES

- A. Finish and measure surface, so gap at any point between gypsum cement underlayment surface and an unlevelled, freestanding, 10-foot- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

END OF SECTION

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Mortar and grout materials.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 ft. vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, use the equivalent thickness method for masonry units in accordance with ACI 216.1 units are listed by UL or a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
- B. Regional Materials: CMUs shall be manufactured within 500 miles of Project site.
- C. Regional Materials: CMUs shall be manufactured within 500 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- D. 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.

2.3 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime shall be manufactured within 500 miles of Project site.
- B. Water: Potable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- C. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested in accordance with ASTM C67/C67M. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

- A. Dimensions and Locations of Elements:
 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
 2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
 3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 ft., or 1/2-inch maximum.
 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
 3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.

4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 ft., or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.3 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

- A. Lay as follows:
 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.

- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Rake out mortar joints at to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.5 CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 - 7. Clean masonry with a proprietary acidic masonry cleaner applied according to manufacturer's written instructions.

3.6 MASONRY WASTE DISPOSAL

- A. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Products furnished, but not installed, under this Section include the following:
 - 1. Loose steel angles and plates.

PART 2 - PRODUCTS

2.1 METALS

- A. Regional Materials: Products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- B. Steel Plates, Angles, Bars, and Rods: ASTM A36/A36M.
- C. Steel W- and WT-shapes: ASTM A992/A992M.

2.2 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.

2.3 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.4 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, as needed to complete the Work.

2.5 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 REPAIRS

- A. Touchup Painting:
1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

END OF SECTION

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Rooftop equipment bases and support curbs
2. Wood blocking ,cants, and nailers.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of process and factory-fabricated product.
2. For preservative-treated wood products.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates:

1. 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.
2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Regional Materials: The following wood products shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.

1. Dimension lumber, except treated materials.
2. Laminated-veneer lumber.
3. Parallel-strand lumber.

4. Prefabricated wood I-joists.
 5. Rim boards.
- B. Maximum Moisture Content:
1. Boards: percent.
 2. Dimension Lumber: unless otherwise indicated.

2.2 PRESERVATIVE TREATMENT

- A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
- B. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

2.3 FASTENERS

- A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Do not splice structural members between supports unless otherwise indicated.
- D. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- E. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.

3.2 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 wet enough 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

SECTION 066400 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes plastic sheet paneling.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PLASTIC SHEET PANELING

- A. Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D5319. Panels are to be USDA accepted for incidental food contact.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Nudo Products, Inc.
 - b. Parkland Plastics, Inc.
 - c. Altro (Basis of design. Refer to Architect if substitution necessary.).
 - 2. Nominal Thickness: Not less than 0.12 inch.
 - 3. Surface Finish: Molded pebble texture.
 - 4. Color: White (See Schedule on A800).

2.2 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners,[outside corners,] and caps as needed to conceal edges.
 - 1. Color: White .
 - 2. Adhesives shall have a VOC content of 50 g/L or less.
- B. Sealant: Mildew-resistant, single-component, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."

1. Sealant shall have a VOC content of 250 g/L or less.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that could impair adhesive bond, including oil, grease, dirt, and dust.
- B. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.
- C. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.

3.2 INSTALLATION

- A. Install plastic paneling according to manufacturer's written instructions.
- B. Install panels in a full spread of adhesive.
- C. Install trim accessories with adhesive. Do not fasten through panels.
- D. Fill grooves in trim accessories with sealant before installing panels, and bed inside corner trim in a bead of sealant.
- E. Maintain uniform space between panels and wall fixtures. Fill space with sealant.
- F. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION

SECTION 070150.19 - PREPARATION FOR REROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Full tear-off of entire roof system.
2. Re-cover preparation of entire roof area.
3. Removal of flashings and counterflashings.

1.2 FIELD CONDITIONS

A. Existing Roofing System: EPDM roofing.

B. Owner will occupy portions of building immediately below reroofing area.

1. Conduct reroofing so Owner's operations are not disrupted.
2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
4. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.
 - a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

1. A roof moisture survey of existing roofing system is available for Contractor's reference.
2. The results of an analysis of test cores from existing roofing system are available for Contractor's reference.

3. Construction Drawings for existing roofing system are provided for Contractor's convenience and information, but they are not a warranty of existing conditions. They are intended to supplement rather than serve in lieu of Contractor's own investigations. Contractor is responsible for conclusions derived from existing documents.
- F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
1. Remove only as much roofing in one day as can be made watertight in the same day.

PART 2 - PRODUCTS

2.1 AUXILIARY REROOFING MATERIALS

- A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing and new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.
- B. Shut off rooftop utilities and service piping before beginning the Work.
- C. Test existing roof drains to verify that they are not blocked or restricted.
1. Immediately notify Architect of any blockages or restrictions.
- D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.
1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
- E. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- F. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.
1. Prevent debris from entering or blocking roof drains and conductors.
 - a. Use roof-drain plugs specifically designed for this purpose.

- b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
- 2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.
 - a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

- A. Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.
- B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.
- C. Full Roof Tear-off: Remove existing roofing and other roofing system components down to the existing roof deck.
 - 1. Remove substrate board vapor retarder roof insulation and cover board.
 - 2. Remove base flashings and counter flashings.
 - 3. Remove perimeter edge flashing and gravel stops.
 - 4. Remove copings.
 - 5. Remove expansion-joint covers.
 - 6. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
 - 7. Remove wood blocking, curbs, and nailers.
 - 8. Remove fasteners from deck or cut fasteners off slightly above deck surface.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of roofing system.
- B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect.
 - 1. Do not proceed with installation until directed by Architect.
- C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.
 - 1. Do not proceed with installation until directed by Architect.

3.4 BASE FLASHING REMOVAL

- A. Remove existing base flashings.

1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain.
1. Replace metal counterflashings damaged during removal with counterflashings specified in Section 076200 "Sheet Metal Flashing and Trim."
- C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage.
1. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

END OF SECTION

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass-fiber blanket insulation.

1.2 ACTION SUBMITTALS

A. Product data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than Class A, 25 and 450 when tested in accordance with ASTM E84.
- B. Fire-Resistance Ratings: Comply with ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.
- C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- D. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- E. Thermal-Resistance Value (R-Value): R-value as indicated on Drawings in accordance with ASTM C518.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or those that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products, applications and applicable codes.
- 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. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members in accordance with 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. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 - 5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 - 6. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install unfaced blanket insulation over ceiling area in thickness indicated. Where partitions occur, extend insulation up either side of partition.
 - 7. For wood-framed construction, install blankets in accordance with ASTM C1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 - 8. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

- a. Exterior Walls: Set units with facing placed toward exterior of construction.
- b. Interior Walls: Set units with facing placed toward areas of high humidity.

3.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. 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

SECTION 075423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered polyolefin (TPO) roofing system.
2. Accessory roofing materials.
3. Roof insulation.
4. Insulation accessories and cover board.
5. Walkways.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accelerated Weathering: Roof membrane to withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
- B. Impact Resistance: Roof membrane to resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- C. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and are listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.
 1. Fire/Windstorm Classification: Class 1A-60 .
 2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 MH.

- D. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- E. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING SYSTEM

- A. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, fabric-backed TPO sheet.
 - 1. 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:
 - a. Carlisle Syntec Systems.
 - b. Firestone Building Products.
 - c. Johns Manville; a Berkshire Hathaway company.
 - 2. Thickness: 60 mils, nominal.

2.3 ACCESSORY ROOFING MATERIALS

- A. General: Accessory materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Bonding Adhesive: Manufacturer's standard, water based.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- G. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 ROOF INSULATION

- A. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
 - 1. 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:
 - a. Carlisle Syntec Systems.
 - b. Firestone Building Products.
 - c. Johns Manville; a Berkshire Hathaway company.
 - 2. Size: 48 by 48 inches.
 - 3. Thickness:
 - a. Base Layer: 1-1/2 inches.
- B. Tapered Insulation: Provide factory-tapered insulation boards.
 - 1. Material: Match roof insulation.
 - 2. Minimum Thickness: 1/4 inch.
 - 3. Slope:
 - a. Roof Field: 1/4 inch per foot unless otherwise indicated on Drawings.
 - b. Saddles and Crickets: 1/4 inch per foot unless otherwise indicated on Drawings.

2.5 INSULATION ACCESSORIES AND COVER BOARD

- A. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.
- B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Adhesives and sealants shall comply with the following limits for VOC content:
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Contact Adhesives: 80 g/L.
 - f. PVC Welding Compounds: 510 g/L.
 - g. Other Adhesives: 250 g/L.
 - h. Single-Ply Roof Membrane Sealants: 450 g/L.
 - i. Nonmembrane Roof Sealants: 300 g/L.

- j. Sealant Primers for Nonporous Substrates: 250 g/L.
 - k. Sealant Primers for Porous Substrates: 775 g/L.
- C. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric; water permeable and resistant to UV degradation; type and weight as recommended by roofing system manufacturer for application.

2.6 WALKWAYS

- A. Walkway Roof Pavers: Heavyweight, hydraulically pressed concrete units, [square edged] [with top edges beveled 3/16 inch], factory cast for use as roof pavers; absorption not greater than 5 percent, ASTM C140/C140M; no breakage and maximum 1 percent mass loss when tested for freeze-thaw resistance, ASTM C67; and as follows:
- 1. 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:
 - a. Hanover Architectural Products.
 - b. Roofblok Limited.
 - c. Sunny Brook Pressed Concrete, Co.
 - d. Wausau Tile, Inc.
 - e. Westile Roofing Products; Oldcastle APG, Inc.; CRH Americas, Inc.
 - 2. Size: 24 by 24 inches. Manufacture pavers to dimensional tolerances of plus or minus 1/16 inch in length, height, and thickness.
 - 3. Colors and Textures: As indicated by manufacturer's designations.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

3.2 PREPARATION

- A. Perform fastener-pullout tests according to roof system manufacturer's written instructions.
- 1. Submit test result within 24 hours after performing tests.
 - a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav listed roof assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.
- C. Install roof membrane and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing roofing system.

3.4 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.
- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Installation Over Metal Decking:
 - 1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows.
 - a. Locate end joints over crests of decking.
 - b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Loosely lay base layer of insulation units over substrate.
 - i. Mechanically attach base layer of insulation using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.

- 1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
 - 2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.
2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
- a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. Fill gaps exceeding 1/4 inch with insulation.
 - f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

3.5 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 2. At internal roof drains, conform to slope of drain sump.
 - a. Trim cover board so that water flow is unrestricted.
 3. Cut and fit cover board tight to nailers, projections, and penetrations.
 4. Loosely lay cover board over substrate.
 5. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav listed roof assembly requirements for specified Windstorm Resistance Classification and FM Global Property Loss Prevention Data Sheet 1-29, as follows:
 - a. Set cover board in a solid mopping of hot roofing asphalt, applied within plus or minus 25 deg F of equiviscous temperature.
 - b. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
 - c. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- B. Install slip sheet over cover board and beneath roof membrane.

- C. Place plates on insulation in required fastening patterns to achieve FM rating and secure in accordance with manufacturer's instructions.
 - 1. Install plates and fasteners tight and flat to substrate with no dimpling, and with fastener extending 1 inch minimum into roof deck; do not overdrive fasteners.

3.6 INSTALLATION OF ADHERED ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Owner's testing and inspection agency.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

3.7 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 INSTALLATION OF WALKWAYS

- A. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions.
 - 1. Install roof paver walkways at the following locations:
 - a. Perimeter of each rooftop unit.
 - b. Between each rooftop unit location, creating a continuous path connecting rooftop unit locations.
 - c. Between each roof hatch and each rooftop unit location or path connecting rooftop unit locations.
 - d. Top and bottom of each roof access ladder.
 - e. Between each roof access ladder and each rooftop unit location or path connecting rooftop unit locations.
 - f. Locations indicated on Drawings.
 - g. As required by roof membrane manufacturer's warranty requirements.
 - 2. Provide 3 inches of space between adjacent roof pavers.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.
- B. Perform the following tests:
 - 1. Infrared Thermography: Testing agency surveys entire roof area using infrared color thermography according to ASTM C1153.
 - a. Perform tests before overlying construction is placed.
 - b. After infrared scan, locate specific areas of leaks by electrical capacitance/impedance testing or nuclear hydrogen detection tests.
 - c. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
 - 1) Cost of retesting is Contractor's responsibility.
 - d. Testing agency to prepare survey report of initial scan indicating locations of entrapped moisture, if any.
 - 2. Electrical Capacitance/Impedance Testing: Testing agency surveys entire roof area for entrapped water within roof assembly according to ASTM D7954/D7954M.

- a. Perform tests before overlying construction is placed.
 - b. After testing, repair leaks, repeat tests, and make further repairs until roofing and flashing installations are watertight.
 - 1) Cost of retesting is Contractor's responsibility.
 - c. Testing agency to prepare survey report indicating locations of entrapped moisture, if any.
 - 3. Low-Voltage ELD Testing: Testing agency surveys entire roof area and flashings to locate discontinuities in the roof membrane using low-voltage horizontal membrane scanning platform in accordance with ASTM D8231.
 - a. Perform tests before overlying construction is placed.
 - b. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.
 - 1) Cost of retesting is Contractor's responsibility.
 - c. Testing agency to prepare survey report indicating locations of initial discontinuities, if any.
 - 4. High-Voltage Membrane Testing: Testing agency surveys entire roof area, to locate discontinuity in the roof membrane using an electrically charged metal "broom head."
 - a. Perform tests before overlying construction is placed.
 - b. After testing, repair areas of discontinuities, repeat tests, and make further repairs until roofing and flashing installations are contiguous.
 - 1) Cost of retesting is Contractor's responsibility.
 - c. Testing agency to prepare survey report indicating locations of initial discontinuities, if any.
 - C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
 - D. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- 3.10 PROTECTING AND CLEANING
- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sheet metal materials.

1.2 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings: For sheet metal flashing and trim.

1. Plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. FM Approvals Listing: Manufacture and install roof edge flashings and copings that comply with requirements in FM Approvals 4471 as part of a roofing system and that are listed in FM Approvals' "Approval Guide" and approved for windstorm classification, Class 1A-60. Identify materials with name of fabricator and design approved by FM Approvals.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METAL MATERIALS

- A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: Coil-coated sheet, ASTM B209/B209M, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - 1. Thickness: 0.050 inch.
 - 2. Surface: Smooth, flat.
 - 3. Exposed Coil-Coated Finish:
 - a. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2.3 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

2.4 FABRICATION, GENERAL

- A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.
 - 1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.

4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances:
1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 ft. on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
 2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.
- C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.
- E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- G. Seams:
1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
 3. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, 4-inch- wide wall flanges to interior, and base extending 4 inches beyond cant or tapered strip into field of roof. Fabricate from the following materials:
1. Aluminum: 0.032 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrates, and other conditions affecting performance of the Work.
 - 1. Verify compliance with requirements for installation tolerances of substrates.
 - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 - 3. Verify that air- or water-resistant barriers have been installed over substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF SHEET METAL FLASHING AND TRIM, GENERAL

- A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.
 - 1. Install fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
 - 3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
 - 4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.
 - 5. Install continuous cleats with fasteners spaced not more than 12 inches o.c.
 - 6. Space individual cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
 - 8. Do not field cut sheet metal flashing and trim by torch.
 - 9. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of uncoated-aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.

2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.
1. Space movement joints at maximum of 10 ft. with no joints within 24 inches of corner or intersection.
 2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 3. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated.
 - a. Embed hooked flanges of joint members not less than 1 inch into sealant.
 - b. Form joints to completely conceal sealant.
 - c. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way.
 - d. Adjust setting proportionately for installation at higher ambient temperatures.
- 1) Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

- G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

3.3 INSTALLATION OF SLOPED ROOF SHEET METAL FABRICATIONS

- A. Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard.
1. Provide concealed fasteners where possible, and set units true to line, levels, and slopes.
 2. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing:
1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.

2. Anchor to resist uplift and outward forces in accordance with recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
 3. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless steel draw band and tighten.

3.4 INSTALLATION TOLERANCES

- A. Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 ft. on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

3.6 PROTECTION

- A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Manufactured units for the following applications:

1. Copings.

1.2 ACTION SUBMITTALS

- A. Product data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. FM Approvals' Listing: Manufacture and install copings that are listed in FM Approvals' "Approval Guide" and approved for windstorm classification, Class 1-60. Identify materials with FM Approvals' markings.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 COPINGS

- A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding 12 ft., concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
1. 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:

- a. Architectural Products Company.
 - b. Drexel Metals.
 - c. Metal-Era, Inc.
- 2. Formed Aluminum Coping Caps: Aluminum sheet, 0.050 inch thick.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: Black As indicated by manufacturer's designations.
- 3. Corners: Factory mitered and continuously welded.

2.3 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install roof specialties in accordance with manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer's written installation instructions.

1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
1. Space movement joints at a maximum of 12 ft. with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal concealed joints with butyl sealant as required by roof specialty manufacturer.
- F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.2 INSTALLATION OF COPINGS

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.
1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at manufacturer's required spacing that meets performance requirements.
 2. Interlock face-leg drip edge into continuous cleat anchored to substrate at manufacturer's required spacing that meets performance requirements. Anchor back leg of coping with screw fasteners and elastomeric washers at manufacturer's required spacing that meets performance requirements.

3.3 INSTALLATION OF ROOF-EDGE SPECIALTIES

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.4 CLEANING AND PROTECTION

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Manufactured units for the following applications:
 - 1. Roof curbs.
 - 2. Equipment supports.
 - 3. Heat and smoke vents.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design roof curbs equipment supports to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2.2 ROOF CURBS

- A. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

2.3 EQUIPMENT SUPPORTS

- A. metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded corner joints, and integrally formed structure-mounting flange at bottom.
- B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500, "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install roof accessories in accordance with manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
 - 3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
 - 4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended in writing by manufacturer's written installation instructions.
 - 1. Coat concealed side of uncoated aluminum roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

3.2 INSTALLATION OF ROOF ACCESSORIES

- A. Roof Curb: Install each roof curb so top surface is level.
- B. Equipment Support: Install equipment supports so top surfaces are level with each other.
- C. Heat and Smoke Vent:
 - 1. Install heat and smoke vent so top perimeter surfaces are level.

2. Install and test heat and smoke vents and their components for proper operation in accordance with NFPA 204.
- D. Seal joints with sealant as required by roof accessory manufacturer.

3.3 CLEANING AND PROTECTION

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.
- B. On completion of installation, clean exposed surfaces in according with manufacturer's written instructions. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as roof accessories are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof accessories in a clean condition during construction.
- D. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics:

1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
2. Test in accordance with testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestop systems installed with products bearing the classification marking of a qualified testing agency.
 - 1) UL in its online directory "Product iQ."
 - 2) Intertek Group in its "Directory of Building Products."
 - 3) FM Approvals in its "Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems are to be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF PENETRATION FIRESTOPPING SYSTEMS

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- C. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- D. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. from end of wall and at intervals not exceeding 30 ft..
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."

2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.3 FIELD QUALITY CONTROL

- A. Owner will engage a qualified inspection agency to conduct and report on inspections in accordance with ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mildew-resistant joint sealants.

1.2 ACTION SUBMITTALS

A. Product data.

- ##### B. Samples:
- Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- ##### A. Compatibility:
- Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- ##### B. Colors of Exposed Joint Sealants:
- As indicated by manufacturer's designations.

2.2 MILDEW-RESISTANT JOINT SEALANTS

- ##### A. Mildew-Resistant Joint Sealants:
- Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- ##### B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT:
- Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.
1. 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:
 - a. Adfast.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.
 - c. Pecora Corporation.

- d. Sika Corporation - Building Components.
- e. Soudal USA.
- f. The Dow Chemical Company.
- g. Tremco Incorporated.

2.3 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
 - 1. 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:
 - a. Adfast.
 - b. Alcot Plastics Ltd.
 - c. Construction Foam Products; a division of Nomaco, Inc.
 - d. Master Builders Solutions.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 3. Remove laitance and form-release agents from concrete.
 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants in accordance with requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
 - 4. Provide flush joint profile at locations indicated on Drawings in accordance with Figure 8B in ASTM C1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated on Drawings in accordance with Figure 8C in ASTM C1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- H. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

- a. Extent of Testing: Test completed and cured sealant joints as follows:
 - 1) Perform 10 tests for the first 1000 ft. of joint length for each kind of sealant and joint substrate.
 - 2) Perform one test for each 1000 ft. of joint length thereafter or one test per each floor per elevation.
 - b. Test Method: Test joint sealants in accordance with Method A, Tail Procedure, in ASTM C1521.
 - 1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - c. Inspect tested joints and report on the following:
 - 1) Whether sealants filled joint cavities and are free of voids.
 - 2) Whether sealant dimensions and configurations comply with specified requirements.
 - 3) Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion complies with sealant manufacturer's field-adhesion hand-pull test criteria.
 - d. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant material, sealant configuration, and sealant dimensions.
 - e. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
2. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

C. Prepare test and inspection reports.

END OF SECTION

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
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.

C. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

PART 2 - PRODUCTS

2.1 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. Ceco Door; AADG, Inc.; ASSA ABLOY.
2. Curries, AADG, Inc.; ASSA ABLOY Group.
3. DCI Hollow Metal on Demand.
4. Fleming Door Products Ltd.; ASSA ABLOY Group.
5. Republic Doors and Frames; a Allegion brand.

2.2 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Standard-Duty Doors and Frames: ANSI/SDI A250.8, Level 1; ANSI/SDI A250.4, Level C. At locations indicated in the Door and Frame Schedule on Drawings.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: 1-3/4 inches.
 - c. Edge Construction: Model 2, Seamless.
 - d. Core: Manufacturer's standard .
 - e. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rated doors.
 - 2. Frames:
 - a. Construction: Full profile welded.
 - b. Factory finished.

2.3 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. .
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: 1-3/4 inches.
 - c. Edge Construction: Model 2, Seamless.
 - d. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - e. Bottom Edges: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - f. Core: Manufacturer's standard.
 - g. Fire-Rated Core: Manufacturer's standard core for fire-rated doors.
 - 2. Frames:

- a. Construction: Full profile welded.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.

B. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.5 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.

2.6 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 2. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule on Drawings, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.

PART 3 - EXECUTION

3.1 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. Touch up factory-applied finishes where spreaders are removed.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

- A. Hollow-Metal Frames: 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 without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - 2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
 - 3. Solidly pack mineral-fiber insulation inside frames.
 - 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 - 5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 - 6. Installation Tolerances: Adjust hollow-metal frames 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.
- B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8.
 - 2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
 - 3. Smoke-Control Doors: Install doors in accordance with NFPA 105.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 REPAIR

- A. 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.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint in accordance with manufacturer's written instructions.

- C. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 081213 - HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standard steel frames.

1.2 DEFINITIONS

- ##### A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 ACTION SUBMITTALS

- ##### A. Product Data: For each type of product.
- ##### B. Shop Drawings: Include elevations, frame profiles, metal thicknesses, and wall opening conditions.
- ##### C. Product Schedule: For hollow-metal frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

PART 2 - PRODUCTS

2.1 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. Ceco Door; AADG, Inc.; ASSA ABLOY.
 2. Curries, AADG, Inc.; ASSA ABLOY Group.
 3. Fleming Door Products Ltd.; ASSA ABLOY Group.
 4. Hollow Metal Xpress.
 5. Republic Doors and Frames; a Allegion brand.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 STANDARD STEEL FRAMES

- A. Construct hollow-metal frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Interior Standard Steel Frames: SDI A250.8. At locations indicated in the Door and Frame Schedule on Drawings.
- C. Factory finished.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

2.5 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

- B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.
- F. Power-Actuated Fasteners in Concrete: Fabricated from corrosion-resistant materials.

2.6 FABRICATION

- A. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding, or by rigid mechanical anchors.
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- B. Hardware Preparation: Factory prepare hollow-metal frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule on Drawings, and templates.
 - 1. Reinforce frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal frames for hardware.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install hollow-metal frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions. Comply with SDI A250.11.
- B. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - 1. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - 2. Install frames with removable stops located on secure side of opening.
- C. Fire-Rated Openings: Install frames according to NFPA 80.
- D. Solidly pack mineral-fiber insulation inside frames.
- E. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
- F. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- G. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.2 CLEANING AND TOUCHUP

- A. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Five-ply flush wood veneer-faced doors for transparent finish.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Wood Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252.
- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.2 FLUSH WOOD DOORS AND FRAMES, GENERAL

- A. Regional Materials: Wood doors shall be manufactured within 500 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site. If materials are transported by rail or water, the distance transported by rail or water shall be multiplied by 0.25 to determine the distance to Project site.
- B. Adhesives: Do not use adhesives that contain urea formaldehyde.
- C. Composite Wood Products: Products shall be made without urea formaldehyde.

2.3 SOLID-CORE, FIVE-PLY FLUSH WOOD VENEER-FACED DOORS FOR TRANSPARENT FINISH

- A. Interior Doors, Solid-Core Five-Ply Veneer-Faced :
 1. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 LIGHT FRAMES AND LOUVERS

- A. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated on Drawings. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.
- B. Wood Louvers: Door manufacturer's standard solid-wood louvers unless otherwise indicated.

2.5 FABRICATION

- A. Openings: Factory cut and trim openings through doors.
 - 1. Light Openings: Trim openings with moldings of material and profile indicated.
 - 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
 - 3. Louvers: Factory install louvers in prepared openings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
- C. Install frames level, plumb, true, and straight.
 - 1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
 - 2. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - a. Secure with countersunk, concealed fasteners and blind nailing.
 - b. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
 - 1) For factory-finished items, use filler matching finish of items being installed.
 - 3. Install smoke- and draft-control doors in accordance with NFPA 105.
- D. Job-Fitted Doors:
 - 1. Align and fit doors in frames with uniform clearances and bevels as indicated below.

- a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
- 2. Machine doors for hardware.
- 3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
- 4. Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.
- 5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
- 6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- E. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- F. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.2 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hinges.
2. Continuous, pin-and-barrel-type hinges.
3. Electric strikes.
4. Exit devices and auxiliary items.
5. Lock cylinders.
6. Key control cabinet.
7. Surface closers.
8. Wall- and floor-mounted stops.
9. Overhead stops and holders.
10. Thresholds.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

- A. Product data.
- B. Shop Drawings: For electrified door hardware.
 1. Diagrams for power, signal, and control wiring.
 2. Details of interface of electrified door hardware and building safety and security systems.
- C. Samples: For each exposed product in each finish specified.
- D. Door hardware schedule.
- E. Keying schedule.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain each type of door hardware from single manufacturer.
 - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested in accordance with UL 1784 and installed in compliance with NFPA 105.
 - 1. Air-Leakage Rate: Maximum air leakage of 0.3 cfm per sq. ft. at the tested pressure differential of 0.3 inch wg of water.
- C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the USDOJ's "2010 ADA Standards for Accessible Design".

2.3 HINGES

- A. Hinges: ANSI/BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 - 1. 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:
 - a. Baldwin; part of the Spectrum Brands Hardware and Home Improvement Group (HHI).
 - b. Hager Companies.

- c. Lawrence Hardware Inc.
- d. STANLEY; dormakaba USA, Inc.

2.4 SELF-CLOSING HINGES AND PIVOTS

- A. Self-Closing Hinges and Pivots: ANSI/BHMA A156.17.
 - 1. 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:
 - a. Design Hardware; Mesker Openings Group; dormakaba.
 - b. Hager Companies.
 - c. STANLEY; dormakaba USA, Inc.

2.5 CONTINUOUS HINGES

- A. Continuous, Pin-and-Barrel-Type Hinges: ANSI/BHMA A156.26; minimum 0.120-inch- thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
 - 1. 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:
 - a. Hager Companies.
 - b. Lawrence Hardware Inc.
 - c. STANLEY; dormakaba USA, Inc.

2.6 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.

2.7 ELECTRIC STRIKES

- A. Electric Strikes: ANSI/BHMA A156.31, Grade 1; with faceplate to suit lock and frame.
 - 1. 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:
 - a. Hager Companies.
 - b. Security Door Controls.
 - c. STANLEY; dormakaba USA, Inc.

2.8 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: ANSI/BHMA A156.3.
 - 1. 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:
 - a. Design Hardware; Mesker Openings Group; dormakaba.
 - b. Hager Companies.
 - c. Lawrence Hardware Inc.
 - d. STANLEY; dormakaba USA, Inc.

2.9 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.
 - 1. 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:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. STANLEY; dormakaba USA, Inc.
- B. Standard Lock Cylinders: ANSI/BHMA A156.5, Grade 1 permanent cores; face finished to match lockset.
 - 1. Core Type: 7-pin, Removable.
- C. High-Security Lock Cylinders: ANSI/BHMA A156.30, Grade 1 permanent cores that are removable; face finished to match lockset.
 - 1. Type M, mechanical Type E, electrical.
- D. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 5 construction master keys.
- E. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 5 construction master keys.

2.10 KEYING

- A. Keying System: Factory registered, complying with guidelines in ANSI/BHMA A156.28, appendix. Provide 5 extra key blank for each lock. Incorporate decisions made in keying conference.

- B. Keys: Nickel silver.

2.11 SURFACE CLOSERS

- A. Surface Closers: ANSI/BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. 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:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. STANLEY; dormakaba USA, Inc.

2.12 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: ANSI/BHMA A156.16.
 - 1. 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:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Rockwood Manufacturing Company; ASSA ABLOY Accessories and Door Controls Group, Inc.; ASSA ABLOY.

2.13 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: ANSI/BHMA A156.8.
 - 1. 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:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Standard Metal Hardware Manufacturing LTD.

2.14 DOOR GASKETING

- A. Door Gasketing: ANSI/BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. 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:
 - a. Hager Companies.
 - b. Legacy Manufacturing.
 - c. M-D Building Products, Inc.

2.15 THRESHOLDS

- A. Thresholds: ANSI/BHMA A156.21; fabricated to full width of opening indicated.
 1. 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:
 - a. Hager Companies.
 - b. Legacy Manufacturing.
 - c. M-D Building Products, Inc.
 - d. National Guard Products, Inc.

2.16 FINISHES

- A. Provide finishes complying with ANSI/BHMA A156.18 as indicated in door hardware schedule.
- B. Factory finished.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.
 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 2. Custom Steel Doors and Frames: HMMA 831.
 3. Wood Doors: DHI's "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. 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.

- C. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule, but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches of door height greater than 90 inches.
- D. 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.
- E. Key Control System:
 - 1. Key Control Cabinet: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- F. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Architect.
 - 1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.
- G. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- H. 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.
- I. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- J. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- K. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.2 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.3 DOOR HARDWARE SCHEDULE

- A. Hardware Set 1: Each door to have the following:

1. DOORS: 111B
 2. 1 1/2 pr Butt Hinges
 3. Storeroom Lockset
 4. Closer
 5. Wall Stop
 6. Silencers
- B. Hardware Set 2: Each door to have the following:
1. DOORS: 108, 118A
 2. 1 1/2 pr Butt Hinges
 3. Storeroom Lockset
 4. Closer
 5. Overhead Stop
 6. Silencers
- C. Hardware Set 3: Each door to have the following:
1. DOORS: NOT USED
 2. 1 1/2 pr Butt Hinges
 3. Classroom Lockset
 4. Closer
 5. Wall Stop
 6. Silencers
- D. Hardware Set 4: Each door to have the following:
1. DOORS: 104, 105A, 105B, 115, 116A, 116B, 120A
 2. 1 1/2 pr Butt Hinges
 3. Classroom Lockset
 4. Closer
 5. Overhead Stop
 6. Silencers
- E. Hardware Set 5: Each door to have the following:
1. DOORS: 103B, 109, 111A
 2. 1 1/2 pr Butt Hinges
 3. Passage Lockset
 4. Wall Stop
 5. Silencers
- F. Hardware Set 6: Each door to have the following:
1. DOORS: 100B
 2. 1 1/2 pr Butt Hinges
 3. Passage Lockset
 4. Overhead Stop
 5. Silencers

G. Hardware Set 7: Each door to have the following:

1. DOORS: 117, 119
2. 1 1/2 pr Butt Hinges
3. Privacy Lockset
4. Closer
5. Overhead Stop
6. Silencers

H. Hardware Set 8: Each door to have the following:

1. DOORS: 100A, 103A, 110A, 113B, 118B, 120B
2. Continuous Hinges
3. Entry Lockset
4. Electric lock
5. Threshold at exterior door
6. Weatherstrip
7. Closer
8. Kick plates both sides

I. Hardware Set 9: Each door to have the following:

1. DOORS: 101, 102A, 102B, 112A, 112B, 114, 121A, 121B, 122
2. 1 1/2 pr Butt Hinges
3. Office Lockset
4. Closer
5. Wall Stop

J. Hardware Set 11: Each door to have the following:

1. DOORS: 103C
2. 1 1/2 pr Butt Hinges
3. Office Lockset
4. Closer
5. Overhead Stop

K. Hardware Set 12: Each door to have the following:

1. DOORS: 107
2. 1 1/2 pr Butt Hinges
3. Electric Lock
4. Entry Lockset
5. Closer
6. Overhead Stop
7. Silencers

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.

1.2 COORDINATION

- ##### A.
- Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.3 ACTION SUBMITTALS

- ##### A.
- Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- ##### A.
- Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

2.2 GLASS PRODUCTS

- ##### A.
- Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.
1. 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:
 - a. AGC Glass Company North America, Inc.
 - b. Cardinal Glass Industries.
 - c. Guardian Glass; SunGuard.
 - d. Vitro Architectural Glass.

- B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

3.2 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.3 CLEANING AND PROTECTION

- A. Immediately after installation, remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
 - 1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

END OF SECTION

SECTION 088700 – WINDOW FILM

PART 1- GENERAL

1.1 SECTION INCLUDES

- A. Black Window Films

1.2 RELATED SECTIONS

- A. Section 08 54 13 - Fiberglass Windows.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.

B. Product Data: Manufacturer's current technical literature on each product to be used, including:

1. Manufacturer's Data Sheets.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods.

C. Verification Samples: For each film specified, two samples representing actual film color and pattern.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer.

1. Provide documentation that the adhesive used on the specified films is a Pressure Sensitive Adhesive (PSA).

B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five years demonstrated experience in installing products of the same type and scope as specified.

1. Provide documentation that the installer is authorized by the Manufacturer to perform Work specified in this section.
2. Provide a commercial building reference list of 5 properties where the installer has applied window films. This list will include the following information:
 - a. Name of building.
 - b. The name and telephone number of a management contact.
 - c. Type of glass.

- d. Type of film and/or film attachment system.
 - e. Amount of film and/or film attachment system installed.
 - f. Date of completion.
- 3. Provide a Glass Stress Analysis of the existing glass and proposed glass/film combination as recommended by the film manufacturer.
- 4. Provide an EFilm application analysis to determine available energy cost reduction and savings.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Follow Manufacturer's instructions for storage and handling.
- B. Store products in manufacturer's unopened packaging until ready for installation.
- C. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.7 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 - PRODUCTS

2.1 PREFORMANCE REQUIREMENTS

- A. Black, completely opaque, polyester film with a high-gloss finish. This film is made of multilayered durable polyester for 100% light blocking applications and is supplied with a silicone coated liner which protects the clear, pressure-sensitive adhesive. It is

designed for application to interior glass or on the outside surface of exterior glass. This ideal privacy film is very easy to install because it is thinner than standard blackout films.

B. Flammability Rating: This product should meet ASTM E84 and is classified as Class A as defined in NFPA 101, Life Safety Code®.

2.2 MANUFACTURERS

A. Acceptable Manufacturer:

1. Basis-of-Design: SOLYX Glass Finishes
2. 3M
3. Solar Art

2.3 BLACK OUT WINDOW FILM

A. Basis of design product: SOLYX □ SXWF-BO Blackout is a black, completely opaque, polyester film with a high-gloss finish, ideal for obscuring direct visibility. If substitution necessary find product with like qualities.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Film Examination:

1. If preparation of glass surfaces is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
 - a. Glass surfaces receiving new film should first be examined to verify that they are free from defects and imperfections, which will affect the final appearance.
2. Do not proceed with installation until glass surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
3. Commencement of installation constitutes acceptance of conditions.

B. Impact Protection Attachment Sealant Examination:

1. If application of window film is/was the responsibility of another installer, notification in writing shall be made of deviations from manufacturer's recommended installation tolerances and conditions.

2. Filmed glass surfaces receiving new attachment should first be examined to verify that they are free from defects and imperfections, and that the film edges extend sufficiently to the frame edges.
3. Do not proceed with installation until film and frame surfaces have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result under the project conditions.
4. Upon the customer's request, an adhesion test to the frame surface may be conducted by applying a 4 - 6 inch long bead, approximately 0.5 - 1 inch in width, masking one side of the frame surface underneath the strip with tape. Allow the Impact Protection Adhesive to cure for 7 days and test adhesion by pulling up on the masked end and a 90 degree angle. If cohesive failure is observed (adhesive residue left behind on the frame surface), adhesion is acceptable; if adhesive failure is observed (clean peel from the frame), adhesion is unacceptable and product is not recommended.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Refer to Manufacturer's installation instructions for methods of preparation for Impact Protection Adhesive or Impact Protection Profile film attachment systems.

3.3 INSTALLATION

A. Film Installation, General:

1. Install in accordance with manufacturer's instructions.
2. Cut film edges neatly and square at a uniform distance of 1/8 inch (3 mm) to 1/16 inch (1.5 mm) of window sealant. Use new blade tips after 3 to 4 cuts.
3. Spray the slip solution, composed of one capful of baby shampoo or dishwashing liquid to 1 gallon of water, on window glass and adhesive to facilitate proper positioning of film.
4. Apply film to glass and lightly spray film with slip solution.
5. Squeegee from top to bottom of window. Spray slip solution to film and squeegee a second time.
6. Bump film edge with lint-free towel wrapped around edge of a 5-way tool.

7. Upon completion of film application, allow 30 days for moisture from film installation to dry thoroughly, and to allow film to dry flat with no moisture dimples when viewed under normal viewing conditions.

8. If completing an exterior application, check with the manufacturer as to whether edge sealing is required.

B. Impact Protection Attachment Sealant Installation:

1. The film attachment system shall be applied according to the specifications of the Manufacturer by an Authorized Dealer/Applicator. Refer to 3M publication, 70-0709-0322-7, 3M Impact Protection Adhesive Attachment System Installation Instructions.

a. For blast mitigation: minimum 1/2 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).

b. For windborne debris protection: minimum 3/8 inch bead overlap on both frame and film (excluding glazing stops or compression gaskets).

2. To ensure a straight and consistent bead width is achieved, masking tape may be applied to film and frame surfaces prior to application.

3. With prior approval of the building owner or property manager, existing compression gaskets may be partially removed or trimmed to allow for a thinner bead and stronger anchorage. If removing the gaskets, sections shall be trimmed approximately 3 inches in length and inserted with appropriate spacing along all sides of the window to help secure the glazing during application and curing of the Impact Protection Adhesive.

4. The Impact Protection Adhesive shall be dispensed with a caulk gun with nozzle opening diameter sized to match the approximate size of the desired bead width.

5. A plastic putty knife or other tool with a clean straight edge shall be used to trowel and smooth out the adhesive. The completed adhesive bead shall be relatively triangular in shape.

6. Any masking tape used shall be carefully removed within 10 minutes after applying the wet glaze.

3.4 CLEANING AND PROTECTION

A. Remove left over material and debris from Work area. Use necessary means to protect film before, during, and after installation.

B. Touch-up, repair or replace damaged products before Substantial Completion.

C. After application of film, wash film using common window cleaning solutions, including ammonia solutions, 30 days after application. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

END OF SECTION

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Framing systems.
 - 2. Suspension systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, in accordance with ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C645 requirements for metal unless otherwise indicated
- C. Studs and Track: ASTM C645.
 - 1. 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:
 - a. CEMCO; California Expanded Metal Products Co.
 - b. Custom Stud.
 - c. MRI Steel Framing, LLC.
 - d. Phillips Manufacturing Co.
 - 2. Depth: 3-5/8 inches.

- D. Firestop Tracks: Top track manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - 1. 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:
 - a. CEMCO; California Expanded Metal Products Co.
 - b. Fire Trak Corp.
 - c. Metal-Lite.

2.3 SUSPENSION SYSTEMS

- A. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- B. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C841 that apply to framing installation.
 - 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
 - 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C844 that apply to framing installation.
 - 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLATION OF FRAMING SYSTEMS

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - 1. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 - 2. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - 3. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
 - 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - 5. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches o.c.
- E. Direct Furring:
 - 1. Screw to wood framing.

2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 INSTALLATION OF SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. Do not attach hangers to steel roof deck.
 5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 7. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

3.4 FIELD QUALITY CONTROL

- A. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

1.2 ACTION SUBMITTALS

A. Product data.

B. Samples: For each texture finish indicated on same backing indicated for Work.

C. Sustainable Design Submittals:

1. Laboratory Test Reports: For ceiling and wall materials, indicating compliance with requirements for low-emitting materials.

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 in accordance with ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

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

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C1396/C1396M.

1. 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:
 - a. Armstrong Ceiling & Wall Solutions.
 - b. Georgia-Pacific Gypsum LLC.
 - c. USG Corporation.
 2. Thickness: 1/2 inch.
- B. Gypsum Board, Type X: ASTM C1396/C1396M.
1. 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:
 - a. American Gypsum.
 - b. Certainteed; SAINT-GOBAIN.
 - c. Continental Building Products Inc.
 - d. Georgia-Pacific Gypsum LLC.
 - e. Gold Bond Building Products, LLC provided by National Gypsum Company.
 - f. PABCO Gypsum.
 - g. Panel Rey.
 - h. USG Corporation.
 2. Thickness: 5/8 inch.
- C. Gypsum Ceiling Board: ASTM C1396/C1396M.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum.
 - b. Georgia-Pacific Gypsum LLC.
 - c. USG Corporation.
 2. Thickness: 1/2 inch.
 3. Long Edges: Tapered.
- D. Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
1. 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:
 - a. American Gypsum.
 - b. Certainteed; SAINT-GOBAIN.

- c. Continental Building Products Inc.
 - d. Georgia-Pacific Gypsum LLC.
 - e. Gold Bond Building Products, LLC provided by National Gypsum Company.
- f. PABCO Gypsum.
 - g. USG Corporation.
- 2. Core: 5/8 inch, Type X.
- 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized-steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Fill Coat: For second coat, use setting-type, sandable topping compound.
 - 3. Finish Coat: For third coat, use setting-type, sandable topping compound.
 - 4. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

PART 3 - EXECUTION

3.1 INSTALLATION OF PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C840.

- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. 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.

3.2 FINISHING OF GYPSUM BOARD

- A. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- B. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- C. Gypsum Board Finish Levels: Finish panels to levels indicated below and in accordance with ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: Panels that are substrate for acoustical tile.
 - 3. Level 3: Where indicated on Drawings.
 - 4. Level 4: [At panel surfaces that will be exposed to view unless otherwise indicated] <Insert locations>.
 - 5. Level 5: Where indicated on Drawings.

3.3 APPLICATION OF TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION

SECTION 095123 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical tiles.
2. Metal suspension system.
3. Accessories.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Ceiling 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."
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.
- C. Seismic Performance: Suspended ceilings to withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
- D. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: Class A in accordance with ASTM E1264.
 2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL TILES

- 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. Armstrong World Industries, Inc.
 2. Certainteed; SAINT-GOBAIN.
 3. USG Corporation.
- B. Acoustical Tile Standard, Type ACT1: Manufacturer's standard tiles of configuration indicated that comply with ASTM E1264.

- C. Acoustical Lay-In Ceiling Tile for Kitchen, Type ACT2: Manufacturer's standard tiles of configuration indicated that comply with ASTM E1264.
 - 1. Basis of Design Product: Subject to compliance with requirements, provide USG Clean Room™ Class 100 Acoustical Panels with Climaplus™ Performance by USG Corp.; or comparable, approved product.
- D. Color: White as selected from manufacturer's full range.

2.3 METAL SUSPENSION SYSTEM

- 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. Armstrong Ceiling & Wall Solutions.
 - 2. USG Corporation.
- B. Metal Suspension-System Standard: Manufacturer's standard, direct-hung, fully concealed, metal suspension system that complies with applicable requirements in ASTM C635/C635M.

PART 3 - EXECUTION

3.1 PREPARATION

- A. 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 unless otherwise indicated.
- B. Layout openings for penetrations centered on the penetrating items.

3.2 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

- A. Install suspended acoustical tile ceilings in accordance with ASTM C636/C636M, seismic design requirements, and manufacturer's written instructions.
- B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical tiles.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- C. Arrange directionally patterned acoustical tiles as indicated on reflected ceiling plan

END OF SECTION

ACOUSTICAL TILE CEILINGS
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SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic-rubber base.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- ##### A. 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 THERMOPLASTIC-RUBBER BASE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Johnsonite; A Tarkett Company. Basis of design, Consult Architect for substitution.
2. Nora Systems, Inc.
3. Roppe Corporation, USA.

B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).

1. Group: I solid, homogeneous.
2. Style and Location:

- a. Style B, Cove.

C. Thickness: 0.125 inch.

D. Height: 6 inches.

- E. Outside Corners: Job formed or preformed.
- F. Inside Corners: Job formed or preformed.
- G. Colors: Refer to schedule on Architectural drawings.

PART 3 - EXECUTION

3.1 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 10 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 materials are the same temperature as space where they are to be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION

SECTION 096519 – RESILIENT VINYL COMPOSITION TILES

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 Tile

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size samples of each resilient product color, texture, and pattern required.
- D. Product Schedule: For resilient products. Use same designations indicated on Drawings.

1.4 QUALITY ASSURANCE

- A. Installation Qualification: Contractors for floor covering installation should be experienced in managing commercial flooring projects and provide professional installers, qualified to install the various flooring materials specified. An installer is “qualified” if trained, or a certified INSTALL (International Standards & Training Alliance) resilient floor covering installer.
- B. Mockups: Provide resilient products 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, not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

1.1 PROJECT CONDITIONS

- A. Install resilient products after other finishing operations, including painting, have been completed.
- B. Maintain ambient temperatures within range recommended by Tarkett, but not less than 65 deg F (18 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- C. Maintain the ambient relative humidity between 40% and 60% during installation.
- D. Until Substantial Completion, maintain ambient temperatures within range, not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, 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. 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 TILE

- A. Subject to compliance with requirements, products that may be incorporated into the work.
- B. Acceptable Manufacturers:
 - 1. Tarkett: Basis-of-Design
 - 2. Armstrong Flooring
- C. Tile Standard: ASTM F1066, specify: Type II (Through Pattern)
- D. Thickness/Wearlayer: 0.125 inch.

- E. Colors and Patterns: As selected by Architect from full range of industry colors.
- F. Sizes specify: 12 by 12 inches.
- G. Test data:
 - 1. Heat Stability (ASTM F1514): $\Delta E \leq 8$
 - 2. Size/Squareness (ASTM F2055): Passes
 - 3. Deflection (ASTM F1304): Passes
 - 4. Chemical Resistance (ASTM F925): Passes
 - 5. Static Load Limit (ASTM F970): 150 psi, ≤ 0.005 inches
 - 6. Residual Indentation (ASTM F1914): Passes
 - 7. Slip Resistance (ASTM D2047): ≥ 0.5 SCOF
 - 8. Dimensional Stability (ASTM F2199): Passes
 - 9. Impact Resistance (ASTM F1265): Passes
 - 10. Flamability (ASTM E648 Critical Radiant Flux): Class 1 (≥ 0.45 W/cm²)
 - 11. Smoke Density (ASTM E662): ≤ 450
 - 12. Limited Commercial Warranty: 5 years

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation.
- B. Adhesives: As recommended by manufacturer of the chosen floor
 - 1. Resilient Vinyl Floor Tile
 - a. Clear Thin Spread Adhesive
 - b. Two-Part Urethane Adhesive
 - c. SpraySmart Adhesive

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic-cement-based formulation.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Prepare substrates according to written instructions from manufacturer to ensure proper adhesion of Resilient Flooring.
 - 1. Prepare concrete substrates in accordance with ASTM F 710.
 - a. Concrete floors must be free of dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, film-forming curing compounds, silicate penetrating curing compounds, sealing, hardening or parting compounds, alkaline salts, excessive carbonation or laitance, mold, mildew, and other foreign materials that may affect dissipation rate of moisture from the concrete, discoloration or adhesive bonding.
 - b. Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
 - c. Perform moisture testing as recommended by manufacturer. Proceed with installation only after substrates have been tested and meet the minimum requirements from the manufacturer in accordance with ASTM F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride or ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
 - d. A pH test for alkalinity must be conducted on the concrete floor prior to installation with results conforming to manufacturer requirements. If the test results are not within the acceptable range, then installation must not proceed until the problem has been corrected.
 - 2. Wood subfloors must have a minimum 18" (45.7 cm) of cross-ventilated space beneath the bottom of the joist.
 - a. The floor must be rigid, free of movement.
 - b. Single wood and tongue and groove subfloors should be covered with ¼" (6.4 mm) or ½" (12.7 mm) APA approved underlayment plywood.
 - 1) Use ¼" (6.4 mm) thick underlayment panels for boards with a face width of 3" (76 mm) or less.
 - 2) Use ½" (12.7 mm) thick underlayment panels for boards with a face width wider than 3" (76 mm).
 - c. Do not install over OSB (Oriented Strand Board), particle board, chipboard, lauan or composite type underlayment's.
- B. Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Floor covering shall not be installed over expansion joints.
- D. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT TILE FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient tile flooring.
- B. Vinyl Composition Flooring:
 - 1. Install with Manufacturer suggested adhesive specified for the site conditions and follow adhesive label for proper use.
 - 2. Follow manufacturers recommendation for tile orientation.
 - 3. Open enough cartons of floor tiles to cover each area and mix tile to ensure shade variations do not occur within any one area.
 - 4. Roll the flooring in both directions using a 100 pound three-section roller.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- B. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 - 1. No traffic for 24 hours after installation.
 - 2. No heavy traffic, rolling loads, or furniture placement for 48 hours after installation.
- D. Wait 48 hours after installation before performing initial cleaning.
- E. A regular maintenance program must be started after the initial cleaning.

END OF SECTION

SECTION 096713 - ELASTOMERIC LIQUID FLOORING

PART 1—GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

- A. Definitions: Elastomeric liquid flooring includes penetrating and sealing, two- component polymeric primer, free flowing polymer formulation including resin, curing agent and finely graded aggregate and powder.
- B. Related Work:
 - 1. Division 3 Section Case-in-place Concrete
 - 2. Division 7 Section Fluid Applied Waterproofing
 - 3. Division 7 Section Joint Sealers

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data, installation instructions and general recommendations for each resinous flooring material required. Include Health Product Declarations (HPD's) and certifications indicating compliance of materials with requirements.
- B. Samples: Submit, for verification purposes, 4.25-inch square samples of each type of elastomeric liquid flooring required, applied to a rigid backing, in color, finish, and top coat indicated.
- C. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on drawings in product schedule.
- D. Maintenance and Cleaning Data: For resinous flooring to include in maintenance manual.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility: Obtain primary, elastomeric liquid flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than ten (10) years of successful experience in manufacturing and installing principal materials described in this section. Contractor shall have completed at least five projects of similar size and complexity; Liquid Elements or approved equal. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.

- B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
 - 1. Contractor shall have completed at least ten (10) projects of similar size and complexity.
- C. Pre-Installation Conference:
 - 1. General contractor shall arrange a meeting not less than thirty days prior to starting work.
 - 2. Attendance:
 - a. General Contractor
 - b. Architect/Owner's Representative
 - c. Manufacturer/Installer's Representative
- D. Manufacturer Field Technical Service Representatives: Field Technical Service Representatives shall be employed by the system manufacturer to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.
- E. ISO 9001-2008: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9001 registered quality system.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.
- B. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate onsite mixing errors. No onsite weighing or volumetric measurements allowed.
- C. Store components protected from exposure to harmful weather conditions and in a temperature controlled area as recommended by manufacturer. Do not allow product to freeze.
- D. Deliver products to areas to receive moisture treatment at least 48 hours prior to application to allow them to acclimate to the space.

1.6 ENVIRONMENTAL CONDITIONS

- A. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier

must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

- B. Utilities, including electric, water, heat (air temperature between 65 and 85°F/18 and 30°C) and finished lighting to be supplied by General Contractor.
- C. Job area to be free of other trades during the installation and for a period of 24 hours after floor installation.
- D. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.
- E. Protection: precautions shall be taken to avoid damage or contamination of any surfaces near the work zone.
- F. Do not install product in this section until one (1) week after building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Manufacturer shall furnish a single written warranty covering both material and workmanship for a period of one (1) full year from date of installation.

PART 2 – PRODUCTS

2.1 RESINOUS FLOORING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the work.
- B. Acceptable Manufactures:
 - 1. Liquid Elements (The Stonhard Group) Basis of design. If substitution necessary, refer to Architect.
 - 2. Spartan Epoxies
 - 3. Epoxy Coating Specialist
- C. Products: Subject to compliance with requirements:
 - 1. See Schedule on A800
- D. System Characteristics:
 - 1. Color and Pattern: select from Liquid Elements standards.

2. Wearing Surface: medium
 3. Overall System Thickness: 2mm 1mm
- E. System Components: Manufacturer's standard components that are compatible with each other and as follows:
1. Primer Coat:
 - a. Material Basis: Stondri MVT epoxy primer.
 - b. Resin: epoxy.
 - c. Formulation Description: two (2) component, high solids, moisture suppressant.
 - d. Application Method: rubber squeegee back roll.
 - e. Number of Coats: one (1) (15 mils).
 2. Undercoat:

Smooth Mono: a. Material Basis: epoxy undercoat HT4. b. Resin: epoxy. c. Formulation Description: two (2) component, 100 percent solids. d. Type: pigmented. e. Number of Coats: one (1).	Undercoat Duo: a. Material Basis: epoxy undercoat HT4. b. Resin: epoxy. c. Formulation Description: two component, 100 percent solids. d. Type: pigmented. e. Number of Coats: one (1).
 3. Base System:

a. Material Basis: smooth mono. b. Resilient epoxy. c. Type: pigmented. d. Finish: standard. e. Number of Coats: one (1).	a. Material Basis: smooth duo, two (2) color blend. b. Resilient epoxy. c. Type: pigmented. d. Finish: gloss. e. Number of Coats: one (1).
 4. Topcoat:

Matte: a. Material Basis: waterbased aliphatic polyurethane/ polyurethane. b. Type: clear. c. Finish: matte. d. Number of Coats: two (2).	Satin: a. Material Basis: aliphatic polyurea. b. Type: clear with polymer microsphere. c. Finish: satin. d. Number of Coats: one (1).

Gloss Micro Texture:

 - a. Material Basis: aliphatic polyurethane/polyurea.
 - b. Type: clear with texture 1.
 - c. Finish: Gloss.
 - d. Number of Coats: one (1).

2.2 EPOXY FLOORING

A. Smooth Liquid Elements (678-498-2945) (manufactured by The Stonhard Group).

1. Physical Properties: Provide flooring system in which physical properties of topping including aggregate, when tested in accordance with standards or procedures referenced below, are as follows:
 - Tensile Strength..... 800 psi (ASTM D-638)
 - Hardness 80-85 (high gloss)
(ASTM D-2240/Shore A Durometer)
 - Scratch Resistance 17% reduction after 100 cycles (high gloss)
(F-1679/Soft Scrub) 50 in-lb
 - Impact Resistance 110 in-lb (high gloss)
(D-2794)
 - Indentation Resistance 32% Indentation/0% Residual Indentation
(F-1914)
 - Static Load Limit..... >250 psi
(F-970)
 - VOC Content Undercoat 58 g/L (high gloss)
(ASTM D-2369 Method E) Self-Levelers 15 g/L (high gloss)
 - Noise Reduction (2mm version only)
(ASTM E492-09/E989-06)..... 11C 34dB-35dB
(ASTM E90-09/E413-10 STC 49dB-50dB
 - Cure Rate Allow 24 hours for foot traffic
(at 77°F/25°C) 48-72 hours for normal operations

2.3 ACCESSORY MATERIALS

- A. Patching and Fill Material: Resinous products of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- B. Joint Sealant: Type produced by manufacturer of elastomeric liquid flooring system for type of service and joint condition indicated. Allowances should be included for Stonflex MP7 joint fill material.
- C. Glides and felt pads should be used on all table and chair legs, recommended diameter is 1-1/4" or greater.

PART 3 - EXECUTION

3.1 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Mechanically prepare substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and re-circulates the shot by vacuum pickup. Obtain a CSP3 profile.
 - b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
 - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
 - 3. Verify that concrete substrates are dry.
 - a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
 - b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 2-3 lb of water/1000 sq. ft. of slab in 24 hours.
 - c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.
 - 4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other non-moving substrate cracks to prevent cracks from

reflecting through resinous flooring according to manufacturer's written recommendations.

- F. Substrate: Must be a super flat and level floor, FFFL 50 ($<1/8''$ per 10' for flatness and $<1/8''$ per 1' for level).

3.2 APPLICATION

- A. General: Apply each component of elastomeric liquid flooring system in compliance with manufacturer's direction to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.
- B. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates.
- C. Base: Mix base material according to manufacturer's recommended procedures. Uniformly spread mixed material over previously primed and sealed substrate using manufacturer's specially designed squeegee. Roll material using manufacturer's specially designed roller. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
- D. Sealant: Mix and apply topcoat material over base with strict adherence to manufacturer's installation procedures and coverage rates.

3.3 TRANSITIONS

- A. Traditional "L" transitions are not recommended for use with self levelers, due to the inherent difficulty with obtaining a flush transition with a self leveling material. Where a flush transition is desired, please contact your local Liquid Elements representative.
- B. A "T" style transition is recommended when adjoining a similar height surface.

3.4 JOINTS AND CRACKS

- A. Treat control joints to bridge potential cracks and to maintain monolithic protection.
- B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
- C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

- A. The right is reserved to invoke the following material testing procedure at any time, and any number of times during period of flooring application.
- B. The Owner will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.
- C. Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.
- D. If test results show materials being used do not comply with specified requirements, Contractor may be directed by Owner to stop work; remove non-complying materials; pay for testing; reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials.

3.6 CURING, PROTECTION AND CLEANING

- A. Cure elastomeric liquid flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.
- B. Protect elastomeric liquid flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.
- C. Cleaning: Remove temporary covering and clean elastomeric liquid flooring just prior to final inspection. Use cleaning materials and procedures recommended by elastomeric liquid flooring manufacturer.

END OF SECTION 096713

SECTION 096723 – RESINOUS FLOORING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes one resinous flooring system, one with epoxy chemistry
 - 1. Application Method: Broadcast and stain.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required. Include Health Product Declaration (HPD's) and certifications indicating compliance of materials with requirements.
- B. Samples for Verification: For each resinous flooring system required, 4.25 inches (150 mm) square, applied to a rigid backing in color and finish and topcoat indicated.
- C. Product Schedule: Use resinous flooring designations indicated in Part 2 and room designations indicated on drawings in product schedule.
- D. Maintenance & Cleaning Data: For resinous flooring to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. No request for substitution shall be considered that would change the generic type of floor system specified (i.e. epoxy broadcast based system with stained concrete look). Equivalent materials of other manufactures may be substituted only on approval of Architect or Engineer. Request for substitution will only be considered only if submitted ten (10) days prior to bid date. Request will be subject to specification requirements described in this Section.
- B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.

1. Contractor shall have completed at least ten (10) projects of similar size and complexity.
- C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer, with not less than ten years of successful experience in manufacturing and installing principal materials described in this Section. Provide secondary materials, including patching and fill material, joint sealant, and repair materials of type and from source recommended by manufacturer of primary materials.
- D. Manufacturer Field Technical Service Representatives: Field Technical Services Representatives shall be employed by the system manufacturer to assist in the quality assurance and quality control process of the installation and shall be available to perform field problem solving issues with the installer.
- E. Mockups: Apply mockups to verify selections made under sample submittals, demonstrate aesthetic effects showing details including joints, and set quality standards for materials and execution.
 1. Apply full-thickness mockups on 48-inch (1200 mm) square floor area selected by Architect.
 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Pre-installation Conference:
 1. General Contractor shall arrange a meeting not less than thirty days prior to starting work.
 2. Attendance:
 - a. General Contractor.
 - b. Architect/Owner's Representative.
 - c. Manufacturer/Installer's Representative.
- G. ISO 9001-2008: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9001 registered quality system.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Add material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.

- B. Store components protected from exposure to harmful weather conditions and in a temperature controlled area as recommended by manufacturer. Do not allow product to freeze.
- C. Deliver products to areas to receive moisture treatment at least 48 hours prior to application to allow them to acclimate to the space.
- D. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate onsite mixing errors. No onsite weighing or volumetric measurements allowed.

1.6 ENVIRONMENTAL CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
 - 1. Maintain material and substrate temperature between 65 and 85°F (18 and 30°C) during resinous flooring application and for not less than 24 hours after application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.
- D. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.
- E. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone.
- F. Do not install product of this Section until one (1) week after building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) full year from date of installation, or provide a joint and several warranty signed on a single document by material manufacturer and applicator jointly and severally warranting the materials and workmanship for a period

of one (1) full year from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

PART 2 - PRODUCTS

2.1 RESINOUS FLOORING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include:
 - 1. Must comply with double broadcasting build. Liquid rich, slurry type systems will not be accepted, and will result in a disqualification from bid.
- B. Acceptable Manufactures:
 - 1. Liquid Elements (The Stonhard Group) Basis of design. If Substitution necessary, refer to Architect.
 - 2. Spartan Epoxies
 - 3. Epoxy Coating Specialist
- C. Products: Subject to compliance with requirements:
 - 1. See Schedule on A800
- D. System Characteristics:
 - 1. Color and Pattern: Select from Liquid Elements standards.
 - 2. Wearing Surface: medium.
 - 3. Overall System Thickness: 2mm.
- E. System Components: Manufacturer's standard components that are compatible with each other and as follows:
 - 1. Primer Coat:
 - a. Material Basis: Polished urethane primer.
 - b. Resin: urethane.
 - c. Formulation Description: two (2) components, 100 percent solids.
 - d. Application Method: squeegee back roll.
 - e. Number of Coats: one (1).
 - 2. Broadcast:
 - a. Material Basis: Texture #3 aggregate.
 - b. Type: non-pigmented.
 - c. Finish: standard.

- d. Number of Coats: one
- 3. Undercoat:
 - a. Material Basis: Polished epoxy undercoat.
 - b. Resin: epoxy.
 - c. Formulation Description: two (2) components, 100 percent solids.
 - d. Type: clear or pigmented.
 - e. Number of Coats: one (1).
- 4. Broadcast: Stainable aggregate:
 - a. Material Basis: Polished aggregate.
 - b. Type: non-pigmented.
 - c. Finish: standard.
 - d. Number of Coats: one (1).
- 5. Stain:
 - a. Material Basis: Polished stain.
 - b. Resin: single (1) component waterborne stain.
 - c. Formulation Description: waterborne.
 - d. Application Method: spray apply.
 - e. Number of Coats: multiple to desired color.
- 6. Sealer:

Finish Gloss: a. Material Basis: Polished sealer. b. Resin: epoxy. c. Formulation Description: two (2) component, 100 percent solids, stable. d. Type: clear. e. Number of Coats: one (1)	Finish Matte: a. Material Basis: Polished sealer. b. Resin: polyurethane. c. Formulation Description: two (2) component, flat, water based UV d. Type: clear. e. Number of Coats: two (2)

Note: Components listed above are the basis of design intent; all bids will be compared to this standard including resin chemistry, color, wearing surface, thickness, and installation procedures, including number of coats. Contractor shall be required to comply with all the requirements of the Specifications and all of the components required by the Specifications, whether or not such products are specifically listed above.

- F. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

- 1. Tensile Strength: 1,600 psi per ASTM D 638.
- 2. Flexural Strength: 4,000 psi per ASTM D 790.
- 3. Water Absorption: < 1% per ASTM C 413.
- 4. Impact Resistance: > 160 in. lbs. per ASTM D 2794.

- 5. Flammability: Class 1 per ASTM E-648.
- 6. Hardness: 85 to 90, Shore D per ASTM D 2240.
- 7. VOC Content: Primer 89 g/L
Undercoat 30 g/L
Sealer 34 g/L

2.2 ACCESSORY MATERIALS

- A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.
- B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service and joint condition indicated. Allowances should be included for Stonflex MP7 joint fill material.

PART 3 – EXECUTION

3.1 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
 - 1. Mechanically prepare substrates as follows:
 - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and re-circulates the shot by vacuum pickup. Obtain a CSP3 profile.
 - b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
 - 2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.
 - 3. Verify that concrete substrates are dry.
 - a. Perform in situ probe test, ASTM F 2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.

- b. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of 2-3 lb of water/1000 sq. ft. of slab in 24 hours.
 - c. Perform additional moisture tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- 4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other non-moving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

3.2 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
 - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
 - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
 - 3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
 - a. Apply joint sealant to comply with manufacturer's written recommendations.
- B. Apply primer where required by resinous system, over prepared substrate at manufacturer's recommended spreading rate.
- C. Broadcast: Immediately broadcast Texture #3 aggregate into the primer using manufacturer's specially designed spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

- D. Undercoat: Remove any surface irregularities by lightly abrading and vacuuming the floor surface. Mix and apply undercoat with strict adherence to manufacturer's installation procedures and coverage rates.
- E. Broadcast: Immediately broadcast stainable aggregate into the undercoat using manufacturer's specially designed spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.
- F. Spray apply single component translucent waterborne stain in number of coats per desired color finish for flooring system and at spreading rates recommended in writing by manufacturer.
- G. Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.3 TERMINATIONS/TRANSITIONS

- A. Chase edges to "lock" the flooring system into the concrete substrate along lines of termination.
- B. Penetration Treatment: Lap and seal flooring system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.
- C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.
- D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

3.4 JOINTS AND CRACKS

- A. Treat control joints to bridge potential cracks and to maintain monolithic protection.
- B. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.
- C. Discontinue floor coating system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.5 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may at any time and any number of times during resinous

flooring application require material samples for testing for compliance with requirements.

1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
3. If test results show applied materials do not comply with specified requirements, pay for testing, remove non-complying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

3.6 CLEANING, PROTECTING, AND CURING

- A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 18 hours.
- B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.
- C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Carpet tile.

PART 2 - PRODUCTS

2.1 CARPET TILE: CRPT-1

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Bentley Mills, Inc. Basis of Design, Consult Architect for any substitution.
2. Mohawk Carpet, LLC; The Mohawk Group.
3. Tarkett USA.

B. Color: As selected by Architect from manufacturer's full range, See Schedule.

C. Pattern: Match Architect's samples.

D. Fiber Content: 100 percent nylon 6,6.

E. Fiber Type: Bentley Premium Type 6,6 Nylon.

F. Pile Characteristic: Tufted Textured loop pile.

G. Pile Thickness: .325 in for finished carpet tile[in accordance with ASTM D6859].

H. Total Weight: 81 for finished carpet tile.

I. Backing System: LuxFelt Cushion .

J. Size: 18 by 36 inches.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended in writing by carpet tile manufacturer.

- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive types to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and that are recommended in writing by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
- D. Access Flooring Systems: Verify the following:
 - 1. Access floor substrate is compatible with carpet tile and adhesive if any.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates.
- B. Use trowelable leveling and patching compounds, in accordance with manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.
- D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns indicated on Drawings.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.
- H. Access Flooring: Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 13.7.
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 DELIVERY, STORAGE, AND HANDLING

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

1.2 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. PPG Paints. Basis of Design, see schedule. If substitution needed refer to Architect.
 - 2. Sherwin-Williams Company (The).
 - 3. Valspar Corporation (The).

2.2 PAINT PRODUCTS, GENERAL

- A. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

- B. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings 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."
- C. Emissions Requirements: Field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:
 - 1. Low-Emitting Materials: VOC emissions 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. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Primers, Sealers, and Undercoats: 100 g/L.
 - d. Shellacs, Clear: 730 g/L.
 - e. Shellacs, Pigmented: 550 g/L.
- D. VOC Emissions: For field applications inside the building, wall paints shall contain no more than half of the chronic REL of VOCs when tested according to 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." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

3.3 INSTALLATION

- A. Apply paints according to manufacturer's written instructions.
 - 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. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
 - 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.

3. Allow empty paint cans to dry before disposal.
 4. Collect waste paint by type and deliver to recycling or collection facility.
- 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.

3.5 INTERIOR PAINTING SCHEDULE

- A. Gypsum Board Substrates:
 1. Latex over Latex Sealer System :
 - a. Prime Coat: Interior latex primer sealer.
 - b. Intermediate Coat: Matching topcoat.
 - c. Topcoat: Interior, latex, semigloss.
 - d. See schedule for color and placement.

END OF SECTION

SECTION 102113.19 - PLASTIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-plastic toilet compartments.
 - a. Toilet enclosures.

B. Related Requirements:

1. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 ACTION SUBMITTALS

- A. Product data.
- B. Shop Drawings: Plans, elevations, sections, details, and attachment details.
- C. Samples: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.
- B. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:
 1. Panels are able to withstand a concentrated load on grab bar of at least 250 lbf applied at any direction and at any point, without deformation of panel.

- C. Regulatory Requirements: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" for toilet compartments designated as accessible.

2.2 SOLID-PLASTIC TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Basis of Design: Bradley Corporation. For substitutions refer to Architect..
 - 2. ASI Accurate Partitions.
 - 3. American Sanitary Partition Corporation.
- B. Toilet-Enclosure Style: Floor anchored.
- C. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) material, not less than 1 inch thick, seamless, with eased edges, and with homogenous color throughout thickness of material.
 - 1. Color: One color in each room as selected by Architect from manufacturer's full range.

2.3 HARDWARE AND ACCESSORIES

- A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories. Mount with through bolts.
 - 1. Hinges:
 - a. Manufacturer's continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.
 - 1) Material, Continuous Hinge: Manufacturer's standard.
 - 2. Latch and Keeper: Manufacturer's surface-mounted latch unit, designed for emergency access, and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible.
 - a. Material: Manufacturer's standard.
 - 3. Coat Hook: Manufacturer's combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.
 - a. Material: Manufacturer's standard.
 - 4. Door Pull: Manufacturer's unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.

- a. Material: Manufacturer's standard.
- B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: ASTM B221.
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless Steel Castings: ASTM A743/A743M.
- E. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.5 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-and-Ceiling-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- D. Urinal-Screen Posts: Manufacturer's standard corrosion-resistant anchoring assemblies at posts and walls, with leveling adjustment nuts at bottoms of posts. Provide shoes and sleeves (caps) at posts to conceal anchorage.
- E. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide, inswinging doors for standard toilet enclosures and 36-inch- wide, outswinging doors with a minimum 32-inch- wide, clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 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.

- 1. Maximum Clearances:

- a. Pilasters and Panels or Screens: 1/2 inch.
 - b. Panels or Screens and Walls: 1 inch.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Public-use shower room accessories.

1.2 ACTION SUBMITTALS

- A. Product data.
- B. Samples: For each exposed product and for each finish specified, full size.

1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Structural Performance: Design accessories and fasteners to comply with the following requirements:
 - 1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
 - 2. Shower Seats: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. Toilet Tissue (Roll) Dispenser :
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.
 - c. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
 - 2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset Double-roll dispenser.
 - 3. Mounting: Surface mounted.
 - 4. Capacity: Designed for 5-inch- diameter tissue rolls.
 - 5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
- B. Automatic Paper Towel (Roll) Dispenser :
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.
 - c. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
 - 2. Description: Automatic motion-sensing mechanism with user-adjustable delay and paper towel length; electrically operated, with adapter for 110 to 240 V ac power supply battery powered.
 - 3. Mounting: Surface mounted.
 - 4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
- C. Soap Dispenser :
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.
 - c. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
 - 2. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
 - 3. Mounting: Vertically oriented, surface mounted.
 - 4. Capacity: 40 fl oz .
- D. Grab Bar :
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.

- c. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
 - 2. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin).
 - 3. OD: 1-1/4 inches.
 - 4. Configuration and Length: As indicated on Drawings .
- E. Sanitary-Napkin Disposal Unit :
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.
 - c. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
 - 2. Mounting: Surface mounted.
 - 3. Door or Cover: Disposal-opening cover.
 - 4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
- F. Mirror Unit :
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.
 - c. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
 - 2. Frame: Stainless steel angle, 0.75 inch thick.
 - a. Corners: Manufacturer's standard.
 - 3. Size: As indicated on Drawings.

2.3 PUBLIC-USE SHOWER ROOM ACCESSORIES

A. Shower Curtain Rod :

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.
 - c. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.

2. Description: 1-inch- OD, straight rod.
3. Configuration: As indicated on Drawings.
4. Mounting Flanges: Concealed fasteners; in material and finish matching rod.
5. Rod Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

B. Folding Shower Seat <Insert drawing designation>:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bobrick Washroom Equipment, Inc.
 - b. Bradley Corporation.
 - c. Gamco Commercial Restroom Accessories; Bobrick Washroom Equipment, Inc.
2. Configuration: Rectangular seat.
3. Seat: Phenolic or polymeric composite of slat-type or one-piece construction in color as selected by Architect .
4. Mounting Mechanism: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.4 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with 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.
1. Remove temporary labels and protective coatings.

END OF SECTION

SECTION 114000 – FOOD SERVICE EQUIPMENT (ALTERNATE)

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Foodservice Equipment as scheduled on the drawings

B. Whenever the term “Foodservice Equipment Sub-Contractor is used, it shall be the company that is the successful bidder and is awarded the contract for the erection and completion of the work that is outlined herein to the complete satisfaction of the Owner.

1.02 SUBMITTALS

A. Within ten calendar days after award of contract, the Foodservice Equipment Sub-Contractor is to supply in quadruplicate, fully dimensioned rough-in drawings and also, as required, plans indicating bases in the building upon which equipment is to set.

B. State the name of the fabricator of all custom fabricated equipment. Any change of source afterward shall be subject approval by the Owner.

C. Within thirty (30) days after award of contract, the Foodservice Equipment Sub-Contractor is to supply, in quadruplicate, a detailed set of shop drawings of custom fabricated equipment, at a scale of no less than 3/4" equals 1'0". Submit in quadruplicate, specifications sheets with full data on all items of brand name manufacturer, catalog cuts to be bound in booklet form and clearly identified with item number to correspond with itemized specifications, hereinafter indicated.

D. Approval of detailed shop drawings and specification sheets shall not waive obligation of Foodservice Equipment Sub-Contractor to furnish materials and methods of construction called for in specifications, even though they may be shown incorrectly, or, not at all, in the drawings.

E. Any substitute for materials specified, or changes in methods of construction from the way specified and shown on the approved detail drawings is to be requested, in writing, from the Owner, before any such substitution is applicable.

F. All equipment of brand name manufacture shall be of the latest model or succeeding model at the time of the delivery. Any price adjustment in this connection shall be requested of the Owner in writing.

1.03 WARRANTY

A. Submit Foodservice Equipment Sub-Contractor's guarantee for all workmanship, material and equipment, for a period of one (1) year from the time the equipment is put into operation and accepted by the Owner.

B. Guarantee and conditions of service on items of brand name manufacture, as established by the manufacturers, shall apply where extending beyond the guarantee and service set forth in these specifications.

1.04 QUALITY ASSURANCE

- A. The following are basic specifications of items of custom fabricated equipment covering the type and quality of materials, the method of fabrication, assembly and design and will be referred to in the itemized specifications by the term "as specified".
- B. All items of custom fabrication shall be the product of the single manufacturer of such equipment so as to insure uniformity throughout and shall be from and certified NSF fabricator and bear the NSF Seal
- C. All metal gauges shall be United States Standard.
- D. All workmanship shall be of the finest and all materials shall be new, of best quality and without flaws.
- E. All equipment shall comply with National Sanitation Foundation standards and all Federal, State and Local Health Codes.
- F. All gas equipment to be U.L. and A.G.A. approved.
- G. All electrical equipment shall bear Underwriter's seal of approval.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. All stainless steel, where specified, shall be type #302 18-8 analysis, nickel bearing steel. All exposed surfaces shall be standard #4 finish.
- B. All piecing of stainless steel, whether on cabinet surfaces or cabinet bases, shall be continuous welded joints. All welded joints shall be smooth and polished to original finish.
- C. Where galvanized iron is specified, it shall be copper bearing sheets, used in largest sizes with as few joints as possible. All welded joints shall be sandblasted and finished with rustproof galvanized zinc compound. All galvanized iron is to be finished with a prime coat and two (2) finish coats of hammerloid enamel.
- D. When plywood is used for backing, supports, construction of casework, it shall be no less than exterior grade plywood, manufactured per U.S. Product Standard PS-1-83, 5 or 7 ply, with waterproof glue.
- E. Where marine grade plywood is specified it will be manufactured per U.S. Product Standard PS-1-83, complete with Douglas Fir 1 and Western Larch. Plywood shall be 5 or 7 ply with waterproof glue.

2.02 PRODUCTS

A. PIPE STANDS AND OPEN BASE TABLES

- 1. All pipe stands shall be constructed of 1-5/8" O.D. 16 gauge steel tubing with all pipe joints welded, ground smooth and polished. Assembly of pipe stands by use of threaded or slip joint fittings will not be accepted. Tables over 6'0" in length shall have legs spaced not over 5'0" apart. Legs to be fitted at top with stainless steel full closed gussets, welded to the channel underbracing, or the table

tops, and shall be fitted with approved, down 1-3/4", polished, stainless steel adjustable feet, with adaptation being internal.

2. All wood tops shall be 1-1/2" selected kiln dried maple strips, set on edge, glued together and bolted with steel rods running through from side to side. End of rods shall be counter sunk and concealed with maple plugs set flush with edges of tops. Top surface and edges shall be scraped and sanded smooth and the underside finished with one (1) coat of waterproof paint.
3. All stainless steel tops shall have all corners welded also all seams. Welded seams shall be ground smooth and polished to match the adjacent surfaces. The edges, unless otherwise specified in itemized specifications, shall be turned down 1-1/2" with 1/2" toe in, except where adjacent to walls or high adjoining equipment, where top is turned up 6" and back 1" on a 90 degree angle. Where turn-up meets top it shall be coved on a minimum of 3/4" radius. End apertures to be closed. All exposed leading corners shall be bull-nosed. Underside of worktop shall be galvanized iron. End apertures of channel bracing shall be closed. Where angle iron is lusted, it shall be 1-1/2" x 2" H.R., welded, extending around outer perimeter and 2'-0" on centers. Underside of top shall be given a smooth coating of sound deadening mastic painted aluminum.

B. BASE CABINETS

1. All cabinet type bodies shall be constructed of 18-gauge stainless steel. Where entirely concealed from view, 18-gauge galvanized steel shall be used. Interior walls shall be galvanized where enclosed by doors, but of stainless steel where open to shelves. Vertical mullions shall be closed flush on the inner side.

C. FIELD JOINTS

1. All field joints in both tops and cabinet bases shall be completely welded on the job and ground smooth and polished to match original finish. Tack welding will not be accepted.

D. SERVICE PIPE CHASES

1. Cabinet bases are to be so constructed with adequate pipe chases provided in the equipment prior to delivery to the jobsite. If necessary to provide overlooked pipe chases in equipment delivered to the jobsite, they are to be provided by the Foodservice Equipment Sub-Contractor and are to be adequately finished to the complete satisfaction of the Owner.

E. SHELVES

1. All interior shelves and cabinet bases or counters shall be constructed of 18-gauge stainless steel, or, of gauges specified in itemized specifications. Under shelves for pipe base tables shall be constructed of 18-gauge stainless steel and are to have outside edges turned down 1-1/2" with 1/2" toe in edge. Shelves for both cabinet bases and pipe base tables are to be rigidly braced.
2. All stainless steel under shelves on open pipe leg tables shall be coved up 2" on the rear when the tables are up against a wall.

F. SINKS

1. All sinks shall be constructed throughout of 14-gauge stainless steel with all seams and joints welded, ground smooth, and polished to the original finish. To have all vertical and horizontal corners coved on a minimum of 3/4" radius to facilitate cleaning. All exposed edges to have a continuous 1-1/2" diameter semi-rolled rim. Where adjacent to walls provide a 6" high x 4" wide deck for faucets. Where away from the wall, the decks are to 6" high and 6" wide. Sinks shall be fitted with 2" twist lever drains and faucets as specified in itemized specifications. Cross partitions between sink compartments shall be of double wall construction.

G. DRAINBOARDS

1. To be constructed of 14-gauge stainless steel and are to be welded integral with sink compartments. To have all vertical and horizontal corners coved and to have underside treated with sound deadened material and painted aluminum. Exposed edges are to be as constructed for sinks and where adjacent to walls, or adjoining equipment, to be turned up 3" and back 2" on a 45 degree angle. Drain boards under 3'0" long to be supported by stainless steel angles welded from end of drain board to sink facing, just above cove of compartment bottom. Drain boards over 3'0" long to be supported on pipe stands, as previously specified. Unless otherwise noted, these drain boards will 1-1/2" deep, pitching to 2" at sink.

H. DRAWERS

1. All drawers shall be of 18-gauge stainless steel and shall measure approximately 20" x 20" x 5" deep, or size as specified in itemized specifications. Drawers shall be die formed, one-piece construction, with all corners coved and drawer body to be of lift out type. All drawer faces to be 16-gauge stainless steel double pan with full length, recessed integral, horizontal pull. Drawers shall operate on roller bearing slides, with nylon roller and are to be self-closing type. Drawer bodies to be removable for cleaning.

I. SLIDING DOORS

1. Sliding doors are to be of double wall construction. Exterior faces and edges of doors shall be of 18- gauge stainless steel. Spaces between doors shall be filled with approved sound proofing material. Doors shall operate on nylon rollers running in a sill at the bottom. Door shall lift out for cleaning and shall have overhead tracks constructed with a drop at the closing run to hold doors closed.

J. ELEVATED CABINETS

1. All elevated cabinets shall be of size specified and shall match base cabinet construction. To be of 16- gauge stainless steel throughout with top constructed as an integral part of body. Bottom of cabinet shall be closed flush.

K. CLOSURE PLATES

1. All equipment bodies, where resting on bases or against walls or columns, shall have 16-gauge stainless steel closure plates where any gaps may occur due to interference's or wall irregularities.

L. ELEVATED SHELVING

1. All elevated shelving shall be of length and width specified and constructed of 18-gauge stainless steel. All exposed edges turned down 1-1/2" with 1/2" toe in. Where butting walls or other equipment, the edges shall be coved up 2". Shelving shall be spaced and mounted as specified in itemized specifications.

M. PRESENT EQUIPMENT

1. Where specified in itemized specifications, present equipment is to be removed from present locations, stored by General Contractor and installed in new locations, where shown on plans. Related trades are to see that all service lines are disconnected prior to General Contractor moving and storing the equipment.
2. Present equipment shall be cleaned, serviced, and stored by Owner and/or General contractor prior to Foodservice Equipment Sub-Contractor. re-installing into locations as shown on plan

PART 3 - EXECUTION

3.01 PREPARATION

- A. All valves, traps, tail pieces, fittings, cut-off switches, or other materials necessary for connections are to be furnished by related contractors, except where otherwise specified.
- B. All electrical equipment shall be correct for type of electric current available.
- C. All items of equipment specified with cord and plug shall match receptacle at the jobsite.

3.02 INSTALLATION

- A. The Foodservice equipment Sub-Contractor is to deliver and set in place, ready for related contractors to make required plumbing, electrical and ventilation connections, all equipment at locations where shown on plan.
- B. All equipment to be sealed to the walls and/or adjacent equipment
- C. All refrigeration units are to be completely installed by the Foodservice Equipment Sub-Contractor except for final electric, water, if water-cooled units are used, and drain connections. The Foodservice Equipment Sub-Contractor is to furnish necessary charge of refrigerant, start and adjust equipment and service the same for a period of one (1) year after final acceptance by the Owner. All exterior refrigerant piping and fittings shall have insulation jacketing. UV resistant Ventureclad 1577CW or Equal

3.03 CLEANING AND PROTECTION

- A. Foodservice Equipment Sub-Contractor shall remove all debris accumulated during the delivery and installation of his equipment daily and immediately upon completion of said installation. He will provide a representative, when necessary, to correlate final hook-up by related contractors, so as not to impede job progress. After final hook-up, he shall lubricate, start up and check out all equipment requiring this

service, and shall clean equipment and turn over to the Owner, for his final acceptance, in first class condition, all items in his contract.

3.04 COMMISSIONING

- A. The Foodservice Equipment Sub-Contractor shall provide a capable representative or representatives, to demonstrate the proper use of the equipment, at the time selected by the Owner. The Owner is to give the Foodservice Equipment Sub-Contractor a minimum of seven (7) calendar days prior to this demonstration date.

FOODSERVICE EQUIPMENT SPECIFICATION

ITEM 1, MOP SINK: ONE (1) REQUIRED

N.I.C.

The Mop Sink shall be furnished and installed by the Plumbing Contractor.

ITEM 2, MOP RACK: ONE (1) LOT REQUIRED

N.I.C.

The Mop Rack shall be furnished and installed by the General Contractor.

ITEM 3, WALL SHELF: ONE (1) LOT REQUIRED

N.I.C.

The Wall Shelf shall be furnished and installed by the General Contractor.

ITEM 4, STORAGE SHELVING: ONE (1) LOT REQUIRED

Manufacturer: Metro, Eagle, Cambro

Style: Super Erecta
Four (4) 2460NC shelves
Eight 2448NC shelves
Four (4) 2454NC shelves
Eight (8) 74P post

To be assembled as individual sections, four (4) shelves high.

ITEM 5, FREEZER: ONE (1) REQUIRED

Manufacturer: True, Continental, Traulsen

Model: T-72F-HC
Three door unit w/ full height doors
Nine (9) additional shelves
Three (3) year parts and labor warranty
Seven (7) year warranty on compressor
Cord and plug
Caters

ITEM 6, REFRIGERATOR: ONE (1) REQUIRED

Manufacturer: True, Continental, Traulsen

Model: T-49-HC
Full height doors hinged as shown on plan.
Six (6) extra shelves
Three (3) year parts and labor warranty
Seven (7) year warranty on compressor
Cord and plug
Caters

ITEM 7, CAN RACK: ONE (1) REQUIRED

Manufacturer: New Age, Channel, Lakeside

Model: 1225
Casters

ITEM 8, HAND SINK: THREE (3) REQUIRED

Manufacturer: Advance Tabco, Eagle, John Boos

Model: 7-PS-70
Punch with 8"O.C. Faucet holes
Fisher splash mounted faucet consisting of 54437, 61549, and 75626 components
Splash shields
Crumb cup drain
Mounted at ADA height to 34" above finished floor

ITEM 9, THREE COMPARTMENT SINK/CLEAN DISH TABLE: ONE (1) REQUIRED

Size: Approximately 9'-0" x 2'-6" x 3'-1" high over roll rim

Description: 14 gauge stainless steel construction
1-1/2" roll rim on front and right end
15-1/2" high splash on rear.
Three (3) approximately 20" x 27" x 14" d. sink compartment
Three (3) removable stainless steel sink covers with finger hole
Left drain board turned down into dish machine
Right drain board pitched to sink
Two (2) Fisher splash mounted faucets consisting of 54429, 61549, and 71447 components
Three (3) Fisher #22209 twist lever drains
1-5/8" o.d. stainless steel cross rails – coordinate with grease trap location
1-5/8" o.d. stainless steel tubing legs with stainless steel gussets and stainless steel adjustable feet

ITEM 10, DOUBLE OVER SHELF: ONE (1) REQUIRED

Size: Approximately 8'-0"x 1'-3" front to back - upper shelf
1'-0" front to back - lower shelf

Description: 18 gauge stainless steel construction
1-1/2" straight turn down on front and ends
2" turn up on rear
1-5/8" o.d. stainless steel tubing supports thru splash of pot sink with stainless steel cantilever brackets

ITEM 11, DISH MACHINE: ONE (1) REQUIRED

Manufacturer: CMA, Hobart, Champion

Model: C
Corner Installation
Low temp Chemical Sanitizing machine

Voltage: 115-60-1

ITEM 12, SOILED DISH TABLE: ONE (1) REQUIRED

Size: Approximately 6'-6" x 2'-6" x 3'-1" high over roll rim

Description: 14 gauge stainless steel construction
1-1/2" x 3" high roll rim on front and left end
15-1/2" high splash on rear
21" x 21" x 6"d. scrap sink.
Removable rack slide
Removable perforated stainless steel basket
One (1) Fisher #22209 twist lever drain
One (1) Fisher deck mounted pre-rinse spray at scrap sink, consisting of 13080, 2932-0002, and 2928 components
6" high deck at scrap sink
1 5/8" O.D. stainless steel tubing legs with stainless steel gussets and stainless steel adjustable feet.
1 5/8" O.D. stainless steel rear cross rails

ITEM 13, RACK SHELF: ONE (1) REQUIRED

Size: Approximately 2'-0" long, single sided

Description: 14 gauge stainless steel construction
Single sided slanted
Inverted raised rolled rim along front
2" straight turn up on rear and ends
Stainless steel wall brackets

ITEM 14, SOILED DISH TRANSPORT CARTS: THREE (3) REQUIRED

Manufacturer: New Age

Model: 1290CL

ITEM 15, POT AND PAN RACKS: TWO (2) REQUIRED

Manufacturer: Metro, Eagle, Cambro

Style: Super Erecta

Eight (8) 2460NK3 shelves
Eight (8) 74UPK3 post
Eight (8) Casters

To be assembled as individual sections, four (4) shelves high.

ITEM 16, PREP TABLE: ONE (1) REQUIRED

Size: Approximately 10'-0" x 2'-6" x 3'-0" high

Description: 14 gauge stainless steel top
1-1/2" straight turn down on front and ends
6" high x 1" deep splash on rear
Two (2) 18" x 20" x 10" deep sink compartment with 6" x 6" high deck at sink
One (1) Fisher deck mounted faucet consisting of 57765 and 41726 components
Two (2) Fisher #22209 twist lever drain
Two (2) 20" x 20" x 5"d. stainless steel drawer assemblies complete w/stainless steel housing, nylon rollers, stainless steel removable drawer pans, and double pan drawer face with full length integral recessed pulls
18 gauge stainless steel under shelf welded to legs, 10" above finished floor
1-5/8" o.d. stainless steel tubing legs with stainless steel gussets and stainless steel adjustable feet

ITEM 17, WALL SHELF: ONE (1) REQUIRED

Manufacturer: Advance Tabco, Eagle, John Boos

Model: WS-12-120
Stainless steel cantilever brackets

ITEM 18, MIXER: ONE (1) REQUIRED

Manufacturer: Globe, Hobart, Univex

Model: SP20
Cord and plug
Standard equipment
Stainless steel bowl
9" vegetable slicer
Grater plate
5/16" shredder plate
3/16" shredder plate
#12 plate holder

ITEM 19, PORTABLE MIXER STAND: ONE (1) REQUIRED

Manufacturer: Advance Tabco, John Boos, Piper

Model: MX-SS-302
Casters

ITEM 20, SPARE NUMBER

ITEM 21, SPARE NUMBER

ITEM 22, SLICER: ONE (1) REQUIRED

Manufacturer: Globe, Hobart, Univex

Model: G14
Cord and plug
Food fence

ITEM 23, SPARE NUMBER

ITEM 24, WORK TABLES: TWO (2) REQUIRED

Manufacturer: Advance Tabco, Eagle, John Boos

Model: FMS-305

ITEM 25, CAN OPENER: ONE (1) REQUIRED

Manufacturer: Edlund or Equal

Model: 1S
KEC to mount in top of Work Table Item #24

ITEM 26, WALL SHELF: ONE (1) REQUIRED

Manufacturer: Advance Tabco, Eagle, John Boos

Model: WS-12-120
Stainless steel cantilever brackets

ITEM 27, COMBI OVEN: ONE (1) REQUIRED

Manufacturer: Alto-Shaam, Rational, Convotharm

Model: CTP7-20G
Natural gas
(1) CE-24750 Combitherm Cleaning liquid, (12) 1 quart containers per case
(1) CE-28892 Combi Clean Cleaning Tabs, (90) packets each container
Everpure #EV979722 water filtration system
Mechanical startup check
Stand with st. st. legs with flanged feet, shelf, and pan slides

ITEM 28, BRAISING PAN: ONE (1) REQUIRED

Manufacturer: Vulcan, Southbend, Groen

Model: VG30
FOODSERVICE EQUIPMENT (ALTERNATE)
T2326-01 – STATE OF MISSOURI READINESS CENTER

Natural gas
2" tangent draw-off
Single pantry faucet
Faucet bracket
Lip strainer

ITEM 29, TRENCH DRAIN: ONE (1) REQUIRED

Size: Approximately 3'-6" x 2'-0"

Description: 14 gauge stainless steel construction
Fully welded, Anti-Splash design.
Flashing flange
Dome strainer
One (1) 4" drain connections
Stainless steel removable grates with st. st. filler plates as required where equipment legs may land on grate

ITEM 30, RANGE: ONE (1) REQUIRED

Manufacturer: Vulcan, Southbend, Garland

Model: 36C-6BN
Natural gas
Casters
Convection oven base
Single high shelf
Rear gas connection
Natural Gas
Dormont Super-swivel quick disconnect complete with restraining device

ITEM 31, ST.ST. WALL PANELING: ONE (1) REQUIRED

Manufacturer: Captive Aire, Accu-rex, Greenheck

Size: Approximately 16'-6" x 9'-0" high (behind full length of hood)

Description: 18 gauge stainless steel
Overlap installation
From top of floor base to 9'-0" above finished floor - up behind hood

ITEM 32, HOOD W/FIRE PROTECTION SYSTEM: ONE (1) REQUIRED

Manufacturer: Captive Aire, Accu-rex, Greenheck

Model: 6618SND-2-PSP-F Series With fire cabinet on left end

Description: The SND-2 series hood with PSP is a low proximity compensating canopy hood system rated for all types of cooking equipment. The hood shall have the size, shape and performance specified on drawings.

Construction shall be type 304 stainless steel with a #3 or #4 polish where exposed. Individual component construction shall be determined by the manufacturer, ETL, and NSF. Construction shall be dependent on the structural application to minimize distortion and other defects. All seams, joints and penetrations of the hood enclosure to the lower outermost perimeter that directs the captures grease-laden vapor and exhaust gasses shall have a liquid-tight continuous external weld in accordance with NFPA 96. Hood shall be wall type with fully welded 10 gauge corner hanging angles. Corner hanging angles have a .625 x 1.500 slot pre-punched at the factory, allowing hanging rods to be used for quick and safe installations. Hanging rod and connect is provided by and installed by others.

Ventilator shall be furnished with U.L. classified stainless steel “Captrate” filters, supplied in size and quantity as required by ventilator. The filters shall extend the full length of the hood and the filler panels shall not be more than 6’ in width.

The hood manufacturer shall supply complete computer generated submittal drawings including hood section view(s) and hood plan view(s). These drawings must be available to the engineer, architect and owner for their use in construction, operation and maintenance.

Exhaust duct collar to be 4” height with 1” flange. Duct sizes, CFM and static pressure requirements shall be as shown on drawings. Static pressure requirements shall be precise and accurate; air velocity and volume information shall be accurate within 1-ft increments along the length of the ventilator.

U.L. light fixtures shall be 4'-0" LED fixtures and shall be installed and pre-wired to a junction box.

The hood shall have:

- A double wall insulated front to eliminate condensation and increase rigidity. The insulation shall have a flexural modulus of 475 EI, meet UL 181 requirements and be in accordance with NFPA 90A and 90B.
- An integral front baffle to direct grease laden vapors toward the exhaust filter bank.
- A built-in wiring chase provided for outlets and electrical controls on the hood face and shall not penetrate the capture area or require an external chaseway.
- Low velocity make-up air (up to 90%) provided through front plenums (PSP accessory).
- A removable grease cup for easy cleaning.
- EMS Energy Management System
- Fan and light switch on face of hood – Verify fan voltages with engineering drawings

The hood shall be ETL Listed as “Exhaust Hood without Exhaust Damper”, NSF Listed and built in accordance with NFPA 96. The hood shall be listed for 450 F cooking surfaces at 150 CFM/ft, 600 F cooking surfaces at 200 CFM/ft, and 700 F cooking surfaces at 250 CFM/ft.

Enclosure Panels to finished ceiling as required

Manufacturer: Ansul or Equal

Model: R-102 Wet Chemical

1. The Kitchen Equipment Contractor shall furnish and install this item per the general and specific conditions complete with the following:

- a. Furnish fire suppression system to meet NFPA standards 17A and 96, and be U.L. Listed to provide protection for plenum, exhaust duct collars and all grease producing cooking surfaces located under the ventilator. All piping, conduit, cable, etc., shall be concealed as applicable.
- b. All nozzles and exposed piping to be chrome-plated or stainless steel. Size, number and location of nozzles and number of fusible links to be in accordance with U.L. limits for this particular system.
- c. Manual control of the system shall be possible by actuation of remote release controls. Provide double-pole, double-throw, and electric snap action switch assembly.
- d. Mechanical gas shut-off valves will be furnished loose and installed by the plumbing contractor. Electrical contractors (or Shut-trip breakers) required will be furnished and installed by the electrical contractor.
- e. Obtain permits and conduct test of system in the presence of the owner's representative and the agency having jurisdiction.
- f. Pre-piping of fire suppression system to be provided by ventilator manufacturer at factory.

ITEM 33, DUCT AND FAN: ONE (1) REQUIRED

N.I.C.

The Duct and Fan shall be furnished and installed by the H.V.A.C.

ITEM 34, RACKS: TWO (2) REQUIRED

Manufacturer: New Age, Piper, Channel

Model: 4330
Pan stops
Wrap around bumper

ITEM 35, ICE MACHINE: ONE (1) REQUIRED

Manufacturer: Scotsman, Manitowoc, Hoshizaki

Model: MC0530SA-1 – Maker
B530P - Bin
Air cooled
Cord and plug
Manufacturer recommended filter system

Voltage: 115-60-1

ITEM 36, BEVERAGE COUNTER: ONE (1) REQUIRED

Manufacturer: Advance Tabco, Eagle, John Boos

Model: FMS-305
Top cut to accept Item #37 Drop in Dump Sink

ITEM 37, DROP-IN DUMP SINK: ONE (1) REQUIRED

Manufacturer: Advance Tabco, Eagle, John Boos

Model: DI-1-1515
Fisher deck mounted 4" O.C. pantry faucet to consist of 53880 and 75626 components
Crumb cup drain

ITEM 38, COFFEE MAKER: ONE (1) REQUIRED N.I.C.

The Coffee Maker shall be furnished and installed by the Vendor.

ITEM 39, TEA BREWER: ONE (1) REQUIRED
N.I.C.

The Tea Brewer shall be furnished and installed by the Vendor.

ITEM 40, PASS-THRU REFRIGERATOR: ONE (1) REQUIRED

Manufacturer: True, Continental, Traulsen

Model: T-23PT-HC
Three (3) extra shelves
Three (3) year parts and labor warranty
Seven (7) year warranty on compressor
Cord and plug
Caters

ITEM 41, WORK TABLE W/ SINK: ONE (1) REQUIRED

Size: Approximately 11'-0" x 2'-6" x 3'-0" high

Description: 14 gauge stainless steel top
1-1/2" straight turn down on all sides
6" h. x 6" d. deck at sink
One (1) 16" x 20" x 10" d. sink compartment
One (1) Fisher deck mounted faucet consisting of 57765 and 41726 components
One (1) Fisher #22209 twist lever drain
Two (2) 20" x 20" x 5" d. stainless steel drawer assemblies complete w/stainless steel housing, nylon rollers, stainless steel removable drawer pans, and double pan drawer face with full length integral recessed pulls
18 gauge stainless steel under shelf welded to legs 10" above finished floor
1-5/8" O.D. stainless steel tubing legs with stainless steel gussets and stainless steel adjustable feet.
KEC shall provide (3) 115 volt, 20 amp receptacles mounted under the top, wired down thru the legs to j-box under bottom shelf, ready for final connections by E.C.

ITEM 42, HANGING UTENSIL RACK: ONE (1) REQUIRED

Size: Approximately 7'-0" x 2'-0"

Description: 3/16" x 2" stainless steel band construction w/radius ends
One (1) lower band 12" below upper band
Stainless steel double side pot hooks 8" o.c.
Stainless steel rods supported to ceiling (structure)
Mount unit at 7'-6" above finished floor to upper band

ITEM 43, HOT HOLDING CABINET: ONE (1) REQUIRED

Manufacturer: Vulcan, Metro, FWE

Model: VPT15
Pass thru style
Cord and plug
Full perimeter bumper
Casters

ITEM 44, SERVING COUNTER: ONE (1) REQUIRED

Size: Approximately 19'-0" x 3'-0" x 3'-0" high

Description: 14 gauge stainless steel top and splash
1-1/2" straight turn down on front and right end
6" high x 1" deep splash on rear and left end
Top cut to accept Drop-in Units.
One (1) Fisher fill faucet at hot wells to consist of 41726 and 58009 components
18 gauge stainless steel cabinet base construction
18 gauge stainless steel bottom and intermediate shelves where possible
Where shown at the window opening the top shall turn down over a stainless steel tray slide.
Tray slide shall cap low wall, extend thru the openings and shall extend approximately 1" beyond wall face. Top shall have a 2" straight turn down on front (customer side) then return to the wall. Ends to be closed
6" high stainless steel legs with stainless steel adjustable feet

ITEM 45, SPARE NUMBER

ITEM 46, DROP-IN COLD PAN: ONE (1) REQUIRED

Manufacturer: Vollrath, Hatco, Atlas Metal

Model: FC-4C-03120-N
Cord and plug
Perforated false bottom
Rear drain valve extension

ITEM 47, DROP-IN HOT FOOD UNIT: ONE (1) REQUIRED

Manufacturer: Vollrath, Hatco, Atlas Metal

Model: 3640701
1000 wat elements
Cord and plug
Rear drain valve extension

Voltage: 208-60-1

ITEM 48, PROTECTOR GUARD UNIT: ONE (1) REQUIRED

Manufacturer: Premier, BSI, Atlas Metal

Model: TM2R-A
23" high post x lengths as shown on plan
Post closet to tray slide only, to be anchored approximately 12" down into cabinet base for additional support
3/8" tempered glass with radiused corners – front panels
3/8" tempered glass with radiused corners – top shelf
Brushed aluminum finish
Concealed fasteners

ITEM 49, TRAY AND SILVER CART: ONE (1) REQUIRED

Size: Piper, Lakeside, Cambro

Description: 715-1-8
Rotating bumpers
Nylon silver ware cylinders

ITEM 50, BEVERAGE TABLE: ONE (1) REQUIRED N.I.C.

The Beverage Table will be furnished and installed by the owner

ITEM 51, SPARE NUMBER

ITEM 52, TEA DISPENSERS: TWO (2) REQUIRED N.I.C.

The Tea Dispensers shall be furnished and installed by the Vendor.

ITEM 53, COFFEE DISPENSERS: TWO (2) REQUIRED N.I.C.

The Coffee Dispensers shall be furnished and installed by the Vendor.

<u>ITEM NUMBER</u>	<u>ITEM DESCRIPTION</u>	<u>ITEM PRICE</u>
1.	MOP SINK	BY PLUMBER
2.	MOP RACK	BY G.C.
3.	WALL SHELF	BY G.C.
4.	STORAGE SHELVING (1) LOT	\$ _____
5.	FREEZER	\$ _____
6.	REFRIGERATOR	\$ _____
7.	CAN RACK	\$ _____
8.	HAND SINKS (3)	\$ _____
9.	THREE COMPARTMENT SINK/CLEAN DISH TABLE	\$ _____
10.	DOUBLE OVER SHELF	\$ _____
11.	DISH MACHINE	\$ _____
12.	SOILED DISH TABLE	\$ _____
13.	RACK SHELF	\$ _____
14.	SOILED DISH TRANSPORT CARTS (3)	\$ _____
15.	POT AND PAN RACKS (2)	\$ _____
16.	PREP TABLE	\$ _____
17.	WALL SHELF	\$ _____
18.	MIXER	\$ _____
19.	PORTABLE MIXER STAND	\$ _____
20.	SPARE NUMBER	
21.	SPARE NUMBER	
22.	SLICER	\$ _____
23.	SPARE NUMBER	
24.	WORK TABLES (2)	\$ _____
25.	CAN OPENER	\$ _____
26.	WALL SHELF	\$ _____

<u>ITEM NUMBER</u>	<u>ITEM DESCRIPTION</u>	<u>ITEM PRICE</u>
27.	COMBI OVEN	\$ _____
28.	BRAISING PAN	\$ _____
29.	TRENCH DRAIN	\$ _____
30.	RANGE	\$ _____
31.	ST. ST. WALL PANELING	\$ _____
32.	HOOD W/FIRE PROTECTION SYSTEM	\$ _____
33.	DUCT AND FAN	BY H.V.A.C.
34.	RACK	\$ _____
35.	ICE MACHINE	\$ _____
36.	BEVERAGE COUNTER	\$ _____
37.	DROP-IN DUMP SINK	\$ _____
38.	COFFEE MAKER	BY VENDOR
39.	TEA BREWER	BY VENDOR
40.	PASS-THRU REFRIGERATOR	\$ _____
41.	WORK TABLE W/SINK	\$ _____
42.	HANGING UTENSIL RACK	\$ _____
43.	HOT HOLDING CABINET	\$ _____
44.	SERVING COUNTER	\$ _____
45.	SPARE NUMBER	
46.	DROP-IN COLD PAN	\$ _____
47.	DROP-IN HOT FOOD UNIT	\$ _____
48.	PROTECTOR GUARD	\$ _____
49.	TRAY AND SILVER CART	\$ _____
50.	BEVERAGE TABLE	BY OWNER
51.	SPARE NUMBER	
52.	TEA DISPENSERS (2)	BY VENDOR
53.	COFFEE DISPENSERS (2)	BY VENDOR

END OF SECTION

SECTION 220000 – PLUMBING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. This section includes general requirements for plumbing systems and piping accessories.

B. System Performance Requirements: Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where otherwise indicated:

1. Water distribution system, Below Ground:	150 psig.
2. Water distribution system, Above Ground:	125 psig.
3. Soil, Waste, and Vent System:	10 ft. head.
4. Sanitary Drainage Systems:	10 ft. head.
5. Storm Drainage Systems:	10 ft. head.
6. Storm Sewage, Pumped Piping System	75 psig.

PART 2 – PRODUCTS

2.1 PIPING ACCESSORIES

A. Backflow preventers: shall be approved assemblies, approved by the Department of Natural Resources.

B. Strainers: shall be Y-pattern, full size of connecting pipe. Type 305 stainless steel screens with 3/64 inch perforations.

1. Pressure ratings: 125 psig.
2. Additional requirements: For sizes 2 inches and smaller: Bronze body with threaded ends.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Backflow preventers: provide type, size, and capacity as required for compliance with Missouri Title, DNR, Division 60, Public Drinking Water program, Chapter 11. Shall be installed at each water supply connection to mechanical equipment and systems. Backflow preventer shall be located in the same room as the equipment being connected.

B. Pressure regulating valves shall be provided with inlet and outlet shutoff valves, balance cock bypass and pressure gage on valve outlet and valved bypass.

C. Strainers shall be provided on the supply side of each control valve and pressure regulating valve.

D. Hose bibs and wall hydrants shall include either integral or field installed vacuum breaker.

E. Install trap seal priming valves with valve outlet piping pitched toward drain trap at a minimum of 1/8-

inch per foot.

- F. Install backwater valves in building drain piping. Provide cleanout deck plate flush with floor and centred over backwater valve cover on interior installations.
- G. Provide expansion joints on vertical risers, stacks, and conductors.
- H. Provide cleanout check plates with top flush with finished floor, for floor cleanouts, for piping below floor.
- I. Provide cleanout wall access covers, with frame and cover flush with finished wall, for cleanout located in concealed piping.
- J. Provide flashing flange and clamping device with each stack and cleanout passing through floors having waterproof membrane.
- K. Provide flashing sleeves on stacks passing through roof.
- L. Depress drain elevations below finished floor as follows:
 - 1. Drain area radius of 60 inches or smaller: 1/2-inch depression.
- M. Drain outlet backwater valves shall have cast iron or bronze body with removable ball float with threaded inlet and outlet.
- N. Drainage type bucket strainers shall be no-pressure rated, cast iron with bolted flange cover, drain, and plug. Stainless steel bucket with 1/3-inch diameter holes, lift out handle and female threaded ends for sizes 2 inches and smaller and flanged ends for sizes 2-1/2 inches and larger.
- O. Cleanouts shall be cast iron body with straight threads and gasket seal or tapered threads for plug, flashing flange and clamping ring, and a brass closure plug.
- P. Floor and trench drains shall have cast iron bodies with seepage flange and clamping device. Floor drains for use as area drains in exterior slab on grade may be furnished with anchor flange instead of seepage flange and clamping device.
 - 1. Two and a half inches and larger: cast iron body with FDA approved epoxy coating and flanged ends.
- Q. Hose bibs shall have bronze body with renewable composition disc, 1/2 or 3/4 inch threaded or soldered joint inlet.
- R. Wall hydrants shall be non-freeze type and key operated.
- S. Stop and waste drain valves shall be ball valves rated for 200 psig WOG minimum with bronze body and a 1/8-inch side drain outlet and cap.
- T. Water hammer arrestors shall be bellows or piston type with pressurized cushioning chamber. Pipe air chambers are not allowed.
- U. Trap seal primer valves shall be water supply fed type rated for a minimum 125 psig working pressure, with bronze body, atmospheric vented drain chamber, 1/2 inch threaded or soldered inlet and outlet connections.
- V. Horizontal backwater valves shall have cast iron body with removable bronze swing check valve.

END OF SECTION

SECTION 221000 – PLUMBING PIPING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Water distribution piping, above ground.
 - 2. Soil, Waste, and Vent Piping below ground.
 - 3. Soil, Waste, and Vent Piping above ground.
 - 4. Storm Drainage Piping, below ground.
 - 5. Storm Drainage Piping, above ground.
- B. System Performance Requirements: Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where otherwise indicated:
 - 1. Water distribution system, Below Ground: 150 psig.
 - 2. Water distribution system, Above Ground: 125 psig.
 - 3. Soil, Waste, and Vent System: 10 ft. head.
 - 4. Sanitary Drainage Systems: 10 ft. head.
 - 5. Storm Drainage Systems: 10 ft. head.
 - 6. Storm Sewage, Pumped Piping System 75 psig.

PART 2 – PRODUCTS

2.1 PIPING

- 1. Use pipe, tube, fittings and joining methods for piping systems according to the following applications:

2.2 WATER DISTRIBUTION PIPING, ABOVE GROUND

- A. Copper Tube and Fittings
 - 1. Hard copper tube, type L, wrought copper.
 - 2. Joints shall be made with no-lead solder or press-joint fittings.
- B. Solder Joints:
 - 1. Solder Filler Metals: ASTM B32, lead-free alloys
 - 2. Flux: ASTM B813, water flushable.
 - 3. Solder joints shall be made in accordance ASTM B828.
 - 4. The temperature of the joint during soldering shall not be raised above the maximum temperature limitation of the flux.
- C. Copper Press-Joint Fittings
 - 1. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B 16.22 and performance criteria of IAPMO PS117. Sealing elements for press fittings

shall be EPDM. Fittings shall be designed such that sealing elements stays properly in its groove and does not roll out when inserting tube. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall have a feature that assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation

2. Press connections: Copper and copper alloy press connections shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. Copper press fittings shall be installed using the proper tools, actuator, jaws and rings as instructed and approved by the press fitting manufacturer.
3. Install shall be a qualified installer and familiar with the installation of copper press joint systems.
4. Follow all all installation instructions of manufacturer of press-joint fitting to ensure quality, leak-tight seal. To prevent distortion of the pipe, be sure to stringently maintain the minimum distance between fittings depending on tubing diameter as directed by manufacturer. Failure to provide this distance may result in an improper seal, and installer shall be held liable for all associated costs of required repairs.
5. The installing contractor shall insure that sealing elements are properly in place and free from damage. For Sizes 2-1/2" to 4", installer should insure that the stainless steel grip ring is in place.
6. Provide unions and arrangement of sufficient length of removable sections of tubing at valves and equipment connections to allow for easy removal and reinstallation for repairs without having to redo press connections.

2.2 SOIL, WASTE, AND VENT PIPING BELOW GROUND

- A. Hub and spigot cast iron soil pipe, hug and spigot cast iron fittings, neoprene rubber gaskets, and compression joints.
- B. Polyvinyl chloride (PVC) plastic DWV pipe; PVC socket drain type, waste and vent pipe pattern fittings or PVC socket type schedule 40 fittings and solvent cemented joints.
- C. Hubless cast iron soil pipe, hubless cast iron soil pipe fittings, cast iron heavy duty couplings for hubless cast iron soil pipe and fittings, and hubless joints.

2.4 SOIL, WASTE, AND VENT PIPING ABOVE GROUND

- A. Hub and spigot cast iron soil pipe, hug and spigot cast iron fittings, neoprene rubber gaskets, and compression joints.
- B. Polyvinyl chloride (PVC) plastic DWV pipe; PVC socket drain type, waste and vent pipe pattern fittings and solvent cemented joints.
- C. Hubless cast iron soil pipe, hubless cast iron soil pipe fittings, cast iron heavy duty couplings for hubless cast iron soil pipe and fittings, and hubless joints.

2.5 STORM DRAINAGE PIPING BELOW GROUND

- A. Hub and spigot cast iron soil pipe, hug and spigot cast iron fittings, neoprene rubber gaskets, and compression joints.
- B. Polyvinyl chloride (PVC) plastic DWV pipe; PVC socket drain type, waste and vent pipe pattern fittings and solvent cemented joints.
- C. Hubless cast iron soil pipe, hubless cast iron soil pipe fittings, cast iron heavy duty couplings for hubless cast iron soil pipe and fittings, and hubless joints.

2.6 STORM DRAINAGE PIPING ABOVE GROUND

- A. Hub and spigot cast iron soil pipe, hub and spigot cast iron fittings, neoprene rubber gaskets, and compression joints.
- B. Polyvinyl chloride (PVC) plastic DWV pipe; PVC socket drain type, waste and vent pipe pattern fittings and solvent cemented joints.
- C. Hubless cast iron soil pipe, hubless cast iron soil pipe fittings, cast-iron heavy-duty couplings for hubless cast iron soil pipe and fittings, and hubless joints.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Provide shut off valve, hose end drain valve, strainer, pressure gauge, and test tee with valve, inside building at water service entrance.
- B. Provide sleeve and mechanical sleeve seal at service penetrations through foundation wall for watertight installation.
- C. Provide for changes in the direction of drainage and vent piping using appropriate Y-branches, Y-branches with 1/8 bends and long sweep 1/4, 1/5, 1/6, 1/8, and 1/16 bends. Sanitary tees and short sweep quarter bends may be used on vertical stacks of drainage lines where change in direction of flow is from horizontal to vertical. Provide long turn double Y branch and 1/8 bend fittings where fixtures are installed back to back or side by side and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. No change greater than 90 degrees shall be made in direction of flow. Reduction in size of drainage piping in the direction of flow is not allowed.
- D. Provide shutoff valves on inlet to each plumbing equipment item, on each supply to each plumbing fixtures not having stops on supply. Shut off valves 2 inches and smaller shall be ball valves, 2-1/2 and larger shall be butterfly valves.
- E. All fittings in contact with drinking water shall be listed by a third party to NSF 61.
- F. Install piping free of sags, bends, and kinks,
- G. Install piping to permit valve servicing.
- H. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

END OF SECTION

SECTION 223100 - DOMESTIC WATER SOFTENERS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. This section includes general requirements for softened water, for domestic water systems and boiler make-up water systems.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Provide twin unit with (2) softener tanks and (1) brine tank. Unit shall be factory assembled, pressure type and fully automatic.
- B. Softener Tanks: Steel, electric welded, pressure vessel quality.
- C. Construction shall comply with ASME code. Pressure rating: 100 psig. Wetted components shall be for water temperatures from 40 to at least 100 deg. F.
- D. Unit shall comply with NSF 44.
- E. Hand holes shall be provided in the top head and lower side wall of tanks 30 inches in diameter and smaller.
- F. Manholes shall be provided in top head of tanks larger than 30 inches in diameter.
- G. Support legs shall be structural steel welded to tank.
- H. Interior and exterior finishes shall be hot dip galvanized.
- I. Provide demand initiated control. Equip softener tank units with automatic reset head water meter in common outlet header that will electrically activate cycle controller to automatically regenerate (1) softener tank and divert flow to other tank. Electrical lockouts are to prevent simultaneous regeneration of more than one tank.
- J. Brine tank shall be fabricated from 3/16 inch thick fiberglass or 3/8 inch thick molded polyethylene with plastic cover.
- K. Brine valves shall be float operated, plastic fitted for automatic control of brine withdrawal and fresh water refill.
- L. Brine tanks shall provide a minimum of (4) registration at full setting.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install softeners per manufacturer's installation instructions.

END OF SECTION

SECTION 223400 – FUEL-FIRED DOMESTIC WATER HEATERS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fuel-fired domestic water heaters.

1.2 GENERAL

- A. Water heaters shall have 5-year manufacturer's warranty and comply with the most current requirements of ASHRAE 90.1.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Water heaters shall be commercial type, ASME labeled minimum 150 psig rated storage tank with integral controls, drain valve, and relief valve.
- B. Insulation shall be fiberglass or polyurethane foam surrounding tank.
- C. Jacket shall be steel with baked on enamel finish.
- D. Tank shall be glass lined steel with anode rods and drain valve.
- E. Electric water heaters shall include flanged bolt in immersion type in multiples of (3) elements, adjustable immersion thermostat, automatic high temperature limit cutoff and low water cutoff.
- F. Gas fired water heaters shall include gas burner, draft diverter, gas regulator, or automatic gas shut-off device in event of excessive temperature in the tank, intermittent electronic ignition and flue damper control.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Connect gas supply piping to burner with gas cock, sediment trap, drip leg, union, and all other appurtenances, minimum size same as inlet connection.
- B. Water heaters shall be installed on concrete bases, oriented such that controls and devices needing servicing are accessible.

- C. Provide an expansion tank on hot water systems.
- D. Connect hot and cold water piping to water heaters using shutoff valves and unions. Extend relief valve discharge to closest floor drain. Install vacuum relief valve in cold water inlet piping.

END OF SECTION

SECTION 230000 – GENERAL PROVISIONS

PART 1 – GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. This section includes general requirements for HVAC systems.

PART 2 – PRODUCTS

2.1 HVAC DESIGN CRITERIA

- A. Design and installation of HVAC systems shall comply with all applicable codes. These shall include the latest edition of the IMC and all local codes.
 - 1. AHRI Air Contioning, Heating and Refrigeration Institue
 - 2. ASHRAE American Society of Heating, Refrigerating, and Air Conditioning Engineers
 - 3. AMSME American Society of Mechanical Engineers
 - 4. ASTM American Society for Testing Material
 - 5. AMCA Air Moving and Conditioing Association.
 - 6. NFPA National Fire Protection Association
 - 7. NEMA National Electric Manufacturers Association
 - 8. OSHA Occupational Safety and Health Administration
 - 9. SMACA Sheet Metal and Air Conditioning Contractors National Association
 - 10. UL Underwriters Laboratories.

2.2 HVAC SYSTEM DESIGN CONDITIONS

- A. HVAC system design shall be based on the following:
 - 1. Outdoor Summer: 97 F Dry Bulb; 78 F Wet Bulb.
 - 2. Outdoor Winter: 0 F Dry Bulb.
 - 3. Indoor Summer: 75 F Dry Bulb; 50% RH
 - 4. Indoor Winter: 72 f Dry Bulb; 30% RH.
 - 5. System shall be capable of maintaining dry bulb temperature within 1.5 F in summer and indoor relative humidity within 10% of setpoint.
 - 6. HVAC system design shall comply with ASHRAE Standard 90.1.
 - 7. Installed HVAC systems shall comply with noise criteria as recommended by ASHRAE standards for the operations to occur in specified areas.
 - 8. Fresh outside ventilation air quantity shall be as indicated on the drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate mechanical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases slots, and openings in other building components during progress of construction, to allow for mechanical installations
4. Coordinate the of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Install systems, materials, and equipment to conform with approved submittal data to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Project Representative.

3.2 ELECTRICAL WIRING

- A. Contractor furnishing mechanical equipment shall provide all low voltage and line voltage control circuit wiring, conduit and connections and all wiring associated with starter holding coils, unless specifically designated as another Contractor's work.
- B. All wiring shall be in compliance with all State and Local codes and in accordance with specifications set forth in Division 26.

END OF SECTION

SECTION 230513 – COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. This section contains the requirements for single phase and three phase electric motors.

1.2 REFERENCED STANDARDS

- A. Motors and motor controls shall be designed, built, and tested in accordance with the latest revision of the following standards:
1. IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.
 2. NEMA MG 1 – Motors and Generators.
 3. NFPA 70 – National Electric Code

1.3 SUBMITTALS

- A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- B. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than three horsepower.
- C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, relubrication provisions, and wiring instructions.
- D. Construction documents shall include a schedule of all motors including the following information:
1. Manufacturer.
 2. Rated Horsepower.
 3. Voltage(s).
 4. Number of phases.
 5. NEMA frame.
 6. Full Load Amps (FLA).
 7. Nominal speed.
 8. Efficiencies (Guaranteed, Nominal).
 9. Label.

1.4 OPERATION AND MAINTENANCE DATA

- A. Operation Data: Include instructions for safe operating procedures.
- B. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.5 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc.,

as suitable for the purpose specified and indicated.

PART 2 – PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Motors 3/4 HP and smaller may be single phase, 60 Hz. Single phase 3/4HP motors shall be a minimum of 208V.
- B. Motors larger than 3/4 HP shall be three phase, Hz.
- C. Motors configured duplex applications require 2 electrical circuits to each duplex control panel. Control circuits for each motor shall be capable of operating independently and shall be fed from their respective power circuits. Control transformers shall be provided as needed to limit control voltage to 120 volts. Single electrical feeds to dual motor systems are expressly prohibited.
- D. All motors shall be selected and applied such that they are capable of powering associated equipment at full design load/capacity without utilizing the service factor of the motor.
- E. Motors 1 HP and larger shall be NEMA Premium Efficient Motors.
- F. Motors located in wet locations shall be total enclosed.

2.2 CONSTRUCTION REQUIREMENTS

- A. Acceptable manufacturers:
 - 1. Marathon, XRI Premium Efficient series.
 - 2. Siemens GP100 series.
 - 3. Baldor Premium Efficient series.
- B. Design:
 - 1. Open drip proof (ODP) or totally enclosed fan cooled (TEFC), except where specifically noted otherwise.
 - 2. Insulation System: NEMA Class B or better. Motors supplied by VFDs shall have NEMA Class F insulation as a minimum.
 - 3. Design for continuous operation in 40 degree Centigrade environment.
 - 4. Motor starting current shall be limited to no more than 7 times full load current.
 - 5. Motors in Variable Frequency Drive (VFD) applications shall be “Inverter Approved” or “VFD Approved”.
 - 6. Bearings: All motors rated 2 HP and above shall have “Ceramic Bearings”. Greased lubricated anti-friction ball bearings with housings equipped with plugged provision for re-lubrication.
 - 7. Visible name plates shall be stainless steel, indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, and nominal and guarantee efficiencies.
 - 8. Wiring terminations:
 - a. Motor leads shall be stranded copper and shall be permanently identified and brought out into the motor terminal box through a neoprene gasket. Conduit opening suitable for locknut type connector. Include UL listed ground lug in terminal enclosure.
 - b. For fractional horsepower motors where connection is made directly, provide conduit opening suitable for locknut type fitting in end frame

2.3 SINGLE PHASE MOTORS

- A. Acceptable single phase motors are: Split phase, permanent split capacitor, and capacitor start.
- B. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
- C. Service Factor: shall be minimum of 1.0.
- D. Multiple Speed: Through tapped windings.

2.4 THREE PHASE MOTORS – SQUIRREL CAGE MOTORS

- A. Torque: NEMA Design B.
- B. Motor Frame: NEMA Standard T-Frames. Motor frame and end brackets shall be a minimum of grade 25 cast iron construction.
- C. Bearings: Rated for minimum L-10 life of 40,000 hours, with an external load per NEMA 1-14, and an L-10 life of 100,000 hours in direct coupled applications. Stamp bearing sizes on nameplate.

2.5 ELECTRONICALLY COMMUTATED MOTORS (ECMS)

- A. ECMS shall be provided only as integral parts of equipment as supplied by the equipment manufacture.
- B. ECMS shall provided only in sizes smaller than 5 HP.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Motors and associated devices shall be installed in accordance with the NEC requirements and in strict accordance with manufacturer's instructions.
- B. Install securely on a concrete housekeeping pad. Mount ball bearing motors with shaft in any position.
- C. Final wiring connections to all motors shall be made with stranded wire. All final wiring connections to any motor shall be in a Liquidtight Flexible Metal Conduit for the last six feet. Flexible Metal Conduit type is not acceptable, except in plenum spaces where a maximum of 4 feet of FMC shall be used. Per NEC, LFMC is not acceptable in plenum spaces.
- D. Testing: Record actual voltage and current readings at each motor in accordance with Section 26 08 10 – Electrical System Start-Up.

3.2 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weatherproof covering. While being stored, motors shall have their shafts rotated periodically to protect bearings. For extended outdoor storage, remove motors from equipment and store separately. Prior to energizing the motor, a polarization index and MEG reading shall be performed and the

results shall meet NEMA MG1 recommendations for new motors. Documentation shall be kept to verify rotation during storage and electrical test performed prior to startup

3.3 WARRANTY

- A. Vendor shall provide the standard form of written guarantee and warranty covering defects in materials and workmanship for the equipment. The guarantee and warranty shall be for a period of one year from the date of final acceptance of the equipment by the University. Date of the acceptance shall be defined as the date that the University assumes operation of the equipment.

END OF SECTION

SECTION 230529 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 – GENERAL

1.1. SUMMARY

- A. Section Includes:
 - 1. Pipe hangers and supports - metal.
 - 2. Strut support systems - metal, rod type.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design trapeze pipe hangers and equipment supports.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment are to withstand the effects of gravity loads and stresses within limits and under conditions indicated in accordance with ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
 - 3. Design of seismic-restraint hangers and supports for piping and equipment is delegated design and shall be completed by licensed engineer, licensed in the state of Missouri. Shop drawings shall be submitted for this design which shall include signed and sealed calculations and sizing of seismic-restraint hangers and supports for piping and equipment.

2.2 PIPE HANGERS AND SUPPORTS – METAL

- A. Pipe Supports – Galvanized Steel:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following]:
 - a. Anvil; an ASC Engineered Solution.
 - b. B-Line; a division of Eaton, Electrical Sector.
 - c. FNW; Ferguson Enterprises, Inc.
 - 2. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

3. Galvanized Metallic Coatings: hot-dip galvanized for outdoor supports.
 - a. Outdoors: for hangers exposed to outdoors, hot dip galvanized finish.
 - b. Indoors: for hangers located indoors, hot dip galvanized finish.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washers.

2.3 STRUT SUPPORT SYSTEMS - METAL, ROD TYPE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. ABB, Electrification Business.
 2. Anvil; an ASC Engineered Solution.
 3. B-Line; a division of Eaton, Electrical Sector.

2.4 MATERIALS

- A. Carbon Steel: ASTM A1011/A1011M.
- B. Threaded Rods: Continuously threaded. Zinc-plated or galvanized steel for indoor applications and stainless steel for outdoor applications. Mating nuts and washers of similar materials as rods.

PART 3 – EXECUTION

3.1 APPLICATION

- A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry static loads within specified loading limits. The minimum static design load used for strength determination is to include weight of supported components plus weight of supports themselves.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

- B. Install lateral bracing with pipe hangers and supports to prevent swaying.
- C. Install building attachments attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 1 and larger and at changes in direction of piping.
- D. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- E. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- F. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- G. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 3 inches maximum.

3.4 HANGER AND SUPPORT SCHEDULE

- A. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.
- B. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- C. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- D. Use carbon-steel pipe hangers and supports and attachments for general service applications.
- E. Use padded hangers for piping that is subject to scratching.
- F. Use thermal-hanger shield inserts for insulated piping and tubing.
- G. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of Non insulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of non insulated, stationary pipes NPS 3/4 to NPS 8.
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of Non insulated, stationary pipes split NPS 1/2 to NPS 8.
 8. Adjustable Band Hangers (MSS Type 9): For suspension of non insulated, stationary pipes NPS 1/2 to NPS 8.
 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of non insulated, stationary pipes NPS 1/2 to NPS 8.
 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of non insulated, stationary pipes NPS 3/8 to NPS 8.
 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of non insulated, stationary pipes NPS 3/8 to NPS 3.
 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is unnecessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is unnecessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- H. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS

24if longer ends are required for riser clamps.

- I. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 - 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 - 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- J. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 - 6. C-Clamps (MSS Type 23): For structural shapes.
 - 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 - 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 - 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 - 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 - 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 - 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 - 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 - 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 - 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- K. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
- L. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- M. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- N. Use powder-actuated fasteners instead of building attachments where required in concrete construction.

END OF SECTION

SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Balancing Air Systems:
 - a. Constant-volume air systems.
 - 2. Testing, Adjusting, and Balancing Equipment:

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- B. Certified TAB reports.
- C. Sample report forms.
- D. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Specialists Qualifications: Certified by AABC.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by AABC.

B. TAB Specialists Qualifications: Certified by NEBB.

1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB.

1.6 FIELD CONDITIONS

- A. Full Owner Occupancy: Owner will occupy the site and existing building during the entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.
- B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.

- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.
- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible, and their controls are connected and functioning.
- K. Examine operating safety interlocks and controls on HVAC equipment.
- L. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.

- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Duct systems are complete with terminals installed.
 - b. Volume, smoke, and fire dampers are open and functional.
 - c. Clean filters are installed.
 - d. Fans are operating, free of vibration, and rotating in the correct direction.
 - e. Variable-frequency controllers' startup is complete, and safeties are verified.
 - f. Automatic temperature-control systems are operational.
 - g. Ceilings are installed.
 - h. Windows and doors are installed.
 - i. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" or NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors that comply with requirements in Section 233300 "Air Duct Accessories."
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," and Section 230719 "HVAC Piping Insulation."
- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes

with required fan volumes.

- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. For variable-air-volume systems, develop a plan to simulate diversity.
- D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- G. Verify that motor starters are equipped with properly sized thermal protection.
- H. Check dampers for proper position to achieve desired airflow path.
- I. Check for airflow blockages.
- J. Check condensate drains for proper connections and functioning.
- K. Check for proper sealing of air-handling-unit components.
- L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by main Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses, close to the fan and prior to any outlets, to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.
 - c. Measure static pressure across each component that makes up the air-

- handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
 - 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
 - 4. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to airflows indicated on HVAC drawings.
- 1. Measure airflow of submain and branch ducts.
 - 2. Adjust submain and branch duct volume dampers for specified airflow.
 - 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
- 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 - 2. Measure inlets and outlets airflow.
 - 3. Adjust each inlet and outlet for specified airflow.
 - 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
- 1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 - 2. Re-measure and confirm that total airflow is within design.
 - 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 - 4. Mark all final settings.
 - 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 - 6. Measure and record all operating data.
 - 7. Record final fan-performance data.

3.6 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
- 1. Manufacturer's name, model number, and serial number.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.

4. Phase and hertz.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Service factor and frame size.

3.7 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
 2. Air Outlets and Inlets: Plus or minus 10 percent.

3.8 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 1. Fan curves.
 2. Manufacturers' test data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Engineer's name and address.
 6. Contractor's name and address.
 7. Report date.
 8. Signature of TAB supervisor who certifies the report.
 9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 10. Summary of contents including the following:
 - a. Indicated versus final performance
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.
 12. Data for terminal units, including manufacturer's name, type, size, and fittings.
 13. Notes to explain why certain final data in the body of reports vary from indicated values.
 14. Test conditions for fans performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Fan drive settings include settings and percentage of maximum pitch diameter.
 - e. Settings for supply-air, static-pressure controller.
- D. System Diagrams: Include schematic layouts of air distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Terminal units.
 3. Position of balancing devices.
- E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
1. Unit Data:
 - a. Unit identification.Location.
 - b. Make and type.
 - c. Model number and unit size.
 - d. Manufacturer's serial number.
 - e. Unit arrangement and class.
 - f. Discharge arrangement.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - i. Number, make, and size of belts.
 - j. Number, type, and size of filters.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.

- g. Cooling-coil static-pressure differential in inches wg.
- h. Heating-coil static-pressure differential in inches wg.
- i. Outdoor airflow in cfm.
- j. Return airflow in cfm.
- k. Outdoor-air damper position.
- l. Return-air damper position.
- m. Vortex damper position.

F. Fan Test Reports: For exhaust fan, include the following:

- 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
- 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
- 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.

G. Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

- 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft.
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.

- j. Actual average velocity in fpm.
- k. Barometric pressure in psig.

H. Air-Terminal-Device Reports:

- 1. Unit Data:
 - a. System and air-handling unit identification.
 - b. Location and zone.
 - c. Apparatus used for test.
 - d. Area served.
 - e. Make.
 - f. Number from system diagram.
 - g. Type and model number.
 - h. Size.
 - i. Effective area in sq. ft..
- 2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm.
 - b. Air velocity in fpm.
 - c. Preliminary airflow rate as needed in cfm.
 - d. Preliminary velocity as needed in fpm.
 - e. Final airflow rate in cfm.
 - f. Final velocity in fpm.
 - g. Space temperature in deg F.

I. Instrument Calibration Reports:

- 1. Report Data:
 - a. Instrument type and make.
 - b. Serial number.
 - c. Application.
 - d. Dates of use.
 - e. Dates of calibration.

3.9 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Construction Manager.
- B. Prepare test and inspection reports.

3.10 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near- peak

summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

SECTION 230700 – HVAC INSULATION

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply air.
 - 2. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
 - 3. Outdoor, make-up air and outdoor, exhaust air.
 - 4. Indoor, condensate piping.
 - 5. Refrigerant piping, indoor and outdoor.
- B. Duct liner:
 - 1. Duct liners: for duct liners, provide 1” thick fiberglass duct liner with a glass mat airstream surface for erosion protection, antimicrobial coating, and edge coatings on ends to encapsulate fibers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied).

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers are to be marked with the manufacturer's name, appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.4 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.5 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.
 - 1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" and "Piping Insulation Schedule, General" articles for where insulating materials are to be applied.
- B. Products do not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.
- D. Mineral Wool Blanket: Basalt volcanic rock-derived fibers bonded with a thermosetting resin, unfaced; suitable for maximum use temperature up to 1200 deg F in accordance with ASTM C447. Comply with ASTM C553.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Owens Corning.
 - c. Knauf.
- E. Glass-Fiber Board Insulation: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature between 35 deg F and 250 deg F for jacketed and between 35 deg F and 450 deg F for unfaced in accordance with ASTM C411. Comply with ASTM C612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. Knauf Insulation.
 - c. Owens Corning.

2.3 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.

2.4 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Knauf Insulation.
 - b. Johns Manville.
 - c. Owens Corning.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with Contract Documents, unless otherwise approved by the engineer-of-record.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers,

supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.
 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation

continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
1. Comply with requirements in Section 078413 "Penetration Firestopping."
- E. Insulation Installation at Floor Penetrations:
1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF GLASS-FIBER AND MINERAL-WOOL INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
- B. Comply with manufacturer's written installation instructions.
1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
 2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
 3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.

- f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply air.
2. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
3. Outdoor, make-up air and outdoor, exhaust air.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.
7. Factory-insulated access panels and doors.

3.7 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round supply-air duct insulation is the following:
 - 1. Glass-Fiber Blanket with FSK factory-applied jacket: 2 inches thick and 1 lb/cu. ft. nominal density to achieve R-6.
- B. Concealed, rectangular, supply-air duct insulation is the following:
 - 1. Glass-Fiber Blanket with FSK factory-applied jacket: 2 inches thick and 1 lb/cu. ft. nominal density to achieve R-6.
- C. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior is the following:
 - 1. Glass-Fiber Blanket with FSK factory-applied jacket: 2 inches thick and lb/cu. ft. nominal density as required to achieve R-8.

3.8 EXTERIOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Rectangular, exhaust-air duct insulation and make-up air duct insulation is the following:
 - 1. Glass-Fiber Board with FSK factory-applied jacket mechanically attached with welded pins and clips: 3 inches thick and lb/cu. ft. nominal density as required to achieve R-10.
 - 2. Field applied jacket applied with water-shedding angle: 0.032" thick, stucco embossed finish for protecting or securing insulation from outdoor elements.

3.9 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is contractor's option.
- B. Items Insulated:
 - 1. Indoor, condensate piping.
 - 2. Refrigerant piping, indoors and outdoors.
- C. Items Not Insulated:
 - 1. Gas piping.
 - 2. Exterior condensate piping.

3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Indoor Condensate and Equipment Drain Water below 60 Deg. F. is the following:
 - 1. All pipe sizes: Insulation shall be one of the following:
 - a. Closed cell type EPDM elastomeric insulation with vapor barrier, manufactured by Aeroflex, AP Armaflex FS, or approved equal: 1" thick.
 - b. Mineral-fiber, Preformed Pipe Insulation with ASJ factory-applied jacket: 3/4" thick.
- B. Indoor refrigerant piping, all pipe sizes:
 - 1. Closed cell type EPDM elastomeric insulation with vapor barrier, manufactured by

Aeroflex, AP Armaflex FS, or approved equal: 1" thick.

C. Outdoor refrigerant piping, all pipe sizes:

1. Closed cell type EPDM elastomeric insulation with vapor barrier, manufactured by Aeroflex, AP Armaflex FS, or approved equal: 1" thick.
2. Field applied jacket applied with water-shedding angle: 0.032" thick, stucco embossed finish for protecting or securing insulation from outdoor elements.

END OF SECTION

SECTION 231232 – FACILITY NATURAL GAS PIPING

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fuel gas systems, including piping, equipment and all necessary accessories as designated in this section. Fuel gas piping systems above 2 PSIG are not included in this section

1.2 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only. Where conflicts occur these specifications and the VHA standard will govern.
- B. American Society of Mechanical Engineers (ASME):
- B16.3-//2019// Malleable Iron Threaded Fittings: Classes 150 and 300
 - B16.9-//2018// Factory Made Wrought Buttwelding Fittings
 - B16.11-//2011// Forged Fittings, Socket-Welding and Threaded
 - B16.15-//2018// Cast Copper Alloy Threaded Fittings: Classes 125 and 250
 - B16.40-//2019// Manually Operated Thermoplastic Gas Shutoffs and Valves in Distribution Systems
 - B31.8-//2018// Gas Transmission and Distribution Piping Systems
- C. American Society for Testing and Materials (ASTM):
- A47/A47M-//2018// Standard Specification for Ferritic Malleable Iron Castings
 - A53/A53M-//2018// Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
- International Code Council (ICC):
- IFGC-//2018// International Fuel Gas Code
 - IPC-//2018// International Plumbing Code
- D. Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS):
- SP-72-//2010a// Ball Valves with Flanged or Butt-Welding for General Service
 - SP-110-//2010// Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
- E. National Fire Protection Association (NFPA):
- 54-//2018// National Fuel Gas Code

1.3 SUMMARY

A. Section Includes:

1. Aboveground piping.
2. Piping and tubing joining materials.
3. Valves.
4. Pressure regulators.

PART 2 – PRODUCTS

2.1 FUEL GAS PIPING ABOVE GROUND

- A. Pipe: Black steel, ASTM A53/A53M, Schedule 40.
- B. Nipples: Steel, ASTM A733, Schedule 40.
- C. Fittings:
 1. Sizes: 2 inch and under: ASME B16.3 threaded malleable iron.
- D. Joints: Provide welded or threaded joints.

2.2 JOINING MATERIALS

- A. Joint Compound and Tape: Suitable for natural gas.
- B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg. F complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.3 MANUAL GAS SHUTOFF VALVES

- A. General Requirements for valves, NSP 2 and smaller: Comply with ASME B16.33:
 1. CWP Rating: 150 psig.
 2. Threaded ends: Comply with ASME B1.20.1.
 3. Listing: Listed and labeled by an NRTL acceptable to authorities having jurisdiction for valves 1 inch and smaller.
 4. Service Mark: Valves 1-1/4 inches to NPS 2 shall have initials “WOG” permanently marked on valve body.
 5. See “GENERAL NOTES – GAS PIPING” section in “Mechanical Legend” sheet for additional information.

2.4 PRESSURE REGULATORS

- A. General Requirements:
 1. Single stage and suitable for natural gas.
 2. Steel jacket and corrosion-resistant components.

3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 and smaller.
- B. Appliance Pressure Regulators: Comply with ANSI Z21.18.
 1. Manufacturers: Subject to compliance with requirements. Provide products by one of the following: Itron, Maxitrol, Watts, and Pietro Fiorentini.
 2. Body and Diaphragm Case: Die-cast aluminum.
 3. Springs: Zinc-plated steel; interchangeable.
 4. Diagram: Zinc-plated steel.
 5. Seat Disc: Nitrile rubber.
 6. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
 7. Factory-Applied Finish: Minimum three-layer polyester and plurethane paint finish.
 8. See "Natural Gas Schedule" on "Gas Piping Isometric" sheet for additional information on gas regulators.

2.5 DIELECTRIC FITTINGS

- A. Provide dielectric couplings or unions between ferrous and non ferrous pipe.
- B. ASSE 1079.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with the ICC IFGC, ICC IPC and the following:
 1. Install branch piping for fuel gas and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment, including those furnished by the Government or specified in other sections.
 2. Install pressure gauges upstream and downstream of all pressure regulators.
 3. Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe, shall be reamed to full size after cutting.
 4. All pipe runs shall be laid out to avoid interference with other work.
 5. Install valves with stem in horizontal position whenever possible. All valves shall be easily accessible.
 6. Install union and shut-off valve on pressure piping at connections to equipment.
 7. Pipe Hangers, Supports and Accessories:
 - a. All piping shall be supported per the ICC IFGC.
 - b. Shop Painting and Plating: Hangers, supports, rods, inserts and accessories used for Pipe supports shall be shop coated zinc Chromate primer paint.
 - c. Floor, Wall and Ceiling Plates, Supports, Hangers:
 - 1) Solid or split unplanted cast iron, chrome plated in finished areas.

- 2) All plates shall be provided with set screws.
 - 3) Pipe Hangers: Height adjustable clevis type.
 - 4) Adjustable Floor Rests and Base Flanges: Steel.
 - 5) Concrete Inserts: "Universal" or continuous slotted type.
 - 6) Hanger Rods: Mild, low carbon steel, fully threaded or Threaded at each end with two removable nuts at each end for positioning rod and hanger and locking each in place.
 - 7) Riser Clamps: Malleable iron or steel.
 - 8) Rollers: Cast iron.
 - 9) Self-drilling type expansion shields shall be "Phillips" type, with case hardened steel expander plugs.
 - 10) Miscellaneous Materials: As specified, required, directed or as noted on the drawings for proper installation of hangers, supports and accessories.
8. Install cast chrome plated escutcheon with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.
 9. Penetrations:
 - a. Fire Stopping: Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases as specified in Section 07 84 00, FIRESTOPPING. Completely fill and seal clearances between piping and openings with the fire stopping materials.
 - b. Waterproofing: At floor penetrations, completely seal clearances around the pipe and make watertight with sealant as specified in Section 07 92 00, JOINT SEALANTS.
 - B. Fuel gas piping shall conform to the following:
 1. Entire fuel gas piping installation shall be in accordance with requirements of NFPA 54.
 2. Provide fuel gas piping with plugged drip pockets at low points.

3.2 CLEANING OF SYSTEM AFTER INSTALLATION

- A. Clean all piping systems to remove all dirt, coatings and debris. //Remove all valves, controls etc., and reinstall after piping system has been cleaned.

3.3 TESTS

- A. General: Test system either in its entirety or in sections after system is installed or cleaned.
- B. Test shall be made in accordance with Section 406 of the International Fuel Gas Code. The system shall be tested at a minimum of 1.5 times maximum working pressure, but not less than 3 psig.
- C. System Purging: After completing pressure tests, and before testing a gas-contaminated line, purge line with nitrogen at junction with main line to remove all air and gas. Clear completed

line by attaching a test pilot fixture at capped stub-in line at building location and let gas flow until test pilot ignites. Procedures shall conform to NFPA 54 and ASME B31.8.

3.4 STARTUP AND TESTING

- A. Perform tests as recommended by product manufacturer and listed standards and under actual or simulated operating conditions and prove full compliance with design and specified requirements. Tests of the various items of equipment shall be performed simultaneously with the system of which each item is an integral part.
- B. When any defects are detected, correct defects and repeat test at no additional cost or time to the Government.

3.5 OUTDOOR PIPING SCHEDULE

- A. Aboveground natural-gas piping shall be one of the following:
 - 1. 2 inch and under: Steel pipe with malleable-iron fittings and threaded joints. Field applied high quality finish made for gas piping: yellow.

END OF SECTION

SECTION 232300 – REFRIGERANT PIPING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes insulating the following:
 - 1. Refrigerant Piping.
 - a. Soldering.
 - b. Brazing.
 - 2. Refrigerants.
- B. Sections not included:
 - 1. Refrigerant valves and specialties: See “237400 Packaged Outdoor HVAC Equipment” for requirements.

1.2 PERFORMANCE REQUIREMENTS

- A. Line Test Pressure for R-454B
- B. Section includes insulating the following:
 - 1. Suction lines for air-conditioning applications and heat-pump applications: Per rooftop unit manufacturer’s installation instructions.
 - 2. Hot-gas and liquid lines: Per rooftop unit manufacturer’s installation instructions.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Pipe and fittings.
 - 2. For each type of valve and refrigerant specialty, provide manufacturer’s catalog data including capacities.
 - 3. Solder and flux.
 - 4. Brazing filler metal and flux.
- B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.
 - 1. Refrigerant piping indicated on drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Field quality-control test reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE:

- A. Products and execution shall be in compliance with applicable codes and standards.
- B. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- C. Comply with ASHRAE Standard-15, Safety Code for Refrigeration Systems. The application of this is intended to assure the safe design, construction, installation, operation, and inspection of refrigerating systems employing a fluid which normally is vaporized and liquefied in its refrigerating cycle.
- D. Comply with ASME-B31.5, "Refrigeration Piping and Heat Transfer Components."
- E. Joints shall be warranted to be free from leaks and imperfections for same time period. Defective joints shall be repaired or replaced at no cost to Owner.
- F. Installation and operation shall be in compliance with Manufacturer's recommendations, requirements, and installation, operations, and maintenance manuals.

1.7 PRODUCT DELIVERY, HANDLING, AND STORAGE

- A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed
- B. Materials shall be stored indoors protected from temperature, physical damage and exposure to fluids, dust and debris. Containers of solder, brazing and weld consumables, pastes and fluids shall remain sealed until use. Opened containers shall be kept sealed when not in use.

1.8 COORDINATION

- A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations.

1.9 WARRANTY

- A. Products and installation thereof shall be warranted to be free from defects in material and workmanship for period of one year from date placed into useful service or 18-months from date of delivery, whichever occurs first. Defective product shall be repaired or replaced at no cost to Owner.
- B. Joints shall be warranted to be free from leaks and imperfections for same time period. Defective joint shall be repaired or replaced at no cost to Owner. Impacted piping system shall be manipulated as required to make repair and fluid media (e.g. refrigerant) shall be brought back to original condition and fill volume at no cost to Owner.

PART 2 – PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- A. Refrigerant line sets: are allowed when installed in accordance with manufacturer's installation instructions.
- B. Copper tubing, when required: Applications shall include include ASTM B 88, Type K or L and ASTM B 280, Type ACR. Reference Part 3 piping applications for system application requirements. Tubing shall be hard-drawn straight lengths, and soft-annealed coils, and seamless. Tubing shall be factory cleaned, ready for installation, and have ends capped to protect cleanliness of pipe interior prior to shipping. Copper tube shall be provided with long radius fittings.

PART 3 – EXECUTION

3.1 PIPING APPLICATIONS:

- A. Refrigerant line sets installed in accordance with manufacturer's installation instructions.

3.2 PIPING INSTALLATION

- A. Drawings plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.
- B. Install refrigerant piping according to ASHRAE 15.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping free of sags and bends.
- E. Install fittings for changes in direction and branch connections.
- F. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.
- G. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels if valves or equipment requiring maintenance is concealed behind finished surfaces.
- H. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation and jacketing installation.
- I. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 HANGERS AND SUPPORTS

- A. Hanger support and anchor products are specified in other Division 23 Sections

- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual runs less than 20 feet long.
 - 2. Spring hangers to support vertical runs.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. Comply with ASME-B31.5, Chapter VI
 - 2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
 - 3. Test high- and low pressure side of piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
 - a. Fill system with nitrogen to the required test pressure.
 - b. System shall maintain test pressure at the manifold gage throughout duration of test.
 - c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
 - 4. Remake leaking joints using new materials and retest until satisfactory results are achieved.

END OF SECTION

SECTION 237400 – PACKAGED OUTDOOR HVAC EQUIPMENT

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. Packaged small-capacity, rooftop air-conditioning units.

1.2 DEFINITIONS

- A. RTU: Rooftop Unit. As used in this Section, this abbreviation means packaged, small-capacity, rooftop air-conditioning units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each product data:

- a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- b. Include rated capacities, dimensions, required clearances, characteristics, and furnished specialties and accessories.
- c. Include unit dimensions and weight.
- d. Include cabinet material, metal thickness, finishes, insulation, and accessories.
- e. Fans:
 - 1) Include certified fan-performance curves with system operating conditions indicated.
 - 2) Include certified fan-sound power ratings.
 - 3) Include fan construction and accessories.
 - 4) Include motor ratings, electrical characteristics, and motor accessories.
- f. Include certified coil-performance ratings with system operating conditions indicated.
- g. Include filters with performance characteristics.
- h. Include gas furnaces with performance characteristics.
- i. Include dampers, including housings, linkages, and operators.

B. Shop Drawings. For each packaged, small-capacity, rooftop air-conditioning unit:

1. Include plans, elevations, sections, and attachment details.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection

3. Include diagrams for power, signal, and control wiring.
- C. Delegated Design Submittals. For For RTU supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 1. Include design calculations or selecting seismic restraints.
 2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system
 3. Restraint Details: Wind and seismic detail fabrication and attachment of wind and seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Data: Certificates, for RTUs, accessories, and components, from manufacturer.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
 4. Restraint of internal components.
- B. Product Certificates: Submit certification that specified equipment will withstand wind and seismic forces specific to job site.
 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Source quality-control reports.
- D. System startup reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For RTUs to include in operation and maintenance manuals.

1.6 WARRANTY

- A. Warranty: Contractor agrees to repair or replace components of packaged, small-capacity, rooftop air-conditioning unit that fails in materials or workmanship within specified warranty period:
 1. Warranty Period: 1 year from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Device, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and application.
- B. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of RTUs and components.
- C. ASHRAE 62.1 Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- D. ASHRAE 15 Compliance: For refrigeration system safety.
- E. ASHRAE 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- F. UL Compliance: Comply with UL 1995.
- G. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design mounting and restraints for RTUs, including comprehensive engineering analysis.
 - 1. Design RTU supports to comply with wind and seismic performance requirements.
- H. Seismic Performance: RTUs, accessories, and components to withstand the effects of earthquake motions determined according to ASCE/SEI 7.
 - 1. The term "withstand" means the "unit will remain in place without separation of any parts when subjected to the seismic forces specified."

2.2 PERFORMANCE REQUIREMENTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Trane.
 - 2. Daikin Applied.
 - 3. AAON.
- B. Unit Casings:
 - 1. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed
 - 2. Double-wall construction:
 - a. Outside Casing Wall: Zinc coated galvanized steel with manufacturer's standard finish corrosion-resistant coating, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
 - b. Inside Casing Wall: G90-coated galvanized steel.
 - c. Floor Plate: G90 galvanized steel insert material, treadplate, minimum 18 gauge.

- d. Casing Insulation:
 - 1) Materials: injected polyurethane foam insulation.
 - 2) Thermal Break: Provide continuity of insulation with no through-casing metal in casing walls, floors, or roof of unit.
- 3. Airstream Surfaces: Surfaces in contact with airstream to comply with requirements in ASHRAE 62.1.
- 4. Static-Pressure Classifications:
 - a. For Unit Sections Upstream of Fans: Minus 3-inch wg
 - b. For Unit Sections Downstream of Fans: 3-inch wg
- 5. Airstream Surfaces: Surfaces in contact with airstream to comply with requirements in ASHRAE 62.1.
- 6. Panels and Doors:
 - a. Panels:
 - 1) Fabrication: Formed and reinforced with same materials and insulation thickness as casing.
 - 2) Fasteners: Two or more camlock type for panel lift-out operation. Arrangement to allow panels to be opened against air-pressure differential.
 - 3) Gasket: Neoprene, applied around entire perimeters of panel frames.
 - 4) Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.
 - b. Access Doors:
 - 1) Hinges: A minimum of two ball-bearing hinges or stainless steel piano hinge and two wedge-lever-type latches, operable from inside and outside. Arrange doors to be opened against air-pressure differential
 - 2) Gasket: Neoprene, applied around entire perimeter of panel frames.
 - 3) Size: Large enough to allow inspection and maintenance of air-handling unit's internal components.
 - 4) Gasket: Neoprene, applied around entire perimeters of panel frames.
 - c. Locations and Applications:
 - 1) Fan Section: Inspection and access panels
 - 2) Coil Section: Inspection and access panels.
 - 3) Damper Section: Inspection and access panels.
 - 4) Filter Section: Inspection and access panels large enough to allow periodic removal and installation of filters.
- 7. Condensate Drain Pans:
 - a. Location: Each type of cooling coil heat exchanger.
 - b. Construction:
 - 1) Noncorrosive polymer stainless steel sheet.

- c. Drain Connection:
 - 1) Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one of pan.
- d. Slope: Minimum 0.125-in./ft. Insert value slope, to comply with ASHRAE 62.1, in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and from humidifiers and to direct water toward drain connection
- e. Width: Entire width of water producing device.
- f. Depth: A minimum of 2 inches deep.
- g. Pan-Top Surface Coating for Galvanized-Steel Drain Pans: Asphaltic waterproofing compound.
- h. Units with stacked coils must have an intermediate drain pan to collect condensate from top coil.

C. Fans, Drives, and Motors:

- 1. Fan and Drive Assemblies: Statically and dynamically balanced and designed for continuous operation and maximum-rated fan speed and motor horsepower.
- 2. Supply-Air Fans: Centrifugal, rated according to AMCA 210; galvanized or painted steel; mounted on solid-steel shaft.
 - a. Shafts: with field adjustable alignment.
 - 1) Turned, ground, and polished hot-rolled steel with keyway.
 - b. Shaft bearings:
 - 1) Heavy-duty, self-aligning, pillow-block type with an L-50 Insert bearing life rating rated life of minimum 100,000 Insert number hours according to ABMA 9.
 - c. Housings: Formed-and reinforced-steel panels to form curved scroll housings with shaped cutoff and spun-metal inlet bell.
 - 1) Bracing: Steel angle or channel supports for mounting and supporting fan scroll, wheel, motor, and accessories.
 - d. Centrifugal Fan Wheels: Inlet flange, backplate, and shallow blades with inlet and tip curved forward in direction of airflow and mechanically fastened to flange and backplate; steel or aluminum hub swaged to backplate and fastened to shaft with setscrews.
 - e. Mounting: For internal vibration isolation and seismic control. Factory-mount fans with manufacturer's standard restrained vibration isolation mounting devices having a minimum static deflection of 1 inch Insert dimension.
 - f. Shaft Lubrication Lines: Extended to a location outside the casing.
 - g. Flexible Connector: Factory fabricated with a fabric strip minimum 3-1/2 inches wide, attached to two strips of minimum 2-3/4-inch-wide by 0.028-inch-thick, galvanized-steel sheet.
 - 1) Flexible Connector Fabric: Glass fabric, double coated with neoprene. Fabrics, coatings, and adhesives to comply with UL 181, Class 1
- 3. Drives, Direct: Factory-mounted, direct drive.

4. Condenser-Coil Fan: Variable-speed propeller, mounted on shaft of permanently lubricated multispeed ECM motors.
5. Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - b. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - c. Enclosure Type: Open, drip proof.
 - d. Efficiency: Premium efficient as defined in NEMA MG 1.
 - e. Motor Pulleys: Adjustable pitch for use with 5 Insert number-hp motors and smaller; fixed pitch for use with motors larger than 5 Insert number hp. Select pulley size so pitch adjustment is at the middle of adjustment range at fan design conditions.
 - f. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.

D. Coils:

1. General Requirements for Coils
 - a. Comply with AHRI 410.
 - b. Fabricate coils section to allow for removal and replacement of coil for maintenance and to allow in-place access for service and maintenance of coil(s).
 - c. Coils to not act as structural component of unit.
2. Supply-Air Refrigerant Coil:
 - a. Tubes: Copper.
 - b. Fins:
 - 1) Material: Aluminum.
 - 2) Fin Spacing: Maximum 16 fins per inch.
 - d. Fin and Tube Joints: Mechanical bond.
 - e. Ratings: Designed, tested, and rated according to ASHRAE 33 and AHRI 410.
 - f. Coatings: None.
3. Outdoor-Air Refrigerant Coil:
 - a. Tubes: Copper.
 - b. Fins:
 - 1) Material: Aluminum.
 - 2) Fin Spacing: Maximum 16 fins per inch.
 - 3) Fin and Tube Joints: Mechanical bond.
 - 4) Ratings: Designed, tested, and rated according to ASHRAE 33 and AHRI 410.

5) Coatings: None.

E. Refrigerant Circuit Components:

1. Compressor: Hermetic, variable-speed scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.
2. Refrigeration Specialties:
 - a. Refrigerant: R-454B.
 - b. Expansion valve with replaceable thermostatic element.
 - c. Refrigerant filter/dryer.
 - d. Manual-reset high-pressure safety switch.
 - e. Automatic-reset low-pressure safety switch.
 - f. Minimum off-time relay.
 - g. Automatic-reset compressor motor thermal overload.
 - h. Brass service valves in compressor suction and liquid lines.

F. Dampers:

1. Outdoor-and Return-Air Dampers: Class 1, double-skin, airfoil-blade, galvanized-steel dampers with compressible jamb seals and extruded-vinyl blade edge seals in opposed parallel-blade arrangement with zinc-plated steel operating rods rotating in sintered bronze or nylon Insert material bearings mounted in a single galvanized-steel frame, and with operating rods connected with a common linkage. Leakage rate must not exceed 4 cfm/sq. ft. at 1-inch wg and 8 cfm/sq. ft. at 4-inch wg rated in accordance with AMCA 500D.
2. Barometric relief dampers.

G. Electrical Power Connections:

1. RTU to have a single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

H. Roof Curbs: Roof curbs shall be rated for seismic activity specific to job site and shall be factory furnished seismic curbs, provided with signed and sealed calculations documenting seismic performance of curb is acceptable.

2.3 SOURCE QUALITY CONTROL

A. AHRI Compliance:

1. Comply with AHRI 210/240 for testing and rating energy efficiencies for RTUs.
2. Comply with AHRI 340/360 for testing and rating energy efficiencies for RTUs.
3. Comply with AHRI 270 for testing and rating sound performance for RTUs.
4. Comply with AHRI 1060 for testing and rating performance for air-to-air exchanger.

B. AMCA Compliance:

1. Comply with AMCA 11 and bear the AMCA-Certified Ratings Seal for air and sound performance according to AMCA 211 and AMCA 311.

2. Damper leakage tested according to AMCA 500-D.
3. Operating Limits: Classify according to AMCA 99.

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 RTUs.
- B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. Equipment Mounting:
 1. Comply with delegated design submittal (indicated earlier within this specification) showing anchorage points and quantity, and all vibration isolation and seismic-control devices.

3.2 DUCT CONNECTIONS

- A. Comply with duct installation requirements specified in other HVAC Sections. Drawings indicate general arrangement of ducts. The following are specific connection requirements:
 1. Install ducts to termination at top of roof curb.
 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
 3. Connect supply ducts to RTUs with flexible duct connectors specified in "Section 233300 "Air Duct Accessories."
 4. Install return air duct continuously through roof structure.

3.3 ELECTRICAL CONNECTIONS

- A. Connect electrical wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- C. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
- D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.
 1. Nameplate to be laminated acrylic or melamine plastic signs as layers of black with engraved white letters at least 1/2 inch high.

3.4 CONTROL CONNECTIONS

- A. Install control and electrical power wiring to field-mounted control devices.
- B. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."

3.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service
 - 1. Complete installation and startup checks according to manufacturer's written instructions.
 - 2. Inspect for visible damage to unit casing.
 - 3. Inspect for visible damage to furnace combustion chamber.
 - 4. Inspect of visible damage to compressor, coils, and fans.
 - 5. Inspect thermal insulation.
 - 6. Verify that labels are clearly visible.
 - 7. Verify that clearance have been provided for servicing.
 - 8. Verify that controls are connected and operable.
 - 9. Verify that filters are installed.
 - 10. Clean condenser coil and inspect for construction debris.
 - 11. Clean furnace flue and inspect for construction debris.
 - 12. Connect and purge gas line.
 - 13. Remove packing from vibration isolators.
 - 14. Inspect operation of barometric relief dampers.
 - 15. Verify lubrication on fan and motor bearings.
 - 16. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 - 17. Adjust fan belts to proper alignment and tension.
 - 18. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system.
 - b. Do not operate below recommended low ambient temperature.
 - c. Complete startup sheets and attach copy with Contractor's startup report.
 - 19. Inspect and record performance of interlocks and protective devices; verify sequences.
 - 20. Operate unit for an initial period as recommended or required by manufacturer.
 - 21. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.
 - a. Measure gas pressure on manifold.
 - b. Inspect operation of power vents.

- c. Measure combustion-air temperature at inlet to combustion chamber.
 - d. Measure flue-gas temperature at furnace discharge.
 - e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
 - f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
- 22. Calibrate thermostats.
 - 23. Adjust and inspect high-temperature limits.
 - 24. Inspect outdoor-air dampers for proper stroke and interlock with return air dampers.
 - 25. Start refrigeration and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:
 - a. Coil entering-air, dry-and wet-bulb temperatures.
 - b. Coil leaving-air, dry-and wet-bulb temperatures.
 - c. Outdoor air, dry-and wet-bulb temperatures.
 - d. Outdoor-air-coil, discharge-air, dry bulb temperature.
 - 26. Inspect controls for for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown
 - 27. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
 - a. Supply-air volume.
 - b. Return-air volume.
 - c. Relief-air volume.
 - d. Outdoor-air intake volume.
 - 28. Simulate maximum cooling demand and inspect the following:
 - a. Compressor refrigerant suction and hot-gas pressures.
 - b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.
 - 29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC" for air-handling system testing, adjusting, and balancing.

3.7 CLEANING

- A. After completing system installation and testing, adjusting, and balancing RTUs and air-distribution systems, clean RTUs internally to remove foreign material and construction dirt and dust. Clean fan wheels, cabinets, dampers, coils, and filter housings, and install new, clean

filters.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections with the assistance of a factory-authorized service representative.
- D. Tests and Inspections:
 - 1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements
 - 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. RTU will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

END OF SECTION

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire.
2. Aluminum building wire.
3. Connectors and splices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belden Inc.
2. Cerro Wire LLC.
3. Okonite Company (The).
4. Southwire Company, LLC.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductor Insulation:

1. Type THHN and Type THWN-2. Comply with UL 83.
2. Type THW and Type THW-2. Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

2.2 ALUMINUM BUILDING WIRE

- A. Description: Flexible, insulated and uninsulated, drawn aluminum current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.
- 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. Belden Inc.
 - 2. Cerro Wire LLC.
 - 3. Okonite Company (The).
 - 4. Southwire Company, LLC.
- C. Standards:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
 - 2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."
- D. Conductors: Aluminum, complying with ASTM B800 and ASTM B801.
- E. Conductor Insulation:
 - 1. Type THHN and Type THWN-2. Comply with UL 83.
 - 2. Type THW and Type THW-2. Comply with NEMA WC-70/ICEA S-95-658 and UL 83.

2.3 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. 3M Electrical Products.
 - 2. AFC Cable Systems; Atkore International.
 - 3. Hubbell Utility Solutions; Hubbell Incorporated.
 - 4. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
- C. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: Two hole with standard barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
2. Copper for feeders smaller than No. 250 kcmil AWG; copper or aluminum for feeders No. 250 kcmil AWG and larger. Conductors must be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper:
 - a. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
 - b. Solid for No. 12 AWG and smaller; stranded for No. 10 AWG and larger.

C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN/THWN-2, single conductors in raceway .
- B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.
- B. Complete raceway installation between conductor and cable termination points according to Section 260533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.
- C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inch of slack.
- D. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm Systems" for connecting, terminating, and identifying wires and cables.

3.5 IDENTIFICATION

- A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS PART

1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding busbars.

B. Related Requirements:

1. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

1.3 SERVICE CONDITIONS FOR ELECTRICAL EQUIPMENT

A. Electrical and ICT Equipment Grounding (Earthing): Do not exceed 25 Ω resistance to ground (earth).

1. Contact Architect for resolution if 25 Ω specified resistance to ground (earth) is not attained after complying with prescriptive requirements in Article 250 of NFPA 70.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 GROUNDING AND BONDING CONDUCTORS

A. Equipment Grounding Conductor:

1. Standard Features: 600 V, THHN/THWN-2, copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. ASTM - Bare Copper Grounding and Bonding Conductor:

1. 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:
 - a. ERICO; brand of nVent Electrical plc.
 - b. Harger Lightning & Grounding; business of Harger, Inc.
2. Standard Features: Complying with one or more of the following:
 - a. Soft or Annealed Copper Wire: ASTM B3.
 - b. Concentric-Lay Stranded Copper Conductor: ASTM B8.

2.3 GROUNDING AND BONDING CLAMPS

A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.

B. UL KDER - Beam Grounding and Bonding Clamp :

1. 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:
 - a. ABB, Electrification Business.
 - b. Anderson; brand of Hubbell Utility Solutions; Hubbell Incorporated.
 - c. Panduit Corp.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
 - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
3. Standard Features: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.

C. UL KDER - Exothermically Welded Connection :

1. 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:
 - a. Continental Industries; brand of Hubbell Utility Solutions; Hubbell Incorporated.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. ERICO; brand of nVent Electrical plc.
 - d. Harger Lightning & Grounding; business of Harger, Inc.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
 - b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.
3. Standard Features: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.4 GROUNDING AND BONDING BUSHINGS

- A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures, and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure. Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.
- B. UL KDER - Bonding Bushing :

1. 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:
 - a. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - b. O-Z/Gedney; brand of Emerson Electric Co., Automation Solutions, Appleton Group.
 - c. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.

2.5 GROUNDING AND BONDING BUSBARS

- A. Description: Miscellaneous grounding and bonding devices that serve as common connection for multiple grounding and bonding conductors.

B. UL KDER - Equipment Room Grounding and Bonding Busbar :

1. 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:
 - a. B-Line; a division of Eaton, Electrical Sector.
 - b. ERICO; brand of nVent Electrical plc.
 - c. Harger Lightning & Grounding; business of Harger, Inc.
 - d. Panduit Corp.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
3. Standard Features:
 - a. Bus: Rectangular bar of annealed copper.
 - b. Mounting Stand-Off Insulators: Lexan or PVC.
 - 1) Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.
4. Other Available Features Required by the Project:
 - a. Dimensions: 1/4 by 4 inch in cross section; length as indicated on the Drawings.
 - b. Predrilled Hole Pattern: 9/32 inch holes spaced 1-1/8 inch apart.
 - c. Mounting Hardware: Stand-off brackets that provide 2 inch clearance to access rear of bus. Brackets and bolts must be stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine facility's grounding electrode system and equipment grounding for compliance with requirements for maximum ground-resistance level and other conditions affecting performance of grounding and bonding of electrical system.
- B. Inspect test results of grounding system measured at point of electrical service equipment connection.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

- D. Proceed with connection of electrical service equipment only after unsatisfactory conditions have been corrected.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS

A. Grounding and Bonding Conductors:

1. Provide solid conductor for 10 AWG and smaller, and stranded conductors for 8 AWG and larger unless otherwise indicated.
2. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
3. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
7. Underground Grounding Conductors: Install bare copper conductor, 2/0 AWG minimum.

B. Grounding and Bonding Connectors:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

C. Grounding and Bonding Busbars: Provide in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated on the Drawings.

3.3 INSTALLATION OF GROUNDING AND BONDING

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
2. Electrical Maintenance: NFPA 70B.
3. Electrical Safety: NFPA 70E.
4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
5. Communications Work: BICSI N1.
6. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
7. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Grounding and Bonding Conductors:
 - a. 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. Underground Grounding Conductors:
 - 1) Bury at least 30 inch below grade.
 - 2) Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.
2. Grounding and Bonding Busbars:
 - a. Install busbar horizontally, on insulated spacers 2 inch minimum from wall, 6 inch above finished floor unless otherwise indicated.
 - b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.
3. Electrodes:
 - a. Ground Rods: Drive rods until tops are 2 inch below finished floor or final grade unless otherwise indicated.
 - 1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 - 2) Use exothermic welds for below-grade connections.
 - b. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.
4. Grounding at Service:
 - a. Equipment grounding conductors and grounding electrode conductors must be connected to ground busbar. Install main bonding jumper between neutral and ground buses.
5. Grounding Separately Derived Systems:
 - a. Permanent Generators: Install grounding electrode(s) at location of permanent generators having switched neutral connections. Electrode must be connected to equipment grounding conductor and to frame of generator.
6. Grounding Underground Distribution System Components:

- a. Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.
 - b. Comply with IEEE C2 grounding requirements.
 - c. Grounding Manholes and Handholes: Install driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inch will extend above finished floor. If necessary, install ground rod before manhole is placed and provide 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inch above to 6 inch below concrete. Seal floor opening with waterproof, nonshrink grout.
 - d. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields in accordance with manufacturer's published instructions with splicing and termination kits.
 - e. Pad-Mounted Transformers and Switches: Install two ground rods and ring electrode around pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than 2 AWG for ring electrode and for taps to equipment grounding terminals. Bury ring electrode not less than 6 inch from foundation.
7. Equipment Grounding and Bonding:
- a. Install insulated equipment grounding conductors with feeders and branch circuits.
 - b. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1) Feeders and branch circuits.
 - 2) Lighting circuits.
 - 3) Receptacle circuits.
 - 4) Single-phase motor and appliance branch circuits.
 - 5) Three-phase motor and appliance branch circuits.
 - 6) Flexible raceway runs.
 - 7) Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

- c. 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.
- d. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- e. Poles Supporting Outdoor Lighting Fixtures: Bond insulated equipment grounding conductor to equipment grounding terminal inside pole base.
- f. Metallic Fences: Comply with requirements of IEEE C2.
 - 1) Grounding Conductor: Bare copper, not less than .
 - 2) Gates: Must be bonded to grounding conductor with flexible bonding jumper.
 - 3) Barbed Wire: Strands must be bonded to grounding conductor.

8. Fence Grounding:

- a. Grounding Method: At each grounding location, drive grounding rod vertically until top is 6 inch below finished grade. Connect rod to fence with 6 AWG conductor. Connect conductor to each fence component at grounding location.
- b. Fences within 100 ft of Buildings, Structures, Walkways, and Roadways: Ground fence at maximum intervals of 750 ft.
 - 1) Gates and Other Fence Openings: Ground fence on each side of opening.
 - a) Bond metal gates to gate posts by connecting bonding jumper between gate post and gate frame.
 - b) Bond across openings, with and without gates, except at openings indicated as intentional fence discontinuities. Use 2 AWG wire and bury it at least 18 inch below finished grade.
- c. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of power line crossing and at maximum distance of 150 ft on each side of crossing.

- D. Protection: After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

3.4 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING

- A. Administrant for Electrical Power Tests and Inspections:

1. Owner will engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
 2. Engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 4. Administer and perform tests and inspections.
- B. Field tests and inspections must be witnessed by authorities having jurisdiction.
- C. Tests and Inspections:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
 3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method in accordance with IEEE Std 81.
 - c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.
- D. Nonconforming Work:
1. Grounding system will be considered defective if it does not pass tests and inspections.
 2. Remove and replace defective components and retest.
- E. Collect, assemble, and submit test and inspection reports.
1. Report measured ground resistances that exceed the following values:
 - a. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 Ω .
 - b. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 Ω .
 - c. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 Ω .
 - d. Substations and Pad-Mounted Equipment: 5 Ω .

- e. Manhole Grounds: 10 Ω .

END OF SECTION

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Support systems.
2. Mounting, anchoring, and attachment components.
3. Installation of fabricated metal supports.
4. Installation of concrete bases.

1.2 DELEGATED DESIGN SERVICES

- A. Delegated Design Professionals: Engage qualified structural professional engineer to design hangers and supports for electrical systems.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 REGULATORY AGENCY APPROVALS

- A. Delegated design submittals and shop drawings requiring approval by authorities having jurisdiction must be signed by qualified structural professional engineer responsible for their preparation. Submit for action by Architect prior to submitting for approval by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Prepare design calculations in accordance with criteria specified in Section 260010 "Supplemental Requirements for Electrical" and Section 018123 "Facility Seismic and Wind Criteria."
- B. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame Rating: Class 1.
 2. Self-extinguishing according to ASTM D635.

2.2 SUPPORT SYSTEMS

A. Steel Slotted Support Systems :

1. 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:
 - a. Allied Tube & Conduit; Atkore International.
 - b. B-Line; a division of Eaton, Electrical Sector.
 - c. CADDY; brand of nVent Electrical plc.
 - d. Unistrut; an Atkore International, Inc. brand.
2. Standard Features: Preformed steel channels and angles with minimum 13/32 inch diameter holes at a maximum of 8 inch on center in at least one surface.
 - a. Referenced Standard: MFMA-4 factory-fabricated components for field assembly.
 - b. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - c. Channel Width: Selected for applicable load criteria 1-1/4 inch.
 - d. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - e. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - f. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Conduit and Cable Support Devices:

1. Standard Features: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

C. Support for Conductors in Vertical Conduit:

1. Standard Features: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs must have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body must be made of malleable iron.

D. Structural Steel for Fabricated Supports and Restraints:

1. Standard Features: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

2.3 MOUNTING, ANCHORING, AND ATTACHMENT COMPONENTS

A. Powder-Actuated Fasteners :

1. 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:
 - a. Hilti, Inc.
 - b. ITW Ramset/Red Head; Illinois Tool Works, Inc.
 - c. MKT Fastening, LLC.
2. Standard Features: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors :

1. 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:
 - a. B-Line; a division of Eaton, Electrical Sector.
 - b. Hilti, Inc.
2. Standard Features: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

C. Concrete Inserts:

1. Standard Features: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.

D. Clamps for Attachment to Steel Structural Elements:

1. Standard Features: MSS SP-58 units are suitable for attached structural element.

E. Through Bolts:

1. Standard Features: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325.

F. Toggle Bolts:

1. Standard Features: All steel springhead type.

G. Hanger Rods:

1. Standard Features: Threaded steel.

PART 3 - EXECUTION

3.1 SELECTION OF HANGERS AND SUPPORTS

- A. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERM C as required by NFPA 70. Minimum rod size must be 1/4 inch in diameter.
- B. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted **[or other]** support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- C. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:
 1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
 2. Work in Confined Spaces: NFPA 350.
 3. Installation of Steel Conduit: NECA NEIS 101
 4. Installation of Aluminum Conduit: NECA NEIS 102.
 5. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
 1. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT IMC and ERM C may be supported by openings through structure members, in accordance with NFPA 70.
 2. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.

3. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - a. To Wood: Fasten with lag screws or through bolts.
 - b. To New Concrete: Bolt to concrete inserts.
 - c. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - d. To Existing Concrete: Expansion anchor fasteners.
 - e. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inch thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inch thick.
 - f. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
 - g. To Light Steel: Sheet metal screws.
 - h. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.
4. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

D. Interfaces with Other Work:

1. Touchup Finishes:
 - a. Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1) Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
 - b. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
 - c. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.
2. Installation of Fabricated Metal Supports:
 - a. Provide site-fabricated metal supports.
 - b. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
 - c. Field Welding: Comply with AWS D1.1/D1.1M. Submit welding certificates.

3. Installation of Concrete Bases:
 - a. Provide concrete bases of dimensions indicated, but not less than 4 inch larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
 - b. Use 3000 psi, 28-day compressive-strength concrete.
 - c. Anchor equipment to concrete base as follows:
 - 1) Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2) Install anchor bolts to elevations required for proper attachment to supported equipment.
 - 3) Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION

SECTION 260533.13 - CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Type EMT duct raceways and elbows.
2. Type ERMCT duct raceways, elbows, couplings, and nipples.
3. Type LFMC duct raceways.
4. Type PVC duct raceways and fittings.
5. Fittings for conduit, tubing, and cable.
6. Joint compounds.
7. Solvent cements.

B. Related Requirements:

1. Section 260519 "Low-Voltage for Electrical Power Conductors and Cables" specifies nonmetallic underground conduit with conductors (Type NUCC).
2. Section 260529 "Hangers and Supports for Electrical Systems" specifies conduit hangers and supports referenced by this Section.
3. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- ##### A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 TYPE EMT DUCT RACEWAYS AND ELBOWS

A. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. 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:

- a. Allied Tube & Conduit; Atkore International.
 - b. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
 - c. Western Tube; Zekelman Industries.
 - d. Wheatland Tube; Zekelman Industries.
- 2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN FJMX; including UL 797.
- 3. Standard Features:
 - a. Material: Steel.
 - b. Exterior Coating: Zinc.
 - c. Interior Coating: Zinc.
 - d. Minimum Trade Size: Metric designator 16 (trade size 1/2).

2.3 TYPE ERMCDUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

- A. UL DYIX - Galvanized-Steel Electrical Rigid Metal Conduit (ERMCD-S-G), Elbows, Couplings, and Nipples:
 - 1. 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:
 - a. Allied Tube & Conduit; Atkore International.
 - b. Killark; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Republic Conduit; Nucor Corporation, Nucor Tubular Products.
 - d. Wheatland Tube; Zekelman Industries.
 - 2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN DYIX; including UL 6.
 - 3. Standard Features:
 - a. Exterior Coating: Zinc.
 - b. Interior Coating: Zinc.
 - c. Minimum Trade Size: Metric designator 16 (trade size 1/2).

2.4 TYPE LFMDUCT RACEWAYS

- A. UL DXHR - Steel Liquidtight Flexible Metal Conduit (LFMD-S):

1. 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:
 - a. ABB, Electrification Business.
 - b. Anaconda Sealtite; Anamet Electrical, Inc.
 - c. Electri-Flex Company.
 - d. International Metal Hose Co.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN DXHR; including UL 360.
3. Standard Features:
 - a. Material: Steel.
 - b. Minimum Trade Size: Metric designator 16 (trade size 1/2).
4. Sustainable Design Features:
 - a. Regional Materials (IgCC/ASHRAE 189.1): Provide documentation if product is sourced (extracted, harvested, recovered, or manufactured) within 500 miles of Project site. Identify percentage of product's travel that is by rail or water.

2.5 TYPE PVC DUCT RACEWAYS AND FITTINGS

A. UL DZYZR - Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

1. 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:
 - a. ABB, Electrification Business.
 - b. Calconduit; Atkore International.
 - c. Opti-Com Manufacturing Network, Inc (OMNI).
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN DZYZR; including UL 651.
3. Standard Features:
 - a. Dimensional Specifications: Schedule 40.
 - b. Minimum Trade Size: Metric designator 21 (trade size 3/4).

- c. Markings: For use with maximum 90 deg C wire.

2.6 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. UL DWTT - Fittings for Type ERM, Type IMC, Type PVC, Type HDPE, Type EPEC, and Type RTRC Duct Raceways:

1. 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:
 - a. Appleton; Emerson Electric Co., Automation Solutions.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - d. Southwire Company, LLC.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN DWTT; including UL 514B.
3. Standard Features:
 - a. Material: Steel.
 - b. Coupling Method: Compression coupling.
 - c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.
4. Sustainable Design Features:
 - a. Regional Materials (IgCC/ASHRAE 189.1): Provide documentation if product is sourced (extracted, harvested, recovered, or manufactured) within 500 miles of Project site. Identify percentage of product's travel that is by rail or water.

B. UL FKA - Fittings for Type EMT Duct Raceways:

1. 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:
 - a. Allied Tube & Conduit; Atkore International.
 - b. Crouse-Hinds; brand of Eaton, Electrical Sector.
 - c. Raco Taymac Bell; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - d. Southwire Company, LLC.

2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN FKAV; including UL 514B.
3. Standard Features:
 - a. Material: Steel.
 - b. Coupling Method: Compression coupling.
 - c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

2.7 JOINT COMPOUNDS

- A. UL FOIZ - Electrically Conductive Corrosion-Resistant Compound for Threaded Conduit:
 1. 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:
 - a. ABB, Electrification Business.
 2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. UL CCN FOIZ; including UL Subject 2419.

2.8 SOLVENT CEMENTS

- A. UL VBEW - Solvent Cements for Nonmetallic Duct Raceways and Fittings:
 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Solvent Cement Compatibility with PVC Conduit Fittings: UL CCN DWTT; including UL 514B. Follow solvent manufacturer's published instructions.
 - b. Solvent Cement Compatibility with Rigid PVC Conduit: UL CCN DZYR; including UL 651. Follow solvent manufacturer's published instructions.

PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Unless more stringent requirements are specified in Contract Documents or manufacturer's published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.
- B. Outdoors:
 - 1. Exposed and Subject to Severe Physical Damage: ERM C.
 - 2. Exposed and Subject to Physical Damage: ERM C.
 - 3. Direct Buried: PVC-40.
 - 4. Concrete Encased Not in Trench: PVC-40.
 - 5. Concrete Encased in Trench: PVC-40.
 - 6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC .
- C. Indoors:
 - 1. Exposed and Subject to Severe Physical Damage: ERM C.
 - 2. Exposed and Subject to Physical Damage: ERM C.
 - 3. Exposed and Not Subject to Physical Damage: EMT.
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 5. Damp or Wet Locations: ERM C.
 - 6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC .
- D. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
 - 1. ERM C: Provide threaded-type fittings unless otherwise indicated.

3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturer's published instructions, comply with the following:
 - 1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
 - 2. Electrical Safety: NFPA 70E.
 - 3. Commissioning of Active and Passive Fire Protection Features: NFPA 3 and NFPA 4.
 - 4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
 - 5. Communications Work: BICSI N1.

6. Life Safety and Means of Egress Work: NFPA 101.
7. Emergency and Standby Power Work: NFPA 110, NFPA 111, and NECA NEIS 416.
8. Work in Confined Spaces: NFPA 350.
9. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
10. Type ERM-C-S: Article 344 of NFPA 70 and NECA NEIS 101.
11. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
12. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
13. Expansion Fittings: NEMA FB 2.40.
14. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. General Requirements for Installation of Duct Raceways:
 - a. Complete duct raceway installation before starting conductor installation.
 - b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
 - c. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch of changes in direction.
 - d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
 - e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
 - f. Support conduit within 12 inch of enclosures to which attached.
 - g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
 - h. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of duct raceways at the following points:
 - 1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2) Where an underground service duct raceway enters a building or structure.
 - 3) Conduit extending from interior to exterior of building.
 - 4) Where otherwise required by NFPA 70.
 - i. Do not install duct raceways or electrical items on "explosion-relief" walls or rotating equipment.
 - j. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
 - k. Keep duct raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.

- l. Cut conduit perpendicular to the length. For conduits metric designator 53 (trade size 2) and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
 - m. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 12 inch of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use.
 - n. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
 - 1) Termination fittings with shoulders do not require two locknuts.
 - o. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to metric designator 35 (trade size 1-1/4) and insulated throat metal bushings on metric designator 41 (trade size 1-1/2) and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
2. Types ERM C :
- a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.
3. Types PVC:
- a. Do not install Type PVC conduit where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
 - b. Comply with manufacturer's published instructions for solvent welding and fittings.
 - c. Join joints with solvent cement in accordance with manufacturer's published instructions and allowed to cure before handling. Joints to be bent, pushed, or pulled must set for minimum 24 h after joining.
4. Duct Raceways Embedded in Slabs:
 - a. Run duct raceways larger than metric designator 27 (trade size 1) below concrete slab.
 - b. Arrange duct raceways to cross building expansion joints with expansion fittings at right angles to the joint.
 - c. Do not embed threadless fittings in concrete unless locations have been specifically approved by Architect.
5. Stub-ups to Above Recessed Ceilings:
 - a. Provide EMT for duct raceways.

- b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- 6. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:
 - a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG..
- 7. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.
 - a. EMT: Provide compression, steel fittings. Comply with NEMA FB 2.10.
 - b. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.
- 8. Expansion-Joint Fittings:
 - a. Install in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft. Install in runs of aboveground EMT conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.
 - b. Install type and quantity of fittings that accommodate temperature change listed for the following locations:
 - 1) Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - c. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - d. Install expansion fittings at locations where conduits cross building or structure expansion joints.
 - e. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's published instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- 9. Duct Raceways Penetrating Rooms or Walls with Acoustical Requirements: Seal duct raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.
- 10. Identification: Provide labels for conduit assemblies, duct raceways, and associated electrical equipment.
 - a. Provide warning signs

D. Interfaces with Other Work:

1. Firestop penetrations of fire-rated floor and wall assemblies.
2. Provide conduit hangers and supports.
3. Coordinate installation of new products with existing conditions.

3.3 FIELD QUALITY CONTROL OF CONDUITS FOR ELECTRICAL SYSTEMS

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
 1. Perform manufacturer's recommended tests and inspections.
 2. Pull solid aluminum or wood test mandrel through duct to prove joint integrity and adequate bend radii, and test for out-of-round duct. Provide minimum 12 inch long mandrel equal to duct size minus 1/4 inch. If obstructions are indicated, remove obstructions and retest.
 3. Conduit Placement:
 - a. Verify that center-line location and offsets are in accordance with the Drawings.
 - b. Verify that hangers and supports for conduits are attached to structure in accordance with the Drawings.
 - c. Verify that nuts on bolts or hanger rods are secure.
 - d. Verify that space between raceways and cored holes are filled with non-shrinking grout or other approved material indicated on the Drawings and the Specifications.
 - e. Verify that expansion devices are installed at locations indicated on the Drawings and the Specifications.
 - f. Verify that ends are cut square to provide flush-butting surfaces when spliced and inside edges are free of burrs that could impede installation of cables.
 - g. Verify minimum separation of utilities, or that approved mechanical protection has been provided to surrounding conduit(s) where minimum separation cannot be achieved.
 4. Document all changes on Record Drawings.
- C. Nonconforming Work:
 1. Conduit will be considered defective if it does not pass tests and inspections.
 2. Remove and replace defective units and retest.
- D. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

3.4 CLEANING

- A. Verify that bentonite or other drilling fluids are contained and removed, and site is restored to its original or improved condition.

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Tapes and stencils.
3. Tags.

PART 2 - PRODUCTS

2.1 LABELS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
2. Listing Criteria: UL CCN PGDQ2 for components; including UL 969.

B. UL PGDQ2 - Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. 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:
 - a. emedco.
 - b. Ideal Industries, Inc.
 - c. Panduit Corp.

2.2 TAPES AND STENCILS

A. Underground-Line Warning Tape:

1. 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:
 - a. Brady Corporation.
 - b. Ideal Industries, Inc.
 - c. Seton Identification Products; a Brady Corporation company.

2. Tape:

- a. Recommended by manufacturer for method of installation and suitable to identify and locate underground electrical and communications utility lines.
- b. Printing on tape must be permanent and may not be damaged by burial operations.
- c. Tape material and ink must be chemically inert and not be subject to degradation when exposed to acids, alkalis, and other destructive substances commonly found in soils.

3. Color and Printing:

- a. Comply with APWA Uniform Color Code using NEMA Z535.1 safety colors.
- b. Inscriptions for Red Tapes: "CAUTION BURIED ELECTRIC LINE BELOW".
- c. Inscriptions for Orange Tapes: .

2.3 TAGS

- A. Nonmetallic Preprinted Tags: Polyethylene tags, 0.015 inch thick, color-coded for phase and voltage level, with factory screened permanent designations; punched for use with self-locking cable tie fastener.
 - 1. 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:
 - a. Brady Corporation.
 - b. emedco.
 - c. Panduit Corp.
 - d. Seton Identification Products; a Brady Corporation company.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

- A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:

1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
 2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.
- B. Pipe and Conduit Labeling: Comply with ASME A13.1 and IEEE C2.
- C. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
1. Color must be factory applied or field applied for sizes larger than 6 AWG when permitted by authorities having jurisdiction.
 2. Colors for 208Y/120 V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 3. Colors for 240 V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 4. Colors for 480Y/277 V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 5. Color for Neutral (Grounded Conductor): White or gray.
 6. Color for Equipment Ground: Green.
- D. Color-Coding Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.
- E. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
1. "EMERGENCY POWER."
 2. "POWER."
- F. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- G. Locations of Underground Lines: Underground-line warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

- H. Vaults, Manholes, Handholes, and Pull and Junction Boxes, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use to identify phase.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
 - 2. Identify system voltage with black letters on orange field.
- I. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, for Service, Feeder, and Branch Circuits, More Than 30 A and 120 V to Ground: Identify with self-adhesive raceway labels.
 - 1. Locate identification at changes in direction, at penetrations of walls and floors, at 50 ft maximum intervals in straight runs, and at 25 ft maximum intervals in congested areas.
 - 2. Identify system voltage and system or service type with black letters on orange field.
- J. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use with conductor or cable designation, origin, and destination.
- K. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes with conductor designation.
- L. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate to be labeled with its individual, sequential designation, numbered clockwise when entering room from primary egress, composed of the following, in the order listed:
 - 1. Wiring closet designation.
 - 2. Colon.
 - 3. Faceplate number.
- M. Equipment Room Labeling:
 - 1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
 - 2. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels.
 - 3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:
 - a. Room number being served.
 - b. Colon.
 - c. Faceplate number.

- N. Backbone Cables: Label each cable with a self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.
- O. Horizontal Cables: Label each cable with a **[vinyl-wraparound label]** **[snap-around label]** **[self-adhesive wraparound label]** indicating the following, in the order listed:
 - 1. Room number.
 - 2. Colon.
 - 3. Faceplate number.
- P. Workspace Indication: Apply to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- Q. Equipment Identification Labels:
 - 1. Indoor Equipment: .
 - 2. Outdoor Equipment: Laminated acrylic or melamine sign.
 - 3. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of self-adhesive, engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Communications cabinets.
 - d. Access doors and panels for concealed electrical items.
 - e. Switchgear.
 - f. Switchboards.
 - g. Transformers: Label that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary.
 - h. Emergency system boxes and enclosures.
 - i. Motor-control centers.
 - j. Enclosed switches.
 - k. Enclosed circuit breakers.
 - l. Enclosed controllers.
 - m. Variable-speed controllers.
 - n. Contactors.
 - o. Remote-controlled switches, dimmer modules, and control devices.
 - p. Computer room air conditioners.
 - q. Fire-alarm and suppression equipment.
 - r. Egress points.

3.3 SELECTION OF SIGNS AND HAZARD MARKINGS

- A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.

B. Electrical Hazard Warnings:

1. Arc-Flash Hazard Warning: Self-adhesive labels. Comply with NFPA 70E requirements for arc-flash hazard warning labels.
2. OSHA Workspace Clearance Warning Legend: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."
3. .

C. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
 - a. Power-transfer switches.
 - b. Controls with external control power connections.

D. Operating Instruction Signs: .

E. Emergency Operating Instruction Signs: with white legend on red background with minimum 3/8 inch high letters for emergency instructions at equipment used for power transfer.

3.4 INSTALLATION

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- C. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.
- D. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- E. Install identifying devices before installing acoustical ceilings and similar concealment.
- F. Verify identity of item before installing identification products.
- G. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

- H. Apply identification devices to surfaces that require finish after completing finish work.
- I. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- J. System Identification for Raceways and Cables under 1000 V: Identification must completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
 - 1. Secure tight to surface of conductor, cable, or raceway.
- K. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- L. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.
- M. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.
- N. Self-Adhesive Labels:
 - 1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
 - 2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high label; where two lines of text are required, use labels 2 inch high.
- O. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.
- P. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.
- Q. Underground Line Warning Tape:
 - 1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 6 to 8 inch below finished grade. Use multiple tapes where width of multiple lines installed in common trench or concrete envelope exceeds 16 inch overall.
 - 2. Limit use of underground-line warning tape to direct-buried cables.
 - 3. Install underground-line warning tape for direct-buried cables and cables in raceways.
- R. Nonmetallic Preprinted Tags:
 - 1. Place in location with high visibility and accessibility.
 - 2. Secure using general-purpose cable ties.

END OF SECTION

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Business occupancy and vacancy sensors.

1.2 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings: Prepare and submit the following:

1. Installation details for the following:
 - a. Occupancy sensors.
 - b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Diagrams for power, signal, and control wiring.

1.3 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that installed lighting control devices perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.

B. Special Manufacturer Extended Warranty: Manufacturer warrants that lighting control devices perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.

1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control software.
 - b. Faulty operation of lighting control devices.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements:

1. Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 BUSINESS OCCUPANCY AND VACANCY SENSORS

A. Dual-Technology, Passive-Infrared (PIR) and Ultrasonic, Occupancy or Vacancy Sensor :

1. 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:
 - a. Cooper Lighting Solutions; Signify North America Corp.
 - b. Lutron
 - c. Acuity.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for one of the following UL product categories:
 - a. Energy Management Equipment: UL CCN PAZX, including UL 916 or UL 60730-1.
3. Standard Features:
 - a. Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
 - b. [Integrated] [Separate] power pack.
 - c. Hardwired connection to switch.
 - d. Sensitivity Adjustment: Separate for each sensing technology.
 - e. Detector Sensitivity: Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch, and detect a person of average size and weight moving not less than 12 inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/s.
 - 1) Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft when mounted on a 96 inch high ceiling.

- 2) Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft when mounted 48 inch above finished floor.

4. Operation:

- a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
- b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
- c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

B. Wall-Switch Occupancy Sensor :

1. 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:
 - a. Leviton Manufacturing Co., Inc.
 - b. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - c. WattStopper; Legrand North America, LLC.
 - d. Lutron.
2. Standard Features:
 - a. Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in single gang switchbox using hardwired connection.
 - 1) Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - 2) Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
 - 3) Switch Rating: Not less than 800 VA LED load at 120 V, 1200 VA LED load at 277 V, and 800 W incandescent.
 - b. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft.
 - c. Sensing Technology: Dual technology - PIR and ultrasonic.
 - d. Switch Type: Single pole, field-selectable automatic "on," or manual "on," automatic "off."
 - e. Capable of controlling load in three-way application.
 - f. Voltage: Match circuit voltage.

- g. Color: White.
- h. Faceplate: Color matched to switch.

PART 3 - EXECUTION

3.1 SELECTION OF CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 INSTALLATION OF LIGHTING CONTROL DEVICES

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:
 - 1. Electrical Construction: ICC IBC, ICC IFB, NFPA 1, NFPA 70, and NECA NEIS 1.
 - 2. Electrical Maintenance: NFPA 70B.
 - 3. Electrical Safety: NFPA 70E.
 - 4. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
 - 5. Communications Work: BICSI N1.
 - 6. Life Safety and Means of Egress Work: NFPA 101.
 - 7. Consult Architect for resolution of conflicting requirements.
- C. Special Installation Techniques:
 - 1. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
 - 2. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.
 - 3. Installation of Wiring:
 - a. Conduit: Minimum conduit size is 1/2 inch.

- b. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's published instructions.
 - c. Size conductors in accordance with lighting control device manufacturer's published instructions unless otherwise indicated.
 - d. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.
- D. Interfaces with Other Work:
 - 1. Identification: Provide labels for lighting control devices and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Label each enclosure with engraved metal or laminated-plastic nameplate.
 - c. Identify controlled circuits in lighting contactors.
 - d. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
 - e. Label time switches and contactors with a unique designation.
- E. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to the Project site during other-than-normal occupancy hours for this purpose. Some of the Work may be required during hours of darkness.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 - 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
 - 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.3 FIELD QUALITY CONTROL

- A. Administrant for Electrical Power Tests and Inspections:
 - 1. Owner will engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
 - 2. Engage qualified electrical testing and inspecting agency to administer and perform tests and inspections.
 - 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 - 4. Administer and perform tests and inspections.
- B. Administrant for Lighting Tests and Inspections:

1. [Owner] [Tenant] will engage qualified lighting testing and inspecting agency to administer and perform tests and inspections.
 2. Engage qualified lighting testing and inspecting agency to administer and perform tests and inspections.
 3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
 4. Administer and perform tests and inspections.
- C. Field tests must be witnessed by authorities having jurisdiction.
- D. Tests and Inspections:
1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Nonconforming Work:
1. Lighting control devices will be considered defective if they do not pass tests and inspections.
 2. Remove and replace defective units and retest.
- F. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.
- G. Manufacturer Services: Engage factory-authorized service representative to supervise field tests and inspections.
1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.4 CLOSEOUT ACTIVITIES

- A. Demonstration:
1. Demonstrate to Owner's maintenance and clerical personnel and building occupants how to operate the following systems and equipment:
 - a. Lighting control devices.
- B. Training:
1. Train Owner's maintenance personnel on the following topics:
 - a. How to adjust, operate, and maintain lighting control devices.

END OF SECTION

SECTION 262213 - LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Distribution, dry-type transformers with nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings:

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of field connections.
2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
3. Include diagrams for power, signal, and control wiring.

PART 2 - PRODUCTS

2.1 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. ABB, Electrification Products Division.
2. Eaton.
3. Siemens Industry, Inc., Energy Management Division.
4. Square D; Schneider Electric USA.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60 Hz service.

- B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- C. Transformers Rated 15 kVA and Larger:
 - 1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
 - 2. Marked as compliant with DOE 2016 efficiency levels by qualified electrical testing laboratory recognized by authorities having jurisdiction.

2.3 DISTRIBUTION TRANSFORMERS

- A. Comply with NFPA 70, and list and label as complying with UL 1561.
- B. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.
 - 1. One leg per phase.
- C. Coils: Continuous windings without splices except for taps.
 - 1. Coil Material: Copper.
 - 2. Internal Coil Connections: Brazed or pressure type.
 - 3. Terminal Connections: Bolted.
- D. Encapsulation: Transformers smaller than 30 kVA must have core and coils completely resin encapsulated.
- E. Enclosure: Ventilated.
 - 1. Core and coil must be encapsulated within resin compound using vacuum-pressure impregnation process to seal out moisture and air.
 - 2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
 - 3. Wiring Compartment: Sized for conduit entry and wiring installation.
 - 4. Environmental Protection:
 - a. Indoor: UL 50E, .
- F. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.
- G. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with maximum of 115 deg C rise above 40 deg C ambient temperature.
- H. Grounding: Provide ground-bar kit or ground bar installed on inside of transformer enclosure.

2.4 IDENTIFICATION

A. Nameplates:

1. Engraved, laminated-acrylic or melamine plastic signs for distribution transformers, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for transformers.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's published instructions.
- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
- D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance must be 5 Ω at location of transformer.
- E. Environment: Enclosures must be rated for environment in which they are located. Covers for UL 50E, Type 4X enclosures may not cause accessibility problems.

3.2 INSTALLATION

- A. Construct concrete bases and anchor floor-mounted transformers in accordance with manufacturer's published instructions, seismic requirements applicable to Project, and requirements in Section 260529 "Hangers and Supports for Electrical Systems."
 1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
- B. Secure transformer to concrete base in accordance with manufacturer's published instructions.
- C. Secure covers to enclosure and tighten bolts to manufacturer-recommended torques to reduce noise generation.
- D. Remove shipping bolts, blocking, and wedges.

3.3 CONNECTIONS

- A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals in accordance with manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- D. Provide flexible connections at conduit and conductor terminations and supports to eliminate sound and vibration transmission to building structure.

3.4 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
 - 1. Small (Up to 167 kVA Single-Phase or 500 kVA Three-Phase) Dry-Type Transformer Field Tests:
 - a. Visual and Mechanical Inspection.
 - 1) Inspect physical and mechanical condition.
 - 2) Inspect anchorage, alignment, and grounding.
 - 3) Verify that resilient mounts are free and that shipping brackets have been removed.
 - 4) Verify that unit is clean.
 - 5) Perform specific inspections and mechanical tests recommended by manufacturer.
 - 6) Verify that as-left tap connections are as specified.
 - 7) Verify presence of surge arresters and that their ratings are as specified.
 - b. Electrical Tests:
 - 1) Measure resistance at windings, taps, and bolted connections.
 - 2) Perform insulation-resistance tests winding-to-winding and windings-to-ground. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index: value of index may not be less than 1.0.
 - 3) Perform turns-ratio tests at tap positions. Test results may not deviate by more than one-half percent from either adjacent coils or calculated ratio. If test fails, replace transformer.

- 4) Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.
 - C. Test Labeling: On completion of satisfactory testing of units, attach dated and signed "Satisfactory Test" label to tested components.
 - D. Nonconforming Work:
 - 1. Transformer will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace units that do not pass tests or inspections and retest as specified above.
 - E. Assemble and submit test and inspection reports.
- 3.5 CLEANING
- A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Panelboards.
2. Disconnecting and overcurrent protective devices.

B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" specifies concrete bases and supports for panelboards installed by this Section.
2. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs installed by this Section.

1.2 DEFINITIONS

A. MCCB: Molded-case circuit breaker.

B. VPR: Voltage protection rating.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. In addition to information identified in Section 013300 "Submittal Procedures," submit the following:

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.

B. Shop Drawings: For each panelboard and related equipment:

1. Include dimensioned plans, elevations, sections, and details.
2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.
3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for series rating of installed devices.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

1.4 QUALIFICATIONS

- A. Low-Voltage Electrical Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.
 - 1. On-site electrical testing supervisors must have documented certification and experience with testing electrical equipment in accordance with NETA testing standards.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation in accordance with NECA 407.

1.6 WARRANTY

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed panelboards perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
- B. Comply with NEMA PB 1.
- C. Enclosures: Surface-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: UL 50E, Type 1.
 - 2. Height: 7 ft maximum.
 - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims must cover live parts and may have no exposed hardware.

4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims must cover live parts and may have no exposed hardware.
5. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
6. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
7. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Same finish as panels and trim.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
 - a. Plating must run entire length of bus.
 - b. Bus must be fully rated for entire length.
2. Interiors must be factory assembled into unit. Replacing switching and protective devices may not disturb adjacent units or require removing main bus connectors.
3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations must allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Compression type, with lug on neutral bar for each pole in panelboard.
5. Ground Lugs and Bus-Configured Terminators: Compression type, with lug on bar for each pole in panelboard.

F. Quality-Control Label: Panelboards or load centers must be labeled, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers must have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

2.2 PANELBOARDS

A. UL QEUUY - Distribution Panelboard :

1. 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:
 - a. Eaton.
 - b. Siemens Industry, Inc., Energy Management Division.
 - c. Square D; Schneider Electric USA.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Distribution Type Panelboards: UL CCN QEUY; including UL 67 and NEMA PB 1.
3. Standard Features:
 - a. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 1) For doors more than 36 inch high, provide two latches, keyed alike.
 - b. Mains: Circuit breaker.
 - 1) Location: Top.

B. UL QEUY - Lighting and Appliance Branch-Circuit Panelboard <Insert drawing designation>:

1. 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:
 - a. Eaton.
 - b. Siemens Industry, Inc., Energy Management Division.
 - c. Square D; Schneider Electric USA.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Lighting and Appliance Branch-Circuit Type Panelboards: UL CCN QEUY; including UL 67 and NEMA PB 1.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- 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. Eaton.

2. Siemens Industry, Inc., Energy Management Division.
 3. Square D; Schneider Electric USA.
- B. MCCB: Comply with UL 489, with to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
 2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards in accordance with NECA 407.

3.2 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Reference Standards:
1. Panelboards: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NECA 407.
 2. Consult Architect for resolution of conflicting requirements.
- C. Special Techniques:
1. Equipment Mounting:
 - a. Install floor-mounted panelboards on cast-in-place concrete equipment base(s).
 - b. Attach panelboard to vertical finished or structural surface behind panelboard.
 - c. Mount surface-mounted panelboards to steel slotted supports [5/8 inch] [1-1/4 inch] in depth. Orient steel slotted supports vertically.
 - d. Provide seismic control devices.
 2. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
 3. Provide mounting and anchoring devices.
 4. Mount top of trim 7.5 ft above finished floor unless otherwise indicated.
 5. Mount panelboard cabinet plumb and rigid without distortion of box.

6. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
7. Install overcurrent protective devices and controllers not already factory installed.
 - a. Set field-adjustable, circuit-breaker trip ranges.
 - b. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.
8. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
9. Install filler plates in unused spaces.
10. Stub four 1 inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in future. Stub four 1 inch empty conduits into raised floor space or below slab not on grade.
11. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

D. Interfaces with Other Work:

1. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components.
- B. Install warning signs.
- C. Panelboard Nameplates: Label each panelboard with nameplate.
- D. Device Nameplates: Label each branch circuit device in power panelboards with nameplate.
- E. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles must be located on interior of panelboard door.
- F. Breaker Labels: Faceplate must list current rating, UL and IEC certification standards, and AIC rating.
- G. Circuit Directory:
 1. Provide directory card inside panelboard door, mounted in transparent card holder.

- a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.
2. Provide computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - a. Circuit directory must identify specific purpose with detail sufficient to distinguish it from other circuits.
3. Create directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

3.4 FIELD QUALITY CONTROL

- A. Administrant for Low-Voltage Electrical Tests and Inspections:
 1. Engage qualified low-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
 2. Administer and perform tests and inspections.
- B. Acceptance Testing Preparation:
 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 2. Test continuity of each circuit.
- C. Field tests and inspections must be witnessed by authorities having jurisdiction.
- D. Tests and Inspections:
 1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
 3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:

- 1) Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- E. Nonconforming Work:
1. Panelboards will be considered defective if they do not pass tests and inspections.
 2. Remove and replace defective units and retest.
- F. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.
1. Include certified report that identifies panelboards included and that describes scanning results, with comparisons of two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- G. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-grade duplex straight-blade receptacles.
2. Receptacles with arc-fault and ground-fault protective devices.

B. Related Requirements:

1. Section 260526 "Grounding and Bonding for Electrical Systems" specifies grounding and bonding referenced by this Section.
2. Section 260553 "Identification for Electrical Systems" specifies electrical equipment labels and warning signs referenced by this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
 - a. If listed manufacturer differs from selling manufacturer, indicate relationship between entities on submittal. Clearly indicate which entity warrants product performance and fitness for purpose.
 - b. Listing criteria identified in approval letter must match specified listing criteria. UL label indicating approval of equipment's enclosure is not considered approval of equipment for intended application.
 - c. Product identification in approval letter must match product branding and model numbers in submittal. Approval letters for discontinued or superseded products are not acceptable for submitted product.
2. Include manufacturer's sample extended warranty language.

1.3 WARRANTY FOR DEVICES

- A. Special Installer Extended Warranty: Installer warrants that installed devices perform in accordance with specified requirements and agrees to repair or replace products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 GENERAL-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

A. Duplex Straight-Blade Receptacle :

1. 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:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Receptacles for Plugs and Attachment Plugs: UL CCN RTRT and UL 498.
 - b. Surge Protective Devices: UL 1449, Type 3.
3. Standard Features:
 - a. Device Color: Ivory.
 - b. Configuration:
 - 1) General-duty, NEMA 5-20R.
4. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

2.3 RECEPTACLES WITH ARC-FAULT AND GROUND-FAULT PROTECTIVE DEVICES

A. General-Grade, Duplex Straight-Blade Receptacle with GFCI Device :

1. 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:
 - a. Arrow Hart, Wiring Devices; Eaton, Electrical Sector.
 - b. Hubbell Wiring Device-Kellems; brand of Hubbell Electrical Solutions; Hubbell Incorporated.
 - c. Leviton Manufacturing Co., Inc.
 - d. Pass & Seymour; Legrand North America, LLC.
2. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Outlet Branch-Circuit Type GFCIs and AFCIs: UL CCN KCXX, UL 498, UL 943, UL 1699, and UL Subject 1699A.
3. Standard Features:
 - a. Device Color: Ivory.
4. Accessories:
 - a. Cover Plate: 0.060 inch thick, high-impact thermoplastic (nylon) with smooth finish and color matching wiring device; from same manufacturer as wiring device.
 - b. Securing Screws for Cover Plate: Metal with head color matching wallplate finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receptacles:

1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF SWITCHES

A. Comply with manufacturer's published instructions.

- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:
 - 1. Electrical Construction: ICC IBC, ICC IFB, NFPA 1, NFPA 70, and NECA NEIS 1.
 - 2. Electrical Safety: NFPA 70E.
 - 3. Life Safety and Means of Egress Work: NFPA 101.
 - 4. Wiring Devices: NECA NEIS 130.
 - 5. Consult Architect for resolution of conflicting requirements.
- C. Interfaces with Other Work:
 - 1. Identification:
 - a. Identify cover or cover plate for device with panelboard identification and circuit number.
 - b. Mark cover or cover plate using hot, stamped, or engraved machine printing with -filled lettering, and provide durable wire markers or tags inside device box or outlet box.
 - c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.

3.3 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

- A. Comply with manufacturer's published instructions.
- B. Reference Standards for Installation: Unless more stringent installation requirements are specified in the Contract Documents or manufacturer's published instructions, comply with the following:
 - 1. Electrical Construction: ICC IBC, ICC IFB, NFPA 1, NFPA 70, and NECA NEIS 1.
 - 2. Electrical Safety: NFPA 70E.
 - 3. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
 - 4. Installing and Maintaining Wiring Devices: NECA NEIS 130.
 - 5. Receptacle Orientation: Unless otherwise indicated in the Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
 - 6. Consult Architect for resolution of conflicting requirements.
- C. Interfaces with Other Work:
 - 1. Identification: Provide labels for receptacles and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Label each enclosure with engraved metal or laminated-plastic nameplate.

- 1) Identify cover or cover plate for device with panelboard identification and circuit number.
 - 2) Mark cover or cover plate using hot, stamped, or engraved machine printing with -filled lettering, and provide durable wire markers or tags inside device box or outlet box.
- c. Provide warning signs and arc-flash hazard warning labels for electrical equipment.

3.4 FIELD QUALITY CONTROL OF SWITCHES

- A. Administrant for Electrical Power Tests and Inspections:
1. Administer and perform tests and inspections.
- B. Field tests and inspections must be witnessed by authorities having jurisdiction.
- C. Tests and Inspections:
1. Perform tests and inspections in accordance with manufacturers' published instructions.
- D. Nonconforming Work:
1. Unit will be considered defective if it does not pass tests and inspections.
 2. Remove and replace defective units and retest.
- E. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.
- F. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.
1. Manufacturer's Field Reports for Field Quality-Control Support: Prepare and submit report after each visit by factory-authorized service representative, documenting activities performed at the Project site.

3.5 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

- A. Administrant for Electrical Power Tests and Inspections:
1. Administer and perform tests and inspections.
- B. Field tests and inspections must be witnessed by authorities having jurisdiction.
- C. Tests and Inspections:
1. Insert and remove test plug to verify that device is securely mounted.
 2. Verify polarity of hot and neutral pins.

3. Measure line voltage.
4. Measure percent voltage drop.
5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.

D. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Field Quality-Control Reports: Collect, assemble, and submit test and inspection reports.

F. Manufacturer Services: Engage factory-authorized service representative to support field tests and inspections.

3.6 PROTECTION

A. Devices:

1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.
2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

B. Connectors, Cords, and Plugs:

1. After installation, protect connectors, cords, and plugs from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonfusible switches.
2. Enclosures.

1.2 DEFINITIONS

- A. GFEP: Ground-fault circuit-interrupter for equipment protection.
- B. GFLS: Ground-fault circuit-interrupter for life safety.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Include evidence of qualified electrical testing laboratory listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 NONFUSIBLE SWITCHES

- 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. ABB, Electrification Business.
 - 2. Eaton.
 - 3. Siemens Industry, Inc., Energy Management Division.
 - 4. Square D; Schneider Electric USA.
- B. Type GD, General Duty, Three Pole, Single Throw, 240 V(ac), 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.
- C. Type HD, Heavy Duty, Three Pole, Single Throw, 600 V(ac), 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- D. Accessories:
 - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.

2.3 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.
- B. Enclosure Finish: Enclosure must be gray baked enamel paint, electrodeposited on cleaned, phosphatized steel (UL 50E Type 1).
- C. Conduit Entry: UL 50E Types 4, 4X, and 12 enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.
- D. Operating Mechanism: Circuit-breaker operating handle must be externally operable with operating mechanism being integral part of box, not cover. Cover interlock mechanism must have externally operated override. Override may not permanently disable interlock mechanism, which must return to locked position once override is released. Tool used to override cover interlock mechanism must not be required to enter enclosure in order to override interlock.
- E. Enclosures designated as UL 50E Type 4, 4X stainless steel, 12, or 12K must have dual cover interlock mechanism to prevent unintentional opening of enclosure cover when circuit breaker is ON and to prevent turning circuit breaker ON when enclosure cover is open.

- F. UL 50E Type 7/9 enclosures must be furnished with breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 SELECTION OF ENCLOSURES

- A. Indoor, Dry and Clean Locations: UL 50E, Type 1.
- B. Outdoor Locations: UL 50E, Type 3R.
- C. Kitchen Areas: UL 50E, Type 4X, stainless steel.

3.2 INSTALLATION

- A. Comply with manufacturer's published instructions.
- B. Special Techniques:
 - 1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
 - 2. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

3.3 IDENTIFICATION

- A. Comply with requirements in Section 260553 "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections for Switches:
 - 1. Visual and Mechanical Inspection:
 - a. Inspect physical and mechanical condition.
 - b. Inspect anchorage, alignment, grounding, and clearances.
 - c. Verify that unit is clean.
 - d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.

- e. Inspect bolted electrical connections for high resistance using one of the following methods:
 - 1) Use low-resistance ohmmeter.
 - a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
 - 2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.
 - a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.
- f. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on Drawings.
- g. Verify correct phase barrier installation.
- h. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

- a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
- b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
- c. Perform ground fault test in accordance with NETA ATS Section 7.14 "Ground Fault Protection Systems, Low-Voltage."

C. Tests and Inspections for Molded-Case Circuit Breakers:

1. Visual and Mechanical Inspection:

- a. Verify that equipment nameplate data are as described in the Specifications and shown on Drawings.
- b. Inspect physical and mechanical condition.
- c. Inspect anchorage, alignment, grounding, and clearances.
- d. Verify that unit is clean.
- e. Operate circuit breaker to ensure smooth operation.

D. Nonconforming Work:

1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Collect, assemble, and submit test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

F. Manufacturer Services:

1. Engage factory-authorized service representative to support field tests and inspections.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION

SECTION 265000 - LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Luminaire fittings.

B. Related Requirements:

1. Section 260529 "Hangers and Supports for Electrical Systems" specifies channel and angle supports installed by this Section.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Luminaires: Include the following additional information:

- a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
- b. Product Certificates: Include product certificates stating compliance with standards listed below, signed by manufacturer or fabricator.
 - 1) Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with current accreditation under National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.
 - 2) Testing Agency Certified Data: For luminaires indicated on Lighting Fixture Schedule on the Drawings, photometric data certified by qualified independent testing laboratory. Photometric data for remaining luminaires must be certified by manufacturer.
- c. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on the Drawings.
- d. Include battery and charger data for emergency lighting units.
- e. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
- f. Include photometric data and adjustment factors obtained from qualified laboratory tests.
- g. Include manufacturer's sample warranty language.

2. Luminaire Fittings: Include the following additional information:

- a. Product Listing: Include copy of unexpired approval letter, on letterhead of qualified electrical testing agency, certifying product's compliance with specified listing criteria.
- b. Include schedule of submitted lighting products. Arrange schedule and accompanying product data in order by luminaire and lamp designations indicated on the Drawings.
- c. Include manufacturer's sample warranty language.

1.3 QUALIFICATIONS

- A. Lighting Testing and Inspecting Agency: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" with documented training and experience with testing and inspecting lighting installations in accordance with applicable IES standards.

1.4 WARRANTY FOR LUMINAIRES

- A. Special Installer Extended Warranty: Installer warrants that fabricated and installed luminaires perform in accordance with specified requirements and agrees to repair or replace products that fail to perform as specified within extended-warranty period. Warranty must convey to Owner upon acceptance of the Work.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Products or components listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

2.2 LUMINAIRE FITTINGS

- A. Luminaire Support Accessories:
 - 1. Standard Features:
 - a. Sized and rated for luminaire weight.
 - b. Capable of maintaining luminaire position after cleaning and relamping.
 - c. Capable of supporting luminaire without causing deflection of ceiling or wall.
 - d. Capable of supporting horizontal force equal to 100 percent of luminaire weight and vertical force equal to 400 percent of luminaire weight.
 - 2. Other Available Features Required by the Project:

- a. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, 12 gage wire supports 10 ft in length.
- b. Aircraft Cables: 5/32 inch diameter aircraft cable supports in length.
- c. Rod Hangers: 3/16 inch nominal diameter, cadmium-plated, threaded steel rod.

PART 3 - EXECUTION

3.1 SELECTION OF LUMINAIRES

A. Finished Spaces:

- 1. Location: See drawings.

B. Unfinished Spaces:

- 1. Location: See drawings.

3.2 INSTALLATION OF LIGHTING

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

- 1. Electrical Construction: ICC IBC, ICC IFC, NFPA 1, NFPA 70, and NECA NEIS 1.
- 2. Grounding and Bonding: NECA NEIS 331 and Article 250 of NFPA 70.
- 3. Work in Confined Spaces: NFPA 350.
- 4. Installation of Indoor Lighting Systems: NECA NEIS 500.
- 5. Installation of Exterior Lighting Systems: NECA NEIS 501.
- 6. Installation of Luminaires, Lampholders, and Lamps: Article 410 of NFPA 70.
- 7. Installation of Emergency Lighting and Exit Signs: ICC IBC, NFPA 101, and Parts IV and V in Article 700 of NFPA 70.
- 8. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

- 1. Install luminaires level, plumb, and square with finished floor or grade unless otherwise indicated.
- 2. Install luminaires at height and aiming angle as indicated on the Drawings.
- 3. Coordinate layout and installation of luminaires with other construction.
- 4. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.
- 5. Flush-Mounted Luminaire Support:

- a. Secured to outlet box.
 - b. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - c. Trim ring flush with finished surface.
- 6. Suspended Luminaire Support:
 - a. Ceiling Mount:
 - 1) Hook hangers.
 - 2) Two wires.
 - 3) Two aircraft cables.
 - b. Pendants and Rods: Where longer than 48 inch, brace to limit swinging.
 - c. Stem-Mounted, Single-Unit luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 - d. Continuous Rows of luminaires: Provide tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
 - e. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- 7. Ceiling-Grid-Mounted Luminaire Support:
 - a. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each luminaire. Locate not more than 6 inch from luminaire corners.
 - b. Support Clips: Fasten to luminaires and to ceiling grid members at or near each luminaire corner with clips that are UL listed for application.
 - c. Seismic Restraint: Install at least one independent support rod or wire from structure to tab on luminaire. Wire or rod must have breaking strength for luminaire weight with safety factor of 3.0.
- 8. Emergency Power Units: Secure with approved fasteners in four or more locations, spaced near corners of unit.
- 9. Install wiring connections for luminaires.
- 10. Identification: Provide labels for luminaires and associated electrical equipment.
 - a. Identify field-installed conductors, interconnecting wiring, and components.
 - b. Label each enclosure with engraved metal or laminated-plastic nameplate.
- D. Interfaces with Other Work:
 - 1. Coordinate installation of new products for with existing conditions.
- E. Systems Integration: Integrate lighting control devices and equipment with electrical power connections for operation of luminaires as specified.

- F. Protection: After installation, protect lighting equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

3.3 FIELD QUALITY CONTROL OF LIGHTING

- A. Field tests and inspections must be witnessed by authorities having jurisdiction.
- B. Tests and Inspections:
 - 1. Perform manufacturer's recommended tests and inspections.
 - 2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
 - 3. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
 - 4. Verify operation of photoelectric controls.
- C. Nonconforming Work:
 - 1. Luminaire will be considered defective if it does not pass tests and inspections.
 - 2. Remove and replace defective units and retest.
- D. Manufacturer Services: Engage factory-authorized service representative to supervise field tests and inspections.

3.4 CLOSEOUT ACTIVITIES

- A. Training:
 - 1. Train Owner's maintenance personnel on the following topics:
 - a. How to adjust, operate, and maintain luminaires.
 - 2. Allow Owner to record training sessions.

END OF SECTION

SECTION 284621.13 - FIRE-ALARM SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.

B. Related Requirements:

1. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for cables and conductors for fire-alarm systems.

1.2 ACTION SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified fire-alarm technician; Level III minimum.
 - c. Licensed or certified by authorities having jurisdiction.

B. Product Data: For each type of product, including furnished options and accessories.

C. Shop Drawings: For fire-alarm system.

1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and locations. Indicate conductor sizes, indicate termination locations and requirements, and distinguish between factory and field wiring.
4. Detail assembly and support requirements.
5. Include voltage drop calculations for notification-appliance circuits.
6. Include battery size calculations.
7. Include input/output matrix.

8. Include statement from manufacturer that all equipment and components have been tested as a system and meet all requirements in this Specification and in NFPA 72.
9. Include performance parameters and installation details for each detector.
10. Verify that each duct smoke detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
11. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
 - a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
 - b. Show field wiring required for HVAC unit shutdown on alarm.
 - c. Locate detectors according to manufacturer's written recommendations.
12. Include floor plans to indicate final outlet locations showing zone designation of each device. Show size and route of cable and conduits and point-to-point wiring diagrams.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
 2. Installation shall be by personnel certified by NICET technician.
- B. NFPA Certification:
 1. Obtain certification according to NFPA 72 by an NRTL (nationally recognized testing laboratory).

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace fire-alarm system equipment and components that fail in materials or workmanship within specified warranty period.
 1. Warranty Extent: All equipment and components not covered in the Maintenance Service Agreement.
 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Source Limitations for Fire-Alarm System and Components: Provide system manufacturer's certification that all components provided have been tested as, and will operate as, a system.
- B. System shall be fully addressable type.
- C. All components provided shall be listed for use with the selected system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Smoke detectors.
 - 4. Duct smoke detectors.
 - 5. Automatic sprinkler system water flow.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Continuously operate alarm notification appliances.
 - 2. Identify alarm zone at fire-alarm control unit.
 - 3. Transmit an alarm signal to the remote alarm receiving station.
 - 4. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 - 5. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 - 6. Record events in the system memory.
- C. Supervisory signal initiation shall be by one or more of the following devices and systems:
 - 1. Valve supervisory switch.
 - 2. Loss of communication with any panel on the network.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
 - 1. Open circuits, shorts, and grounds in designated circuits.

2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in internal circuits of fire-alarm control unit.
5. Break in standby battery circuitry.
6. Failure of battery charging.

E. System Trouble and Supervisory Signal Actions:

1. Annunciate at fire-alarm control unit.

2.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2.4 FIRE-ALARM CONTROL UNIT

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. Edwards; Carrier Global Corporation.
2. Fire-Lite Alarms; Honeywell International, Inc.
3. Gamewell-FCI; Honeywell International, Inc.
4. Notifier; Honeywell International, Inc.
5. Siemens Industry, Inc.; Fire Safety Division.
6. Silent Knight; Honeywell International, Inc.
7. Simplex; brand of Johnson Controls International plc, Building Solutions North America.

B. General Requirements for Fire-Alarm Control Unit:

1. Modular, power-limited design with electronic modules, UL 864 listed.
 - a. Include a real-time clock for time annotation of events.
 - b. The FACP shall be listed for connection to a central-station signaling system service.

C. Alphanumeric Display and System Controls: Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, two lines of 80 characters, minimum.

D. Circuits:

1. Initiating-Device Circuits: No fewer than five
 - a. Four circuits, NFPA 72, Class B.
 - b. One circuit(s), NFPA 72, Class A.
2. Notification-Appliance Circuits: No fewer than two; NFPA 72, Class B.
3. Serial Interfaces:
 - a. One RS 232 port for personal computer configuration.

E. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

F. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals and supervisory and digital alarm communicator transmitters shall be powered by the 24-V dc source.

1. Alarm current draw of the entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

G. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

2.5 MANUAL FIRE-ALARM BOXES

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. Edwards; Carrier Global Corporation.
2. Federal Signal Corporation.
3. Fire-Lite Alarms; Honeywell International, Inc.
4. Gamewell-FCI; Honeywell International, Inc.
5. Notifier; Honeywell International, Inc.
6. Siemens Industry, Inc.; Fire Safety Division.
7. System Sensor.
8. Wheelock, Life Safety and Mass Notification; Eaton, Electrical Sector.

B. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38.

1. Single-action mechanism, pull-lever type.
2. Station Reset: Key- or wrench-operated switch.

2.6 SYSTEM SMOKE DETECTORS

- 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. Edwards; Carrier Global Corporation.
 - 2. Fire-Lite Alarms; Honeywell International, Inc.
 - 3. Gamewell-FCI; Honeywell International, Inc.
 - 4. Gentex Corporation.
 - 5. Notifier; Honeywell International, Inc.
 - 6. Siemens Industry, Inc.; Fire Safety Division.
 - 7. Silent Knight; Honeywell International, Inc.
 - 8. Simplex; brand of Johnson Controls International plc, Building Solutions North America.
 - 9. System Sensor.
- B. General Requirements for System Smoke Detectors:
 - 1. Operating at 24-V dc, nominal.
 - 2. Detectors shall be two-wire type.
 - 3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
- C. Photoelectric Smoke Detectors: Comply with UL 268.
- D. Ionization Smoke Detector: Comply with UL 268.
- E. Duct Smoke Detectors: Photoelectric type complying with UL 268A.
 - 1. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
 - 2. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.

2.7 HEAT DETECTORS

- 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. Edwards; Carrier Global Corporation.
 - 2. Fire-Lite Alarms; Honeywell International, Inc.
 - 3. Gamewell-FCI; Honeywell International, Inc.
 - 4. Gentex Corporation.
 - 5. Notifier; Honeywell International, Inc.
 - 6. Siemens Industry, Inc.; Fire Safety Division.

7. Silent Knight; Honeywell International, Inc.
 8. Simplex; brand of Johnson Controls International plc, Building Solutions North America.
 9. System Sensor.
- B. General Requirements for Heat Detectors: Comply with UL 521.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature.
1. Mounting: Adapter plate for outlet box mounting.

2.8 NOTIFICATION APPLIANCES

- 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. Edwards; Carrier Global Corporation.
 2. Federal Signal Corporation.
 3. Gentex Corporation.
 4. Siemens Industry, Inc.; Fire Safety Division.
 5. Simplex; brand of Johnson Controls International plc, Building Solutions North America.
 6. System Sensor.
 7. Wheelock, Life Safety and Mass Notification; Eaton, Electrical Sector.
- B. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- C. Chimes, High-Level Output: Vibrating type.
- D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464.
- E. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
1. Mounting: Wall mounted unless otherwise indicated.
 2. Flashing shall be in a temporal pattern, synchronized with other units.
 3. Strobe Leads: Factory connected to screw terminals.
 4. Mounting Faceplate: Factory finished, red.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
- B. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.
- C. Manual Fire-Alarm Boxes:
 - 1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
 - 2. Mount manual fire-alarm box on a background of a contrasting color.
 - 3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.
- D. Smoke- or Heat-Detector Spacing: Comply with NFPA 72.
- E. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.
- F. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- G. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.
- H. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.
- I. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2 PATHWAYS

- A. Pathways above recessed ceilings and in nonaccessible locations may be routed exposed.

1. Exposed pathways located less than 96 inches above the floor shall be installed in EMT.
- B. Pathways shall be installed in EMT.
- C. Exposed EMT shall be painted red enamel.

3.3 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 087100 "Door Hardware." Connect hardware and devices to fire-alarm system.
 1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
- B. Connect supervised interface devices to the following devices and systems. Install the interface device less than 36 inches from the device controlled.
 1. Smoke dampers in air ducts of designated HVAC duct systems.
 2. Electronically locked doors and access gates.
 3. Supervisory connections at valve supervisory switches.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.5 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.6 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 1. Visual Inspection: Conduct the visual inspection prior to testing.

- a. Inspection shall be based on completed record Drawings and system documentation that is required by NFPA 72 in Chapter 10 "Fundamentals," Section 10.18.21 "Completion Documents, Preparation."
 - b. Comply with NFPA 72, Chapter 14, "Inspection, Testing, and Maintenance," Section 14.3 "Inspection" and the "Visual Inspection Frequencies" Table; retain the "Initial/Reacceptance" column and list only the installed components.
 - 2. System Testing: Comply with NFPA 72, Chapter 14, "Inspection, Testing, and Maintenance," Section 14.4 "Testing" and the "Test Methods" Table.
 - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 - 4. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 - 5. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
 - D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
 - E. Prepare test and inspection reports.
 - F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
 - G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with the visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.
- 3.7 DEMONSTRATION
- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes planting soils specified by composition of the mixes.

1.2 DEFINITIONS

- A. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- B. Imported Soil: Soil that is transported to Project site for use.
- C. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- E. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- F. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- G. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- H. USCC: U.S. Composting Council.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Regional Materials: Imported soil shall be manufactured within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

PART 3 - EXECUTION

3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.
- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches and stockpile until amended.
- B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
- C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.
- D. Screening: Pass unamended soil through a 2-inch sieve to remove large materials.

3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Spread unamended soil to total depth of 4 inches , but not less than required to meet finish grades after mixing with amendments and natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

1. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches in loose depth for material compacted by compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place except where a different compaction value is indicated on Drawings.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 BLENDING PLANTING SOIL IN PLACE

- A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.
 1. Mix fertilizer with planting soil no more than seven days before planting.
- D. Compaction: Compact blended planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 except where a different compaction value is indicated on Drawings.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.5 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

- A. Application: Apply compost component of planting-soil mix to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.6 PROTECTION AND CLEANING

- A. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Vehicle traffic.
 - 4. Foot traffic.
 - 5. Erection of sheds or structures.
 - 6. Impoundment of water.
 - 7. Excavation or other digging unless otherwise indicated.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
 - 1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding.

1.2 DEFINITIONS

- A. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- B. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species:
 1. Quality, State Certified: State-certified seed of grass species.

PART 3 - EXECUTION

3.1 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."
- B. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.2 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 2 lb/1000 sq. ft..
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- E. Protect seeded areas from hot, dry weather or drying winds by applying within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.3 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

- B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings.

3.4 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 - 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

END OF SECTION

APPENDIX 1 – ASBESTOS AND LEAD INSPECTION REPORTS

St. John Environmental Consulting LLC
5515 Grace Avenue, St. Louis, MO 63116
Phone: (314)-853-4668
Email: ian@stjohnenv.com
SDVOSB



January 22, 2024

Mr. Ali Badran
Vestal Corporation

RE: Asbestos Bulk Sampling Survey: 375 N. Commercial, St. Clair, MO
Project # 2401-018

Dear Mr. Badran:

Thank you for allowing St. John Environmental Consulting (SEC) the opportunity to perform the asbestos sampling on the property located at 375 N. Central, St. Clair, Missouri. Under the US EPA Federal NESHAPs regulations, structures planned for renovation and demolition must have all suspect asbestos containing materials to be impacted sampled by a licensed inspector and analyzed by an accredited testing laboratory. The structures identified were sampled according to the Federal Requirements.

Sample #1 – 9X9 Green Floor Tile / Mastic – Asbestos Containing (2400 Sq. Ft.)

Sample #2 – 12X12 Black with White Floor Tile / Mastic – Non-Asbestos Containing

Sample #3 – 4” Gray Covebase / Mastic – Non-Asbestos Containing

Sample #4 – 2X2 White Worm & Pin Ceiling Tile – Non-Asbestos Containing

Sample #5 – Drywall / Joint Compound – Asbestos Containing

Sample #6 – 12X12 White with Beige Floor Tile / Mastic – Asbestos Containing (660 Sq. Ft.)

Sample #7 – 4” Black Covebase / Mastic – Non-Asbestos Containing

Sample #8 – 2X4 Worm & Pin Ceiling Tile – Non-Asbestos Containing

Sample #9 – Pipe Insulation-Asbestos Containing (100 Linear Feet)

Sample #10 – Pipe Fittings– Asbestos Containing (40 Fitting)

Sample #11 – Black Rubitex on Pipe – Non-Asbestos Containing

Sample #12 – 12X12 Tan with Gray Floor Tile / Mastic – Non-Asbestos Containing

Sample #13 – 4” Brown Covebase / Mastic – Non-Asbestos Containing

Sample #14 – 12X12 Gray with White Floor Tile / Mastic – Non-Asbestos Containing

Sample #15 – Gray Floor Epoxy – Non-Asbestos Containing

St. John Environmental Consulting LLC
5515 Grace Avenue, St. Louis, MO 63116
Phone: (314)-853-4668
Email: ian@stjohnenv.com
SDVOSB



All quantities are to be verified by any contractor bidding for the removal. Assumed piping above the drywall ceilings and in the walls in the bathrooms and kitchen. All though we believe the quantities to be correct.

Enclosed please find Bulk Sampling Forms, Laboratory Results, and applicable certifications. If you have any questions, please contact us at (314) 853.4668. Thank You.

Respectfully,

A handwritten signature in black ink, appearing to read "Ian St. John", written over a horizontal line.

Ian St. John
President

St. John Environmental Consulting
5515 Grace Avenue
St. Louis, MO 63116
Tel: (314) 853-4668
Email: ian@stjohnenv.com

Asbestos Bulk Sampling Form

Project Number: 2401-018
Client: Vestal Corporation
Address: 1 The Pine Court, Suite A
City/State: St. Louis, MO
Contact: Ali Badran
Results Needed By: 24 Hours

Taken By: Ian St. John
Facility: 1175 M.P. Company
Address: 375 N. *Commercial*
City/State: St. Clair, MO
Phone Number: N/A
Page: 1 of 3

Date: 1/16/24

Sample No.	Sample Description	Sample Location
1-01	9X9 Green Floor Tile / Mastic	Platoon Offices
1-02	9X9 Green Floor Tile / Mastic	Conference Room
1-03	9X9 Green Floor Tile / Mastic	NCO Office
2-01	12X12 Black with White Floor Tile / Mastic	Platoon Offices
2-02	12X12 Black with White Floor Tile / Mastic	Platoon Offices
2-03	12X12 Black with White Floor Tile / Mastic	Platoon Offices
3-01	4" Gray Covebase / Mastic	Recruiting Office
3-02	4" Gray Covebase / Mastic	Entry at Transport
3-03	4" Gray Covebase / Mastic	1st Sgt. Office
4-01	2X2 White Worm & Pin Ceiling Tile	Recruiting Office
4-02	2X2 White Worm & Pin Ceiling Tile	Conference Room
4-03	2X2 White Worm & Pin Ceiling Tile	Conference Room
5-01	Drywall / Joint Compound	Throughout
5-02	Drywall / Joint Compound	Throughout
5-03	Drywall / Joint Compound	Throughout
6-01	12X12 White with Beige Floor Tile / Mastic	Kitchen
6-02	12X12 White with Beige Floor Tile / Mastic	Kitchen
6-03	12X12 White with Beige Floor Tile / Mastic	Kitchen
7-01	4" Black Covebase / Mastic	Kitchen
7-02	4" Black Covebase / Mastic	Classroom Office
7-03	4" Black Covebase / Mastic	Classroom Office

St. John Environmental Consulting
 55515 Grace Avenue
 St. Louis, MO 63116
 Tel: (314) 853-4668
 Email: ian@stjohnenv.com

Asbestos Bulk Sampling Form

Project Number:	2401-018	Taken By:	Ian St. John	Date:	1/16/24
Client:	Vestal Corporation	Facility:	1175 M.P. Company		
Address:	1 The Pine Court, Suite A	Address:	375 N. Commercial		
City/State:	St. Louis, MO	City/State:	St. Clair, MO		
Contact:	Ali Badran	Phone Number:	N/A		
Results Needed By:	24 Hours	Page:	2 of 3		

Sample No.	Sample Description	Sample Location
8-01	2X4 Worm & Pin Ceiling Tile	Ladies Room
8-02	2X4 Worm & Pin Ceiling Tile	Gym
8-03	2X4 Worm & Pin Ceiling Tile	Gym
9-01	Pipe Insulation	Cafeteria
9-02	Pipe Insulation	Ladies Room
9-03	Pipe Insulation	Supply Room
10-01	Pipe Fittings	Cafeteria
10-02	Pipe Fittings	Ladies Room
10-03	Pipe Fittings	Ladies Room
11-01	Black Rubitex	Mens Room
11-02	Black Rubitex	Mens Room
11-03	Black Rubitex	Mens Room
12-01	12X12 Tan wih Gray Floor Tile / Mastic	Classroom
12-02	12X12 Tan wih Gray Floor Tile / Mastic	Classroom
12-03	12X12 Tan wih Gray Floor Tile / Mastic	Classroom
13-01	4" Brown Covebase / Mastic	Classroom
13-02	4" Brown Covebase / Mastic	Classroom
13-03	4" Brown Covebase / Mastic	Classroom
14-01	12x12 Gray with White Floor Tile / Mastic	Transportation Office
14-02	12x12 Gray with White Floor Tile / Mastic	Transportation Office
14-03	12x12 Gray with White Floor Tile / Mastic	Transportation Office

St. John Environmental Consulting
55515 Grace Avenue
St. Louis, MO 63116
Tel: (314) 853-4668
Email: ian@stjohnenv.com

Asbestos Bulk Sampling Form

Project Number: 2401-018
Client: Vestal Corporation
Address: 1 The Pine Court, Suite A
City/State: St. Louis, MO
Contact: Ali Badran
Results Needed By: 24 Hours

Taken By: Ian St. John
Facility: 1175 M.P. Company
Address: 375 N. Commercial
City/State: St. Clair, MO
Phone Number: N/A
Page: 3 of 3

Date: 1/16/24

[illegible]



Southeast Environmental Microbiology Laboratories - Asbestos Division

102 Edinburgh Court Greenville, SC 29607
Phone: 864-233-3770, Fax: 864-233-6589 , www.seeml.com
NVLAP Lab ID:201031-0 xas Lic: 300474

PLM Asbestos Bulk Sample Summary

Client: St. John Environmental Consulting " 314)853-4668/ian@stjohnenv.com, mak@seeml.com			Date Sampled:	01/16/2024
			Date Received:	01/17/2024
			Date Analyzed:	01/17/2024
			Date Reported:	01/17/2024
			Date Revised:	
			Project Name:	1175th Army National Gaurd
			Project No:	
Analyzed by:		Emily McElveen	Project Address:	375 N Commercial Ave
			City, State. ZIP:	St. Clair, MO 63077
Methodology:		EPA/600/R-93/116 Without Gravimetry	SEEML Ref#:	G-240117037
Lab No.:	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material	Description/Location
Client No.:				
120A	3% Chrysotile	None Detected	97% Organic Matrix	(Green) Floor Tile/1st Sgt Commanders Platoon Offices
1-01				
120B	4% Chrysotile	None Detected	96% Organic Matrix	(Black) Mastic/1st Sgt Commanders Platoon Offices
1-01				
121A	POSITIVE STOP			(Green) Floor Tile/1st Sgt Commanders Conference Room
1-02				
121B	POSITIVE STOP			(Black) Mastic/1st Sgt Commanders Conference Room
1-02				
122A	POSITIVE STOP			(Green) Floor Tile/1st Sgt Commanders NCO Office Admin
1-03				
122B	POSITIVE STOP			(Black) Mastic/1st Sgt Commanders NCO Office Admin
1-03				
123A	None Detected	None Detected	100% Organic Matrix	(Black) Floor Tile/Platoon Offices
2-01				
123B	None Detected	None Detected	100% Organic Matrix	(Tan) Mastic/Platoon Offices
2-01				
124A	None Detected	None Detected	100% Organic Matrix	(Black) Floor Tile/Platoon Offices
2-02				

Approved By: Andrea Berrios

Disclaimer:

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Southeast Environmental Microbiology Laboratories - Asbestos Division

102 Edinburgh Court Greenville, SC 29607

Phone: 864-233-3770, Fax: 864-233-6589 , www.seeml.com

NVLAP Lab ID:201031-0

xas Lic: 300474

PLM Asbestos Bulk Sample Summary

Client: St. John Environmental Consulting		Date Sampled: 01/16/2024
		Date Received: 01/17/2024
		Date Analyzed: 01/17/2024
314)853-4668/ian@stjohnenv.com, mak@seeml.com		Date Reported: 01/17/2024
		Date Revised:
		Project Name: 1175th Army National Gaurd
		Project No:
Analyzed by:	Emily McElveen	Project Address: 375 N Commercial Ave
		City, State, ZIP: St. Clair, MO 63077
Methodology:	EPA/600/R-93/116 Without Gravimetry	SEEML Ref#: G-240117037

Lab No.:	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material	Description/Location
124B	None Detected	None Detected	100% Organic Matrix	(Tan) Mastic/Platoon Offices
2-02				
125A	None Detected	None Detected	100% Organic Matrix	(Black) Floor Tile/Platoon Offices
2-03				
125B	None Detected	None Detected	100% Organic Matrix	(Tan) Mastic/Platoon Offices
2-03				
126A	None Detected	None Detected	100% Organic Matrix	(Gray) Cove Base/Recruiting Office
3-01				
126B	None Detected	None Detected	100% Organic Matrix	(Tan) Mastic/Recruiting Office
3-01				
127A	None Detected	None Detected	100% Organic Matrix	(Gray) Cove Base/Entry To Transport
3-02				
127B	None Detected	None Detected	100% Organic Matrix	(Tan) Mastic/Entry To Transport
3-02				
128A	None Detected	None Detected	100% Organic Matrix	(Gray) Cove Base/1st Sgt Office
3-03				
128B	None Detected	None Detected	100% Organic Matrix	(Tan) Mastic/1st Sgt Office
3-03				

Approved By: Andrea Berrios

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Form 8.0 Rev. 8/04/29/20



Southeast Environmental Microbiology Laboratories - Asbestos Division

102 Edinburgh Court Greenville, SC 29607
 Phone: 864-233-3770, Fax: 864-233-6589 , www.seeml.com
 NVLAP Lab ID:201031-0 xas Lic: 300474

PLM Asbestos Bulk Sample Summary

Client: St. John Environmental Consulting		Date Sampled:	01/16/2024
		Date Received:	01/17/2024
		Date Analyzed:	01/17/2024
314)853-4668/ian@stjohnenv.com, mak@seeml.com		Date Reported:	01/17/2024
		Date Revised:	
		Project Name:	1175th Army National Gaurd
		Project No:	
Analyzed by:	Emily McElveen	Project Address:	375 N Commercial Ave
		City, State, ZIP:	St. Clair, MO 63077
Methodology:	EPA/600/R-93/116 Without Gravimetry	SEEML Ref#:	G-240117037

Lab No.:	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material	Description/Location
129A	None Detected	85% Cellulose	10% Binder/Filler, 5% Perlite	(White) Ceiling Tile/Recruiting
4-01				
130A	None Detected	85% Cellulose	10% Binder/Filler, 5% Perlite	(White) Ceiling Tile/Conference Room
4-02				
131A	None Detected	85% Cellulose	10% Binder/Filler, 5% Perlite	(White) Ceiling Tile/Conference Room
4-03				
132A	4% Chrysotile	None Detected	96% Binder/Filler	(Tan) Joint Compound/Uprooms
5-01				
132B	None Detected	25% Cellulose	75% Gypsum	(White) Drywall/Uprooms
5-01				
133A	POSITIVE STOP			(Tan) Joint Compound/Uprooms
5-02				
133B	None Detected	30% Cellulose	70% Gypsum	(White) Drywall/Uprooms
5-02				
134A	POSITIVE STOP			(Tan) Joint Compound/Uprooms
5-03				
134B	None Detected	30% Cellulose	70% Gypsum	(Pink) Drywall/Uprooms
5-03				

Approved By: Andrea Berrios

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**Southeast Environmental Microbiology Laboratories - Asbestos Division**

102 Edinburgh Court Greenville, SC 29607

Phone: 864-233-3770, Fax: 864-233-6589 , www.seeml.com

NVLAP Lab ID:201031-0

xas Lic: 300474

PLM Asbestos Bulk Sample Summary

Client: St. John Environmental Consulting		Date Sampled:	01/16/2024	
		Date Received:	01/17/2024	
		Date Analyzed:	01/17/2024	
314)853-4668/ian@stjohnenv.com, mak@seeml.com		Date Reported:	01/17/2024	
		Date Revised:		
		Project Name:	1175th Army National Gaurd	
		Project No:		
Analyzed by:	Emily McElveen	Project Address:	375 N Commercial Ave	
		City, State, ZIP:	St. Clair, MO 63077	
Methodology:	EPA/600/R-93/116 Without Gravimetry	SEEML Ref#:	G-240117037	
Lab No.:	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material	Description/Location
Client No.:				
135A	2% Chrysotile	None Detected	98% Organic Matrix	(Off-White) Floor Tile/Kitchen
6-01				
135B	None Detected	None Detected	100% Organic Matrix	(Yellow) Mastic/Kitchen
6-01				
136A	POSITIVE STOP			(Off-White) Floor Tile/Kitchen
6-02				
136B	None Detected	None Detected	100% Organic Matrix	(Yellow) Mastic/Kitchen
6-02				
137A	POSITIVE STOP			(Off-White) Floor Tile/Kitchen
6-03				
137B	None Detected	None Detected	100% Organic Matrix	(Yellow) Mastic/Kitchen
6-03				
138A	None Detected	None Detected	100% Organic Matrix	(Black) Cove BAsE/Kitchen
7-01				
138B	None Detected	None Detected	100% Organic Matrix	(Brown) Mastic/Kitchen
7-01				
139A	None Detected	None Detected	100% Organic Matrix	(Black) Cove Base/Classroom Office
7-02				

Approved By: Andrea Berrios**Disclaimer:**

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**Southeast Environmental Microbiology Laboratories - Asbestos Division**

102 Edinburgh Court Greenville, SC 29607

Phone: 864-233-3770, Fax: 864-233-6589 , www.seeml.com

NVLAP Lab ID:201031-0

xas Lic: 300474

PLM Asbestos Bulk Sample Summary

Client: St. John Environmental Consulting		Date Sampled:	01/16/2024	
		Date Received:	01/17/2024	
		Date Analyzed:	01/17/2024	
" (314)853-4668/ian@stjohnenv.com, mak@seeml.com		Date Reported:	01/17/2024	
		Date Revised:		
		Project Name:	1175th Army National Gaurd	
		Project No:		
Analyzed by:	Emily McElveen	Project Address:	375 N Commercial Ave	
		City, State, ZIP:	St. Clair, MO 63077	
Methodology:	EPA/600/R-93/116 Without Gravimetry	SEEML Ref#:	G-240117037	
Lab No.:	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material	Description/Location
Client No.:				
147A	40% Chrysotile	None Detected	60% Binder/Filler	(Gray) Pipe Fitting/Cafeteria
10-01				
148A	POSITIVE STOP			(Gray) Pipe Fitting/Ladie's Room
10-02				
149A	POSITIVE STOP			(Gray) Pipe Fitting/Ladie's Room
10-03				
150A	None Detected	None Detected	100% Organic Matrix	(Gray) Foam/Mens Room
11-01				
150B	None Detected	None Detected	100% Organic Matrix	(Yellow) Mastic/Mens Room
11-01				
151A	None Detected	None Detected	100% Organic Matrix	(Gray) Foam/Mens Room
11-02				
152A	None Detected	None Detected	100% Organic Matrix	(Gray) Foam/Mens Room
11-03				
153A	None Detected	None Detected	100% Organic Matrix	(Tan) Floor Tile/Classroom
12-01				
153B	None Detected	None Detected	100% Organic Matrix	(Black) Mastic/Classroom
12-01				

Approved By: Andrea Berrios**Disclaimer:**

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Form 8.0 Rev. 8/04/29/20



Southeast Environmental Microbiology Laboratories - Asbestos Division

102 Edinburgh Court Greenville, SC 29607

Phone: 864-233-3770, Fax: 864-233-6589 , www.seeml.com

NVLAP Lab ID:201031-0

xas Lic: 300474

PLM Asbestos Bulk Sample Summary

Client: St. John Environmental Consulting		Date Sampled:	01/16/2024
		Date Received:	01/17/2024
		Date Analyzed:	01/17/2024
314)853-4668/ian@stjohnenv.com, mak@seeml.com		Date Reported:	01/17/2024
		Date Revised:	
		Project Name:	1175th Army National Gaurd
		Project No:	
Analyzed by:	Emily McElveen	Project Address:	375 N Commercial Ave
		City, State, ZIP:	St. Clair, MO 63077
Methodology:	EPA/600/R-93/116 Without Gravimetry	SEEML Ref#:	G-240117037

Lab No.:	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material	Description/Location
Client No.:				
139B	None Detected	None Detected	100% Organic Matrix	(Brown) Mastic/Classroom Office
7-02				
140A	None Detected	None Detected	100% Organic Matrix	(Black) Cove Base/Classroom Office
7-03				
140B	None Detected	None Detected	100% Organic Matrix	(Brown) Mastic/Classroom Office
7-03				
141A	None Detected	25% Min Wool,60% Cellulose	10% Binder/Filler,5% Perlite	(White) Ceiling Tile/Ladie's Room
8-01				
142A	None Detected	25% Min Wool,60% Cellulose	10% Binder/Filler,5% Perlite	(White) Ceiling Tile/Gym
8-02				
143A	None Detected	25% Min Wool,60% Cellulose	10% Binder/Filler,5% Perlite	(White) Ceiling Tile/Gym
8-03				
144A	70% Chrysotile	None Detected	30% Binder/Filler	(Gray) Pipe Insulation/Cafeteria
9-01				
145A	POSITIVE STOP			(Gray) Pipe Insulation/Ladie's Room
9-02				
146A	POSITIVE STOP			(Gray) Pipe Insulation/Supply Room
9-03				

Approved By: Andrea Berrios

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Form 8.0 Rev. 8/04/2020



Southeast Environmental Microbiology Laboratories - Asbestos Division

102 Edinburgh Court Greenville, SC 29607
 Phone: 864-233-3770, Fax: 864-233-6589 , www.seeml.com
 NVLAP Lab ID:201031-0 xas Lic: 300474

PLM Asbestos Bulk Sample Summary

Client: St. John Environmental Consulting " " 314)853-4668/ian@stjohnenv.com, mak@seeml.com		Date Sampled:	01/16/2024	
		Date Received:	01/17/2024	
		Date Analyzed:	01/17/2024	
		Date Reported:	01/17/2024	
		Date Revised:		
		Project Name:	1175th Army National Gaurd	
		Project No:		
Analyzed by:	Emily McElveen	Project Address:	375 N Commercial Ave	
		City, State, ZIP:	St. Clair, MO 63077	
Methodology:	EPA/600/R-93/116 Without Gravimetry	SEEML Ref#:	G-240117037	
Lab No.:	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material	Description/Location
Client No.:				
154A	None Detected	None Detected	100% Organic Matrix	(Tan) Floor Tile/Classroom
12-02				
154B	None Detected	None Detected	100% Organic Matrix	(Black) Mastic/Classroom
12-02				
155A	None Detected	None Detected	100% Organic Matrix	(Tan) Floor Tile/Classroom
12-03				
155B	None Detected	None Detected	100% Organic Matrix	(Black) Mastic/Classroom
12-03				
156A	None Detected	None Detected	100% Organic Matrix	(Brown) Cove Base/Classroom
13-01				
156B	None Detected	None Detected	100% Organic Matrix	(Tan) Mastic/Classroom
13-01				
157A	None Detected	None Detected	100% Organic Matrix	(Brown) Cove Base/Classroom
13-02				
157B	None Detected	None Detected	100% Organic Matrix	(Tan) Mastic/Classroom
13-02				
158A	None Detected	None Detected	100% Organic Matrix	(Brown) Cove Base/Classroom
13-03				

Approved By: Andrea Berrios

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NVLAP Lab ID:201031-0 xas Lic: 300474

PLM Asbestos Bulk Sample Summary

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		Date Received: 01/17/2024
		Date Analyzed: 01/17/2024
(314)853-4668/ian@stjohnenv.com, mak@seeml.com		Date Reported: 01/17/2024
		Date Revised:
		Project Name: 1175th Army National Gaurd
		Project No:
Analyzed by:	Emily McElveen	Project Address: 375 N Commercial Ave
		City, State, ZIP: St. Clair, MO 63077
Methodology:	EPA/600/R-93/116 Without Gravimetry	SEEML Ref#: G-240117037

Lab No.:	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material	Description/Location
158B	None Detected	None Detected	100% Organic Matrix	(Tan) Mastic/Classroom
13-03				
159A	None Detected	None Detected	100% Organic Matrix	(Gray) Floor Tile/Transportation Office
14-01				
159B	None Detected	None Detected	100% Organic Matrix	(Black) Mastic/Transportation Office
14-01				
160A	None Detected	None Detected	100% Organic Matrix	(Gray) Floor Tile/Transportation Office
14-02				
160B	None Detected	None Detected	100% Organic Matrix	(Black) Mastic/Transportation Office
14-02				
161A	None Detected	None Detected	100% Organic Matrix	(Gray) Floor Tile/Transportation Office
14-03				
161B	None Detected	None Detected	100% Organic Matrix	(Black) Mastic/Transportation Office
14-03				
162A	None Detected	None Detected	100% Organic Matrix	(Gray) Floor Epoxy/Cage Hallway
15-01				
163A	None Detected	None Detected	100% Organic Matrix	(Gray) Floor Epoxy/Cage Hallway
15-02				

Approved By: Andrea Berrios**Disclaimer:**

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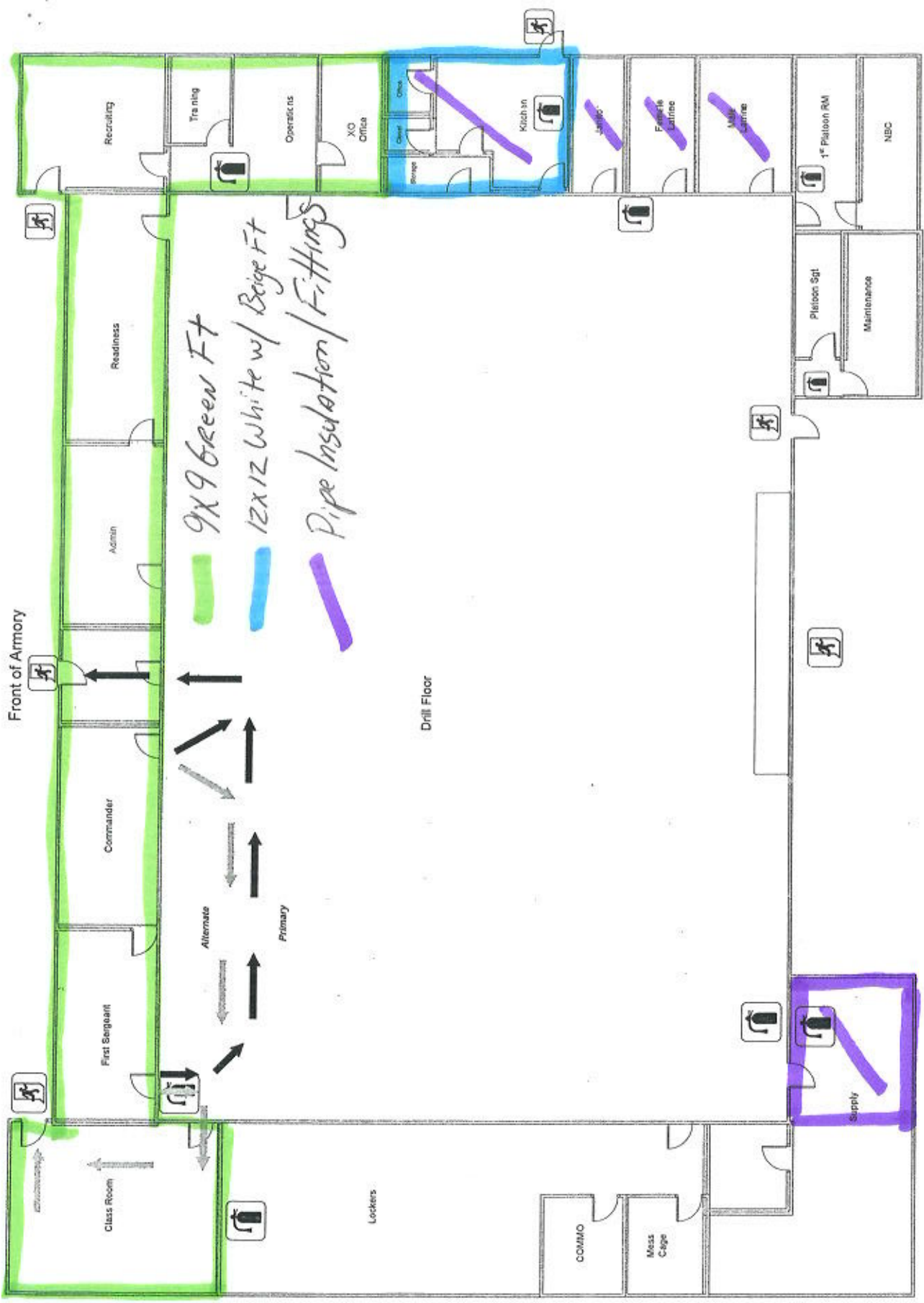
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Form 8.0 Rev. 8/04/29/20



**Southeast Environmental Microbiology Laboratories**

102 Edinburgh Court

Greenville, SC 29607

Phone: (864) 233-3770

Fax: (864) 233-6589

Asbestos Analytical Report By: Polarized Light Microscopy

This report has been prepared for **St. John Environmental Consulting** the information and data has been checked for thoroughness and accuracy. The results reported apply only to the materials as received. The documents(s) contained herein are confidential and privileged information intended for the exclusive use of the individual or entity named above. This report shall not be reproduced except in full without SEEML's approval.

Client Project Name: Old Ballwin Police Dept

The Following report was prepared using this test method(s) contained within this document.

- ☒ PLM Bulk Asbestos Fiber Analysis: EPA 600/R-93/116
- ☐ PLM 400 Point Count (<0.25%) EPA 600/R-93/116
- ☐ PLM 1000 Point Count (<0.1%) EPA 600/R-93/116
- ☐ PLM Carb 435 Level A Reporting Limit (<0.25%)
- ☐ PLM Carb 435 Level B (Reporting limit <0.1%)
- ☐ PLM by EPA/600/R-93/116 with Milling Prep 400 Point Count
- ☐ PLM Vermiculite Initial Screening EPA 600R-93/116
- ☐ PLM Cincinnati Method 600/R-04/004 (Amphibole Only)
- ☐ PLM Vermiculite Method SOF-V 198.8 (Step 1 Chrysotile & Prep)
- ☐ PLM Vermiculite Method SOF-V 198.8 (Step 2 (Amphibole)

Approved By : Andrea Berrios

Thank you for choosing SEEML Labs. We strive to provide superior quality testing, analytical data and customer service. SEEML is accredited through the National Institute of Standards and Technology (NIST) National Voluntary Accreditation Program (NVLAP) for bulk asbestos analysis NVLAP # 201031-0 and licensed by the Texas Department of State Health Services (License Number: 300474). This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the US government.

Asbestos Bulk Sampling Form

Project Number:

Client: *Vestal Corporation*

Address: *1 Pines Ct. Suite A*

City/State: *St. Louis, MO*

Contact: *Ali Badran*

Results Needed By: *24 Hours*

Taken By: *Ian St. John*

Facility: *1175 M.P. Company*

Address: *375 N. Commercial Ave.*

City/State: *St. Clair, MO*

Phone Number:

Page: *1 of 3*

Date: *1/16/24*

Sample No.	Sample Description	Sample Location
1-01	9x9 Green Ft / Mastic	1st Sgt. Platform Offices
1-02	19x11, 120, 44x20	Commanders Conference Room
1-03	19x35, 16x12, 16x12, 16x12	NCO Office, Admin
2-01	12x12 Black w/White Ft / Mastic	Platform Offices
2-02	20 Sq Ft	
2-03		
3-01	4" Gray Concrete / Mastic	Recruiting Office
3-02		Entry to Transport
3-03		1st Sgt. office
4-01	2x2 White Worn & Pin Ceiling Tile	Recruiting
4-02		Conference Room
4-03		
5-01	Drywall / Joint Compound	Upstairs
5-02		
5-03		
6-01	12x12 White w/Beige Ft / Mastic	Kitchen
6-02	32x20	
6-03		
7-01	4" Black Concrete / Mastic	Kitchen
7-02		Classroom office
7-03		" "

12 LF of Pipe Kitchen
 Ladies Room 3 10' Vertical
 " " 2 12' Horizontal
 Womens & Mens Can't tell because of DW
 30 LF in Supply Room

St. John Environmental Consulting
 5515 Grace Avenue
 St. Louis, MO 63116
 Tel: (314) 853-4668
 Email: ian@stjohnenv.com

Asbestos Bulk Sampling Form

Project Number:

Client: Vestal Corporation
 Address: 1 Pines Ct. Suite A
 City/State: St. Louis, MO.
 Contact: Ali Badran
 Results Needed By: 24 hrs

Taken By: Ian St. John
 Facility: 1175th MP Company
 Address: 375 N. Commercial Ave.
 City/State: St. Clair, MO
 Phone Number:
 Page: 2 of 3

Date: 1/16/2024

Sample No.	Sample Description	Sample Location
8-01	2x4 Worn & Pin Ceiling Tile	Ladies' ~~Business~~ Room
8-02	↓	Gym
8-03	↓	Gym
9-01	Pipe Insulation	Cafeteria
9-02	↓	Ladies Room
9-03	↓	Supply Room
10-01	Fittings	Cafeteria
10-02	↓	Ladies Room
10-03	↓	
11-01	Black Rubitec on Pipe	Mens Room
11-02	↓	↓
11-03	↓	↓
12-01	12x12 Tan w/Gray Ft/Mastic	Classroom
12-02	25x36 12x25	↓
12-03	↓	↓
13-01	4" Brown Corebase/Mastic	Classroom
13-02	↓	↓
13-03	↓	↓
14-01	12x12 Gray w/White Floor Tile/Mastic	Transportation Office
14-02	20x12	↓
14-03	↓	↓

[illegible]

St. John Environmental Consulting
5515 Grace Avenue
St. Louis, Missouri 63116
tel. 314-853-4668
Email: ian@stjohnenv.com

January 22, 2024

Mr. Ali Badran
Vestal Corporation

RE: Lead-Based Paint Inspection – 375 N. Commercial, St. Clair, MO
Project # 2401-018

Dear Mr. Badran:

On January 16, 2024, Ian St. John of St. John Environmental Consulting (SEC) conducted a Lead-Based Paint (LBP) inspection at the property located at 375 N. Commercial, St. Clair, MO

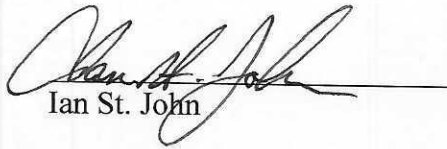
The XRF LBP inspection survey form is enclosed. The inspection was conducted utilizing the Viken XRF Lead Paint Analyzer. Any readings of 1.0 mg/cm² or greater are lead-based paint. No paint was found to be sampled.
NO LEAD PAINT WAS DETECTED.

Your XRF survey form is described the following way:

- Column 1:** the room number referenced by the drawing
- Column 2:** the direction: North, South, East or West
- Column 3:** the description of the surface
- Column 4:** the substrate of the surface: W = wood, M = metal, D = drywall, P = plaster, C = concrete, B = Brick, T = Transite, S = stone, CT = ceramic tile, CB = concrete block, CER = ceramic, FG = fiberglass, and V = vinyl.
- Column 5:** the condition of the surface: P = poor and G = good.
- Column 6:** the XRF Reading. Any reading 1.0 mg/cm² or greater is lead-based paint.
- Column 7:** whether the reading was P = positive for the presence of lead-based paint, or I = inconclusive. If the column is left blank, the reading was negative.
- Column 8:** the surveyor's notes. These notes may address visual observations of existing conditions and conditions which may impact Lead-Based Paint hazards.
-

It was a pleasure to be of service. If you have any questions, please contact us at (314) 853-4668. Thank You.

Sincerely,



Ian St. John

UNIT

375 N. Commercial

Front=North

	Room	Dir	Surface	Substrate	Condition	Reading	P/I	Notes
1	----		Calibration	----	----	0.9		
2	----		Calibration	----	----	0.9		
3	----		Calibration	----	----	1.0		
4	Supply	N	Wall	CB	G	0.3		
5	Supply	S	Wall	CB	G	0.1		
6	Supply	E	Wall	CB	G	0.0		
7	Supply	W	Wall	CB	G	0.0		
8	Supply		Divider Wall	W	G	0.1		
9	Supply		Door to Storage	W	G	0.1		
10	Supply		Door Frame to Storage	W	G	0.2		
11	Supply Storage	N	Wall	CB	G	0.1		Cage
12	Supply Storage	W	Wall	CB	G	0.0		
13	Supply		Door to Drill Floor	M	G	0.1		
14	Supply		Door Frame to Drill Floor	M	G	0.1		
15	Supply		Safe Door	M	G	0.1		
16	Supply		Safe Door Frame	M	G	0.0		
17	Safe	N	Wall	CB	G	0.0		
18	Safe	S	Wall	CB	G	0.0		
19	Safe	E	Wall	CB	G	0.0		
20	Safe	W	Wall	CB	G	0.0		
21	Safe		Ceiling	CB	G	0.0		
22	Safe		Floor	CB	G	0.0		
23	Safe		Door	M	G	0.1		
24	Safe		Door Frame	M	G	0.1		
25	Gym	N	Wall	CB	G	0.0		

UNIT 375 N. Commercial

	Room	Dir	Surface	Substrate	Condition	Reading	P/I	Notes
1	Gym	S	Wall	CB	G	0.0		
2	Gym	E	Wall	CB	G	0.0		
3	Gym	W	Wall	CB	G	0.0		
4	Gym		Floor	CB	G	0.0		
5	Gym		Duct	M	G	0.1		
6	Gym		Ceiling	M	G	0.1		
7	Gym	N	Door Frame	M	G	0.4		
8	Gym	S	Door Frame	M	G	0.1		
9	Conference	N	Wall	CB	G	0.1		
10	Conference	S	Wall	CB	G	0.0		
11	Conference	E	Wall	CB	G	0.0		
12	Conference	W	Wall	CB	G	0.0		
13	Conference		Floor Vent	M	G	0.0		
14	Conference		Door to Ext	M	G	0.3		
15	Conference		Door Frame to Ext	M	G	0.5		
16	Conference		Door Frame to Gym	M	G	0.4		
17	NCO Training		Door Frame to Gym	M	G	0.1		
18	NCO Training		Window Sill	CB	G	0.0		
19	NCO Training		Door Frame to Admin	M	G	0.4		
20	NCO Admin	N	Wall	W	G	0.1		
21	NCO Admin	S	Wall	W	G	0.2		
22	NCO Admin	E	Wall	W	G	0.3		
23	NCO Admin	W	Wall	W	G	0.2		
24	NCO Admin		Baseboard	W	G	0.1		
25	NCO Admin		Window Sill	CB	G	0.0		

UNIT 375 N. Commercial

	Room	Dir	Surface	Substrate	Condition	Reading	P/I	Notes
1	NCO Admin		Door Frame to Gym	M	G	0.4		
2	NCO Admin		Door Frame to NCO Training	M	G	0.4		
3	Lobby	N	Wall	CB	G	0.0		
4	Lobby	S	Wall	CB	G	0.1		
5	Lobby	E	Wall	CB	G	0.0		
6	Lobby	W	Wall	CB	G	0.0		
7	Lobby		Ceiling	D	G	0.0		
8	Lobby		Door to Ext	M	G	0.0		
9	Lobby		Door Frame to Ext	M	G	0.3		
10	Lobby		Door Frame to Gym	M	G	0.4		
11	1st Sgt.		Window Sill	CB	G	0.0		
12	1st Sgt.		Window to Lobby	W	G	0.1		
13	1st Sgt.		Door Frame to Gym	M	G	0.5		
14	1st Sgt.		Door Frame to Commander	M	G	0.3		
15	Commander	N	Wall	W	G	0.2		
16	Commander	S	Wall	W	G	0.1		
17	Commander	E	Wall	W	G	0.2		
18	Commander	W	Wall	W	G	0.1		
19	Commander		Window Sill	CB	G	0.1		
20	Commander		Door Frame to 1st Sgt	M	G	0.3		
21	Commander		Door Frame to Gym	M	G	0.4		
22	Recruiter	N	Wall	W	G	0.0		
23	Recruiter	S	Wall	W	G	0.0		
24	Recruiter	E	Wall	W	G	0.1		
25	Recruiter	W	Wall	W	G	0.1		

UNIT 375 N. Commercial

	Room	Dir	Surface	Substrate	Condition	Reading	P/I	Notes
1	Recruiter		Door to Ext	M	G	0.1		
2	Recruiter		Door Frame to Ext	M	G	0.0		
3	Recruiter		Window Sill	CB	G	0.1		
4	Recruiter		Window Casing	W	G	0.2		
5	Recruiter		Closet Door	W	G	0.1		
6	Recruiter		Closet Door Casing	W	G	0.0		
7	Recruiter		Door to Platoon Office	W	G	0.0		
8	Recruiter		Door Casing to Platoon Office	W	G	0.0		
9	Recruiter		Door Jamb to Platoon Office	W	G	0.0		
10	E. Recruiter	N	Wall	D	G	0.1		
11	E. Recruiter	S	Wall	D	G	0.0		
12	E. Recruiter	E	Wall	CB	G	0.1		
13	E. Recruiter	W	Wall	D	G	0.0		
14	E. Recruiter		Window Sill	CB	G	0.0		
15	E. Recruiter		Door	W	G	0.1		
16	E. Recruiter		Door Jamb	W	G	0.0		
17	E. Recruiter		Door Casing	W	G	0.0		
18	Staging	N	Wall	D	G	0.2		
19	Staging	S	Wall	D	G	0.1		
20	Staging	E	Wall	CB	G	0.1		
21	Staging	E	Wall	D	G	0.1		
22	Staging	W	Wall	CB	G	0.1		
23	Staging	W	Wall	D	G	0.1		
24	Staging		Door Frame to Gym	M	G	0.1		
25	Platoon Officer	N	Wall	D	G	0.1		

UNIT 375 N. Commercial

	Room	Dir	Surface	Substrate	Condition	Reading	P/I	Notes
1	Platoon Officer	S	Wall	CB	G	0.0		
2	Platoon Officer	E	Wall	CB	G	0.0		
3	Platoon Officer	W	Wall	CB	G	0.0		
4	Platoon Officer		Vent	M	G	0.3		
5	Cafeteria	N	Wall	CB	G	0.0		Office
6	Cafeteria	S	Wall	D	G	0.0		Office
7	Cafeteria	E	Wall	CB	G	0.1		Office
8	Cafeteria	W	Wall	D	G	0.1		Office
9	Cafeteria		Window Casing	W	G	0.0		Office
10	Cafeteria	N	Wall	D	G	0.1		Kitchen
11	Cafeteria	S	Wall	CB	G	0.0		Kitchen
12	Cafeteria	E	Wall	CB	G	0.0		Kitchen
13	Cafeteria	W	Wall	CB	G	0.1		Kitchen
14	Cafeteria		Door to Ext	M	G	0.1		Kitchen
15	Cafeteria		Door Frame to Ext	M	G	0.0		Kitchen
16	Cafeteria		Window Casing to Gym	M	G	0.4		Kitchen
17	Cafeteria		Door Frame to Gym	M	G	0.1		Kitchen
18	Cafeteria	N	Wall	CB	G	0.1		Closet
19	Cafeteria	S	Wall	D	G	0.1		Closet
20	Cafeteria	E	Wall	D	G	0.1		Closet
21	Cafeteria	W	Wall	D	G	0.1		Closet
22	Cafeteria	N	Wall	CB	G	0.1		Pots and Pans
23	Cafeteria	S	Wall	D	G	0.1		
24	Cafeteria	E	Wall	D	G	0.0		
25	Cafeteria	W	Wall	CB	G	0.0		

UNIT **375 N. Commercial**

	Room	Dir	Surface	Substrate	Condition	Reading	P/I	Notes
1	Ladies	N	Wall	CB	G	0.0		
2	Ladies	S	Wall	CB	G	0.0		
3	Ladies	E	Wall	CB	G	0.0		
4	Ladies	W	Wall	CB	G	0.0		
5	Ladies		Floor	C	G	0.0		
6	Ladies		Door Frame to Gym	M	G	0.4		
7	Womens	N	Wall	CB	G	0.4		
8	Womens	S	Wall	CB	G	0.0		
9	Womens	E	Wall	CB	G	0.4		
10	Womens	W	Wall	CB	G	0.0		
11	Womens		Floor	C	G	0.0		
12	Womens		Door Frame to Gym	M	G	0.4		
13	Womens		Ceiling	D	G	0.1		
14	Mens	N	Wall	CB	G	0.0		
15	Mens	S	Wall	CB	G	0.0		
16	Mens	E	Wall	CB	G	0.0		
17	Mens	W	Wall	CB	G	0.0		
18	Mens		Floor	C	G	0.1		
19	Mens		Door Frame to Gym	M	G	0.4		
20	Classroom	N	Wall	CB	G	0.1		
21	Classroom	S	Wall	CB	G	0.1		
22	Classroom	E	Wall	CB	G	0.0		
23	Classroom	W	Wall	CB	G	0.0		
24	Classroom	E	Wall	D	G	0.1		
25	Classroom		Door Frame to Gym	M	G	0.2		

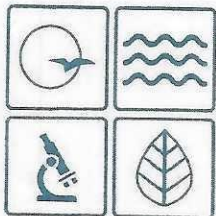
UNIT 375 N. Commercial

	Room	Dir	Surface	Substrate	Condition	Reading	P/I	Notes
1	Classroom	N	Wall	D	G	0.1		Office
2	Classroom	S	Wall	CB	G	0.0		Office
3	Classroom	E	Wall	CB	G	0.1		Office
4	Classroom	W	Wall	CB	G	0.1		Office
5	Utility	N	Wall	D	G	0.1		
6	Utility	S	Wall	CB	G	0.0		
7	Utility	E	Wall	CB	G	0.2		
8	Utility	W	Wall	CB	G	0.0		
9	Utility		Door to Ext	M	G	0.3		
10	Utility		Door Frame to Ext	M	G	0.3		
11	Utility Office	N	Wall	D	G	0.1		
12	Utility Office	S	Wall	D	G	0.1		
13	Utility Office	E	Wall	D	G	0.1		
14	Utility Office	W	Wall	D	G	0.0		
15	Utility Hall	N	Wall	CB	G	0.0		
16	Utility Hall	S	Wall	D	G	0.2		
17	Utility Hall	E	Wall	D	G	0.2		
18	Utility Hall	W	Wall	CB	G	0.2		
19	Utility Hall		Door Frame to Gym	M	G	0.4		
20	Gym	N	Wall	CB	G	0.0		
21	Gym	S	Wall	CB	G	0.6		
22	Gym	E	Wall	CB	G	0.1		
23	Gym	W	Wall	CB	G	0.3		
24	Gym		Floor	C	P	0.1		
25	Gym		Serving Window	M	G	0.6		

UNIT

375 N. Commercial

	Room	Dir	Surface	Substrate	Condition	Reading	P/I	Notes
1	Gym		Back Door Ext	M	G	0.7		
2	Gym		Back Door Ext Frame	M	G	0.4		
3	----		Calibration	----	----	0.9		
4	----		Calibration	----	----	1.0		
5	----		Calibration	----	----	0.9		
6								
7								
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25								



MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Michael L. Parson
Governor

Dru Buntin
Director

August 29, 2023

John R Reckart
4437 Deer Run
Catawissa, MO 63015

RE: Missouri Asbestos Occupation Certification Card

Enclosed is your certification card for Asbestos Inspector, as issued by the Asbestos Unit of the Missouri Department of Natural Resources' Air Pollution Control Program.

Missouri Certification Number: 7118081823MOIR1065

Course Training Date: August 18, 2023

Missouri Certification Approval Date: August 29, 2023

Missouri Certification Expiration Date: August 29, 2024

Note:

- All Missouri-certified asbestos personnel must comply with the following statutes and regulations:
 - Sections 643.225 to 643.250, RSMo;
 - 10 CSR 10-6.241 *Asbestos Projects-Registration, Abatement, Notification, Inspection, Demolition, and Performance Requirements; and*
 - 10 CSR 10-6.250 *Asbestos Projects-Certification, Accreditation and Business Exemption Requirements.*
- To keep your occupation certification up-to-date, you must complete an annual refresher course and submit a renewal application each year.
- In order to be eligible to renew your certification, you must successfully complete a refresher course with a Missouri-accredited training provider within 12 months of the expiration date of your current training certificate. If you exceed this grace period, you will be required to retake a Missouri-accredited initial course in order to be eligible for Missouri certification.

To obtain a copy of the certification renewal application, or review regulations and requirements, please visit our website at <http://dnr.mo.gov/env/apcp/asbestos/index.htm>.

If you have any questions please call the Air Pollution Control Program at 573-751-4817.

AIR POLLUTION CONTROL PROGRAM

Director of Air Pollution Control Program





Southeast Environmental Microbiology Laboratories - Asbestos Division

102 Edinburgh Court Greenville, SC 29607
 Phone: 864-233-3770, Fax: 864-233-6589 , www.seeml.com
 NVLAP Lab ID:201031-0 Texas Lic: 300474

PLM Asbestos Bulk Sample Summary

Client: St. John Environmental Consulting 5515 Grace Ave St. Louis, MO, 63116 (314)853-4668/ian@stjohnenv.com		Date Sampled:	08/30/2024	
		Date Received:	09/03/2024	
		Date Analyzed:	09/03/2024	
		Date Reported:	09/03/2024	
		Date Revised:		
		Project Name:	National Guard	
		Project No:		
Analyzed by:	Kajal Pandya	Project Address:	375 N. Commercial Ave	
		City, State, ZIP:	-	
Methodology:	EPA – Appendix E to Subpart E of 40 CFR Part 763; Interim Method for the Determination of Asbestos in Bulk Insulation Samples.		SEEML Ref#:	G-240903056
Lab No.:	% Asbestos Type	% Fibrous Non-Asbestos Material Type	% Non-Fibrous Material	Description/Location
Client No.:				
261A	None Detected	None Detected	100% Organic Matrix	(Tan) Foam/Roofing System
1-01				
261B	None Detected	95% Cellulose	5% Binder/Filler	(Brown) Fibrous Material/Roofing System
1-01				
261C	None Detected	None Detected	100% Organic Matrix	(Black) Organic Material/Roofing System
1-01				
262A	None Detected	None Detected	100% Organic Matrix	(Tan) Foam/Roofing System
1-02				
262B	None Detected	95% Cellulose	5% Binder/Filler	(Brown) Fibrous Material/Roofing System
1-02				
262C	None Detected	None Detected	100% Organic Matrix	(Black) Organic Material/Roofing System
1-02				
263A	None Detected	None Detected	100% Organic Matrix	(Tan) Foam/Roofing System
1-03				
263B	None Detected	95% Cellulose	5% Binder/Filler	(Brown) Fibrous Material/Roofing System
1-03				
263C	None Detected	None Detected	100% Organic Matrix	(Black) Organic Material/Roofing System
1-03				

Approved By: Derrick Young

Disclaimer:

The results in this report only apply to the samples as received.

NOB samples are tested as a preliminary analysis. We highly recommend for Negative NOB samples resulting in less than 1% Asbestos to be verified by TEM or Point Analysis.

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. NAD means no asbestos fibers were detected. When detected the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.

Guidelines for Interpretation:

Any opinions/interpretations expressed in this report are outside the scope of this laboratory's accreditation. Interpretation of the data and information within this document is left to the company, consultant, and/or persons who conducted the fieldwork. A material is considered regulated asbestos containing material (ACM) where the asbestos content is determined to be one percent or greater. Several organizations, including the American Conference of Government Industrial Hygienists (ACGIH); the American Industrial Hygiene Association (AIHA); the Indoor Air Quality Association (IAQA); the United States Environmental Protection Agency (USEPA); the Centers for Disease Control (CDC) as well as the California Department of Health Services (CADHS) have published guidelines for assessment and interpretation of analytical data indicating a tested material is ACM.

Form 8.0 Rev. 8/04/2020

SEEML Reference Number:
G-240903056
Date Issued: 09/03/2024



Southeast Environmental Microbiology Laboratories

102 Edinburgh Court
Greenville, SC 29607
Phone: (864) 233-3770
Fax: (864) 233-6589

Asbestos Analytical Report By: Polarized Light Microscopy

This report has been prepared for **St. John Environmental Consulting** the information and data has been checked for thoroughness and accuracy. The results reported apply only to the materials as received. The documents(s) contained herein are confidential and privileged information intended for the exclusive use of the individual or entity named above. This report shall not be reproduced except in full without SEEML's approval.

Client Project Name: National Guard

The Following report was prepared using this test method(s) contained within this document.

- ☒ PLM Bulk Asbestos Fiber Analysis; EPA – Appendix E to Subpart E of 40 CFR Part 763; Interim Method for the Determination of Asbestos in Bulk Insulation Samples
- ☐ PLM 400 Point Count (<0.25%) EPA 600/R-93/116
- ☐ PLM 1000 Point Count (<0.1%) EPA 600/R-93/116
- ☐ PLM Carb 435 Level A Reporting Limit (<0.25%)
- ☐ PLM Carb 435 Level B (Reporting limit <0.1%)
- ☐ PLM by EPA/600/R-93/116 with Milling Prep 400 Point Count
- ☐ PLM Vermiculite Initial Screening EPA 600R-93/116
- ☐ PLM Cinnat Method 600/R-04/004 (Amphibole Only)
- ☐ PLM Vermiculite Method SOF-V 198.8 (Step 1 Chrysotile & Prep)
- ☐ PLM Vermiculite Method SOF-V 198.8 (Step 2 (Amphibole))

Approved By : Derrick Young

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