

# PROJECT MANUAL

*Six New Full Service Cabins  
Johnson's Shut-Ins State Park, Reynolds County  
Middle Brooke, Missouri*

Designed By: Frontenac Engineering Group  
2725 Sutton Blvd  
St. Louis, MO 63143

Date Issued: April 11, 2023

Project No.: X2206-01

STATE *of* MISSOURI

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OFFICE *of* ADMINISTRATION  
Facilities Management, Design & Construction

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JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

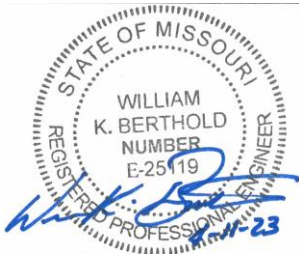
SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: X2206-01

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:

**FRONTENAC ENGINEERING GROUP:**

**WILLIAM K. BERTHOLD, P.E., P.L.S.**



**FRONTENAC ENGINEERING GROUP:**

**AARON S. ODLE, P.E.**

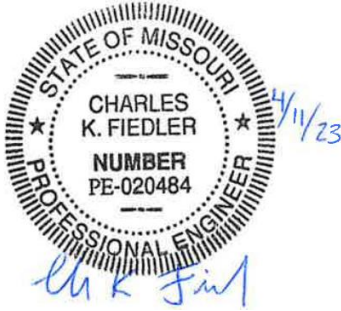


**KWK ARCHITECTS:**

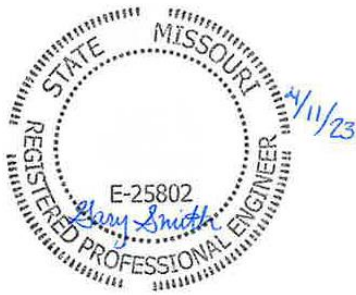
**ERIC R. NEUNER, A.I.A.**



**303<sup>RD</sup> ENGINEERING:**  
**CHARLES K. FIEDLER, P.E.**



**303<sup>RD</sup> ENGINEERING:**  
**GARY R. SMITH, JR., P.E.**



**CODE ENGINEERING SERVICES, LLC:**  
**MICHAEL T. O'BRIEN., P.E.**



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## 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. Six New Full Service Cabins Johnson's Shut-Ins  
State Park, Reynolds County  
Middle Brooke, Missouri  
**Project No.: X2206-01**

### 3.0 BIDS WILL BE RECEIVED:

- A. Until: 1:30 PM, Thursday, June 22, 2023
- B. **Only electronic bids on MissouriBUYS shall be accepted: <https://missouribuys.mo.gov>. Bidder must be registered to bid.**

### 4.0 DESCRIPTION:

- A. Scope: The project consists of construction of six (6) new full-service cabins along with the development and improvement of roadways, utility infrastructure, and sanitary sewer infrastructure for the development of new cabins area. More specifically, the work includes: Earthwork, culverts and asphalt and concrete paving of new roadways and parking areas, protection of the endangered species habitat area, new sanitary sewage collection system, duplex grinder pump, force main, underground electrical and water services, siltation control and site restoration.
- 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.**
- C. **\*\*NOTE:** Bidders are provided new Good Faith Effort (GFE) forms on MissouriBUYS.

### 5.0 PRE-BID MEETING:

- A. Place/Time: 11 AM, Wednesday, May, 31, 2023, at Black River Conference Room; 148 Taum Sauk Trail, Middle Brook, MO 63656
- 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: Frontenac Engineering Group, Bill Berthold, (314) 504-4442, email: billb@fe-stl.com
- B. Project Manager: Ryan Abbott, (573) 298-1967, email: Ryan.Abbott@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.



## **Very Important MissouriBUYS Instructions to Help Submit a Bid Correctly**

- A. The bidder shall submit his or her bid and all supporting documentation on MissouriBUYS eProcurement System. No hard copy bids shall be accepted. Go to <https://missouribuyss.mo.gov> and register. The bidder must register and complete a profile fully with all required documents submitted prior to submitting a bid.
- B. Once registered, log in.
1. Under “Solicitation” select “View Current Solicitations.”
  2. Under “Filter by Agency” select “OA-FMDC-Contracts Chapter 8”, then click “Filter Solicitation” button.
  3. Select “Active Solicitations” tab.
  4. To see the Solicitation Summary, click on the Project Number and the summary will open. Click each heading to open detailed information.
- C. Here are simplified instructions for uploading the bid to MissouriBUYS:
1. Find the solicitation by completing Steps 1 through 4 above.
  2. Select the three dots under “Actions.” Select “Add New Response.”
  3. When the Quote box opens, give the response a title and select “OK.”
  4. The detailed solicitation will open. Select “Check All” for the Original Solicitation Documents, open each document, and select “Accept.” If this step is not completed, a bid cannot be uploaded. Scroll to the bottom of the page and select “Add Attachments.” If you do not see this command, not all documents have been opened and accepted.
  5. The Supplier Attachments box will open. Select “Add Attachment” again.
  6. The Upload Documents box will open. Read the instructions for uploading. Disregard the “Confidential” check box.
  7. Browse and attach up to 5 files at a time. Scroll to bottom of box and select “Upload.” The Supplier Attachments box will open. Repeat Steps 5 through 7 if more than 5 files are to be uploaded.
  8. When the Supplier Attachments box opens again and uploading is complete, select “Done.” A message should appear that the upload is successful. If it does not, go to the Bidder Response tab and select “Submit.”
  9. The detailed solicitation will open. At the bottom select “Close.”
- D. Any time a bidder wants to modify the bid, he or she will have to submit a new one. FMDC will open the last response the bidder submits. The bidder may revise and submit the bid up to the close of the solicitation (bid date and time). Be sure to allow for uploading time so that the bid is successfully uploaded prior to the 1:30 PM deadline; we can only accept the bid if it is uploaded before the deadline.
- E. If you want to verify that you are uploading documents correctly, please contact Paul Girouard: 573-751-4797, [paul.girouard@oa.mo.gov](mailto:paul.girouard@oa.mo.gov) ; April Howser: 573-751-0053, [April.Howser@oa.mo.gov](mailto:April.Howser@oa.mo.gov) ; or Mandy Roberson: 573-522-0074, [Mandy.Roberson@oa.mo.gov](mailto:Mandy.Roberson@oa.mo.gov).
- F. If you are experiencing login issues, please contact Web Procure Support (Proactis) at 866-889-8533 anytime from 7:00 AM to 7:00 PM Central Time, Monday through Friday. If you try using a userid or password several times that is incorrect, the system will lock you out. Web Procure Support is the only option to unlock you! If you forget your userid or password, Web Procure Support will provide a temporary userid or password. Also, if it has been a while since your last successful login and you receive an “inactive” message, contact Web Procure (Proactis). If you are having a registration issue, you may contact Cathy Holliday at 573-751-3491 or by email: [cathy.holliday@oa.mo.gov](mailto:cathy.holliday@oa.mo.gov).

## IMPORTANT REMINDER REGARDING REQUIREMENT FOR OEO CERTIFICATION

A. SECTION 002113 – INSTRUCTIONS TO  
BIDDERS: Article 15.0, Section D1:

**As of July 1, 2020**, all MBE, WBE, and MBE/WBE contractors, subcontractors, and suppliers must be certified by the State of Missouri, Office of Equal Opportunity. No certifications from other Missouri certifying agencies will be accepted.

## **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 any one (1) party may be limited in accordance with available supply.
- B. For the convenience of contractors, sub-contractors and suppliers, copies of construction documents are on file at the office of the Director, Division of Facilities Management, Design and Construction and on the Division's web site - <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 also 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 contractor to fulfill in every detail all of the requirements of the contract, nor accepted as a basis for any claims for extra compensation.
- B. Under no circumstances will contractors give their plans and specifications to another contractor. Any bid received from a contractor whose name does not appear on the list of plan holders may be subject to rejection.

### **4.0 - INTERPRETATIONS**

- A. No bidder shall be entitled to rely on oral interpretations as to the meaning of the plans and specifications or the acceptability of alternate products, materials, form or type of construction. Every request for interpretation shall be made in writing and submitted with all supporting documents not less than five (5) working days before opening of bids. Every interpretation made to a bidder will be in the form of an addendum and will be sent as promptly as is practicable to all persons to whom plans and specifications have been issued. All such addenda shall become part of the contract documents.
- B. Approval for an "acceptable substitution" issued in the form of an addendum as per Paragraph 4A above, and as per Article 3.1 of the General Conditions; ACCEPTABLE SUBSTITUTIONS shall constitute approval for use in the project of the product.
- C. An "acceptable substitution" requested after the award of bid shall be approved if proven to the satisfaction of the Owner and the Designer as per Article 3.1, 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.
- D. A request for "Acceptable Substitutions" shall be made on the Section 006325 Substitution Request Form. The request shall be sent directly to the project Designer. A copy of said request should also be mailed to the Owner, Division of Facilities Management, Design and Construction, Post Office Box 809, Jefferson City, Missouri 65102.

## **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 or their bid will be rejected for being non-responsive.

Depending on the specific project requirements, **the following is a GENERIC list** of all possible bid forms that may be due with bid submittals and times when they may be due. Please check for specific project requirements on the proposal form (Section 004113). ***Not all of the following bid forms may be required to be submitted.***

### **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

- B. All bids shall be submitted without additional terms and conditions, modification or reservation on the bid forms with each space properly filled. Bids not on these forms will be rejected.
- C. 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 on the bid form, Section 004113. Failure of the contractor to submit 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 closing, or if on notification of award refuses or is unable to execute tendered contract, provide an acceptable performance and payment bond, provide evidence of required insurance coverage and/or provide required copies of affirmative action plans within ten (10) working days after such tender.
- D. The 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. Bid bonds will only be returned upon request.

## **6.0 - SIGNING OF BIDS**

- A. A bid from an individual shall be signed as noted on the Bid Form.
- B. 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.
- C. A bid from a limited liability company (LLC) shall be signed by a manager or a managing member of the LLC.
- D. A bid from a corporation shall have the correct corporate name thereon and the signature of an authorized officer of the corporation manually written. Title of office held by the person signing for the corporation shall appear, along with typed name of said individual. Corporate license number shall be provided and, if a corporation organized in a state other than Missouri, a Certificate of Authority to do business in the State of Missouri shall be attached. In addition, for corporate proposals, the President or Vice-President should sign as the bidder. If the signator is other than the corporate president or vice president, the bidder must provide satisfactory evidence that the signator has the legal authority to bind the corporation.

- E. 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.
- F. The Bidder should include its corporate license number on the Bid Form and, if the corporation is organized in a state other than Missouri, a Certificate of Authority to do business in the State of Missouri shall be attached to the bid form.

#### **7.0 - RECEIVING BID SUBMITTALS**

- A. It is the bidder's sole responsibility to assure receipt by Owner of bid submittals by the date and time specified in the Invitation for Bid. Bids received after the date and time specified shall not be considered by the Owner.
- B. Bids must be submitted through the MissouriBUYS statewide eProcurement system (<https://www.missouribuys.mo.gov/>) in accordance with the instructions for that system. The Owner shall only accept bids submitted through MissouriBUYS. Bids received by the Owner through any other means, including hard copies, shall not be considered and will be discarded by the Owner unopened.
- C. To respond to an Invitation for Bid, the Bidder must first register with MissouriBUYS by going through the MissouriBUYS Home Page (<https://www.missouribuys.mo.gov/>), clicking the "Register" button at the top of the page, and completing the Vendor Registration. Once registered, the Bidder accesses its account by clicking the "Login" button at the top of the MissouriBUYS Home Page. Enter your USERID and PASSWORD, which the Bidder will select. Under Solicitations, select "View Current Solicitations." A new screen will open. Under "Filter by Agency" select "OA-FMDC-Contracts Chapter 8." Under "Filter by Opp. No." type in the State Project Number. Select "Submit." Above the dark blue bar, select "Other Active Opportunities." To see the Solicitation Summary, single click the Opp. No. (Project Number) and the summary will open. Single quick click each blue bar to open detailed information. The Bidder must read and accept the Original Solicitation Documents and complete all identified requirements. The Bidder should download and save all of the Original Solicitation Documents on its computer so that the Bidder can prepare its response to these documents. The Bidder should upload its completed response to the downloaded documents as an attachment to the electronic solicitation response.
- D. Step-by-step instructions for how a registered vendor responds to a solicitation electronically are provided in Section 001116 – Invitation For Bid.
- E. The Bidder shall submit its bid on the forms provided by the Owner on MissouriBUYS with each space fully and properly completed, including all amounts required for alternate bids, unit prices, cost accounting data, etc. The Owner may reject bids that are not on the Owner's forms or that do not contain all requested information.
- F. No Contractor shall stipulate in his bid any conditions not contained in the specifications or standard bid form contained in the contract documents. To do so may subject the Contractor's bid to rejection.
- G. The completed forms shall be without interlineations, alterations or erasures.

#### **8.0 - MODIFICATION AND WITHDRAWAL OF BIDS**

- A. Bidder may withdraw his bid at any time prior to 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. The Bidder shall modify his or her original bid by submitting a revised bid on MissouriBUYS.

#### **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 by way of limitation, contracts for the furnishing and installation of furniture, equipment, machines, appliances and other apparatus.

- C. The Owner shall award a contract to the lowest, responsive, 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 bid shall be considered binding upon the Owner until the written contract has been properly executed, a satisfactory bond has been furnished, evidence of required insurance coverage, submittal of executed Section 004541, Affidavit of Work Authorization form, documentation evidencing enrollment and participation in a federal work authorization program has been received and an affirmative action plan submitted. Failure to execute and return the contract and associated documents within the prescribed period of time 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.
- F. If the successful bidder is doing business in the State of Missouri under a fictitious name, he 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.
- G. Any successful bidder which is a corporation organized in a state other than Missouri shall furnish to the Owner, attached to the Bid Form, a properly certified copy of its current Certificate of Authority to do business in the State of Missouri, such certificate to remain on file with the Owner. No contract will be awarded by the Owner unless such certificate is furnished by the bidder.
- H. Any successful bidder which is a corporation organized in the State of Missouri shall furnish at its own cost to the Owner, if requested, a Certificate of Good Standing issued by the Secretary of State, such certificate to remain on file with the Owner.
- I. 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.
- J. 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. Section-004541, Affidavit of Work Authorization is located on the MissouriBUYS solicitation for this project. Bidders must also submit an E-Verify Memorandum before the Owner may award a contract to the Bidder. Information regarding an E-Verify is located at <https://www.uscis.gov/e-verify/>. The contractor shall be responsible for ensuring that all subcontractors and suppliers associated with this contract enroll in E-Verify.

#### **10.0 - CONTRACT SECURITY**

- A. The successful bidder shall furnish a performance/payment bond as set forth in General Conditions Article 6.1 on a condition 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, 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. Failure to list the Bidder's firm, or a subcontractor for each category of work identified on the Bid Form or the listing of more than one subcontractor for any category without designating the portion of work to be performed by each shall be cause for rejection of the bid. 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, 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 person'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. Pursuant to section 34.600, RSMo, 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 as defined in section 34.600, RSMo, 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 requested to complete and submit the applicable portion of Section 004545 - Anti-Discrimination Against Israel Act Certification with their 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. If the exhibit is not submitted, the Owner shall rescind its Intent to Award and move to the next lowest, responsive, responsible bidder.

## **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 non-responsive, and its bid shall be rejected.
2. The Bidder should submit with its bid all of 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 appropriate 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 Bidder that is a SDVE doing business as Missouri firm, corporation, or individual, or that maintains a Missouri office or place of business, shall receive a three-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 becomes 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. The form is available on the MissouriBUYS solicitation for this project.

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.) In order 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 actually 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 Administration, Division of Purchasing and Material Management or by the Department of Veterans Affairs.
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 Division of Purchasing and Materials Management's online SDVE directory (<https://oa.mo.gov/sites/default/files/sdvelisting.pdf>) or the Department of Veterans Affairs' directory (<https://vetbiz.va.gov/basic-search/>).
3. Additional information, clarifications, etc., regarding the listings in the directories may be obtained by calling the Division at (573)751-3339 and asking to speak to 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 GFE forms are located on the MissouriBUYS solicitation for this project. 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 determined 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;
3. If no bidder has obtained any participation in a particular category (MBE/WBE/SDVE) or made a good faith effort to do so, the Director may waive that goal rather than rebid.

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 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 non-responsive 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 this 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.
4. The Contractor shall provide the Owner with regular reports on its progress in meeting its MBE/WBE/SDVE obligations. At a minimum, the Contractor shall report the dollar-value of work completed by each MBE, WBE, or SDVE during the preceding month and the cumulative total of work completed by each MBE, WBE or SDVE to date with each monthly application for payment. The Contractor shall also make a final report, which shall include the total dollar-value of work completed by each MBE, WBE, and SDVE during the entire contract.

**STATE OF MISSOURI  
DIVISION OF FACILITIES MANAGEMENT,  
DESIGN AND CONSTRUCTION  
*MBE/WBE/SDVE DIRECTORIES***

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The MBE/WBE Directory for goods and services is maintained by the Office of Equal Opportunity (OEO) and is located at the following web address:

<https://apps1.mo.gov/MWBCertifiedFirms/>

The SERVICE DISABLED VETERAN ENTERPRISE (SDVE) Directories may be accessed at the following web addresses:

<https://purch.oa.mo.gov/media/pdf/listing-certified-missouri-service-disabled-veteran-business-enterprises-sdves>

<https://veterans.certify.sba.gov/#search>



# 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:**                    **Six New Full Service Cabins Johnson's Shut-Ins  
State Park, Reynolds County  
Middle Brooke, Missouri**

**Project Number:**            **X2206-01**

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 **300 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: \$  
Alternate No. 1: \$  
Alternate No. 2: \$

**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)
    - ix. Affidavit for Affirmative Action (Section 005414)
  - 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)
  - 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.

Further, if the Contractor provides any “personal information” as defined in §105.1500, RSMo concerning an entity exempt from federal income tax under Section 501(c) of the Internal Revenue Code of 1986, as amended, the Contractor understands and agrees that it is voluntarily choosing to enter into a state contract and providing such information for that purpose. The state will treat such personal information in accord with §105.1500, RSMo.



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*



STATE OF MISSOURI  
 OFFICE OF ADMINISTRATION  
 DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION  
**AFFIDAVIT FOR AFFIRMATIVE ACTION**

PROJECT NUMBER
----------------

NAME
------

First being duly sworn on oath states: that

he/she is the  sole proprietor  partner  officer or  manager or managing member of

NAME
------

a  sole proprietorship  partnership  
 limited liability company (LLC)

or  corporation, and as such, said proprietor, partner, or officer is duly authorized to make this

affidavit on behalf of said sole proprietorship, partnership, or corporation; that under the contract known as

PROJECT TITLE
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Less than 50 persons in the aggregate will be employed and therefore, the applicable Affirmative Action requirements as set forth in Article 1.4 of the General Conditions of the State of Missouri have been met.

PRINT NAME & SIGNATURE
------------------------

DATE
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--

**NOTARY INFORMATION**

NOTARY PUBLIC EMBOSSER SEAL
-----------------------------

STATE OF
----------

COUNTY (OR CITY OF ST. LOUIS)
-------------------------------

USE RUBBER STAMP IN CLEAR AREA BELOW
--------------------------------------

SUBSCRIBED AND SWORN BEFORE ME, THIS
--------------------------------------

DAY OF
--------

YEAR
------

NOTARY PUBLIC SIGNATURE
-------------------------

MY COMMISSION EXPIRES
-----------------------

NOTARY PUBLIC NAME (TYPED OR PRINTED)
---------------------------------------

**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	DATE INSTALLED
LOCATION		

**SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT**

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**REASON FOR SUBSTITUTION**

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**DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?**

YES     NO

IF YES, EXPLAIN

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**SUBSTITUTION REQUIRES DIMENSIONAL REVISION OR REDESIGN OF STRUCTURE OR A/E WORK**

YES     NO

**BIDDER'S/CONTRACTOR'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:**

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

BIDDER/CONTRACTOR

DATE

**REVIEW AND ACTION**

Resubmit Substitution Request with the following additional information:

---

Substitution is accepted.

Substitution is accepted with the following comments:

---

Substitution is not accepted.

ARCHITECT/ENGINEER

DATE



PROJECT NUMBER
----------------

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

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

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

DOES HEREBY:

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

DATED this                    day of                    , 20                    .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents





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

**MBE/WBE/SDVE PROGRESS REPORT**

Remit with **ALL** Progress and Final Payments

(Please check appropriate box) CONSULTANT CONSTRUCTION

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

PROJECT TITLE

PROJECT LOCATION

FIRM

ORIGINAL CONTRACT SUM (Same as Line Item 1. on Form A of Application for Payment)  
\$

TOTAL CONTRACT SUM TO DATE (Same as Line Item 3. on Form A of Application for Payment)  
\$

THE TOTAL MBE/WBE/SDVE PARTICIPATION DOLLAR AMOUNT OF THIS PROJECT AS INDICATED IN THE ORIGINAL CONTRACT: \$

SELECT MBE, WBE, SDVE	TOTAL AMOUNT OF SUBCONTRACT	\$ AMOUNT PAID-TO-DATE (include approved contract changes)	CONSULTANT/SUBCONSULTANT OR CONTRACTOR/SUBCONTRACTOR/SUPPLIER COMPANY NAME
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	
<input type="checkbox"/> MBE <input type="checkbox"/> WBE <input type="checkbox"/> SDVE	\$	\$	

## **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 EMBOSSEY OR BLACK INK RUBBER STAMP SEAL

STATE

COUNTY (OR CITY OF ST. LOUIS)

SUBSCRIBED AND SWORN BEFORE ME, THIS

**USE RUBBER STAMP IN CLEAR AREA BELOW**

DAY OF

YEAR

NOTARY PUBLIC SIGNATURE

MY COMMISSION EXPIRES

NOTARY PUBLIC NAME (TYPED OR PRINTED)

# GENERAL CONDITIONS

## INDEX

### ARTICLE:

#### 1. General Provisions

- 1.1. Definitions
- 1.2. Drawings and Specifications
- 1.3. Compliance with Laws, Permits, Regulations and Inspections
- 1.4. Nondiscrimination in Employment
- 1.5. Anti-Kickback
- 1.6. Patents and Royalties
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- 1.8. Communications
- 1.9. Separate Contracts and Cooperation
- 1.10. Assignment of Contract
- 1.11. Indemnification
- 1.12. Disputes and Disagreements

#### 2. Owner/Designer Responsibilities

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- 3.1. Acceptable Substitutions
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- 5.1. Construction Commencement
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#### 6. Bond and Insurance

#### 6.1. Bond

#### 6.2. Insurance

#### 7. Termination or Suspension of Contract

#### 7.1. For Site Conditions

#### 7.2. For Cause

#### 7.3. For Convenience

## SECTION 007213 - GENERAL CONDITIONS

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

## ARTICLE 1 – GENERAL PROVISIONS

### ARTICLE 1.1 - DEFINITIONS

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

1. **"COMMISSIONER"**: The Commissioner of the Office of Administration.
2. **"CONSTRUCTION DOCUMENTS"**: The "Construction Documents" shall consist of the Project Manual, Drawings and Addenda.
3. **"CONSTRUCTION REPRESENTATIVE:"** Whenever the term "Construction Representative" is used, it shall mean the Owner's Representative at the work site.
4. **"CONTRACTOR"**: Party or parties who have entered into a contract with the Owner to furnish work under these specifications and drawings.
5. **"DESIGNER"**: When the term "Designer" is used herein, it shall refer to the Architect, Engineer, or Consultant of Record specified and defined in Paragraph 2.0 of the Supplemental Conditions, or his duly authorized representative. The Designer may be either a consultant or state employee.
6. **"DIRECTOR"**: Whenever the term "Director" is used, it shall mean the Director of the Division of Facilities Management, Design and Construction or his Designee, representing the Office of Administration, State of Missouri. The Director is the agent of the Owner.
7. **"DIVISION"**: Shall mean the Division of Facilities Management, Design and Construction, State of Missouri.

8. **"INCIDENTAL JOB BURDENS"**: Shall mean those expenses relating to the cost of work, incurred either in the home office or on the job-site, which are necessary in the course of doing business but are incidental to the job. Such costs include office supplies and equipment, postage, courier services, telephone expenses including long distance, water and ice and other similar expenses.
9. **"JOINT VENTURE"**: An association of two (2) or more businesses to carry out a single business enterprise for profit for which purpose they combine their property, capital, efforts, skills and knowledge.
10. **"OWNER"**: Whenever the term "Owner" is used, it shall mean the State of Missouri.
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"**: Labor, material, supplies, plant and equipment required to perform and complete the service agreed to by the Contractor 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 take affirmative action to insure 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.

- B. The Contractor and his subcontractors shall develop, implement, maintain and submit in writing to the Owner an affirmative action program if at least fifty (50) persons in the aggregate are employed under this contract. If less than fifty (50) persons in the aggregate are to be employed under this contract, the Contractor shall submit, in lieu of the written affirmative action program, a properly executed Affidavit for Affirmative Action in the form included in the contract specifications. For the purpose of this section, an "affirmative action program" means positive action to influence all employment practices (including, but not limited to, recruiting, hiring, promoting and training) in providing equal employment opportunity regardless of race, color, sex, national origin, religion, age (where the person affected is between age 40 and 70), disabled and Vietnam-era veteran status, and disability. Such "affirmative action program" shall include:
1. A written policy statement committing the total organization to affirmative action and

assigning management responsibilities and procedures for evaluation and dissemination;

2. The identification of a person designated to handle affirmative action;
3. The establishment of non-discriminatory selection standards, objective measures to analyze recruitment, an upward mobility system, a wage and salary structure, and standards applicable to lay-off, recall, discharge, demotion and discipline;
4. The exclusion of discrimination from all collective bargaining agreements; and
5. Performance of an internal audit of the reporting system to monitor execution and to provide for future planning.

In the enforcement of this non-discrimination clause, the Owner may use any reasonable procedures available, including, but not limited to: requests, reports, site visits and inspection of relevant documents of contractors and subcontractors.

- C. 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 place 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 insure 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 negotiated, and may vary according to the nature, extent, and complexity of the work involved. However, the overhead and profit for the Contractor or subcontractor actually performing the work shall not exceed 14%. When one or more tiers of subcontractors are used, in no event shall any Contractor or subcontractor receive as overhead and profit more than 3% of the cost of the work performed by any of his subcontractors. In no case shall the total overhead and profit paid by the Owner on any Contract Changes exceed twenty percent (20%) 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 bonding and insurance to their cost of work. This bonding and insurance cost shall not exceed 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 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 negotiated, and may vary according to the nature, extent and complexity of the work involved, but in no case shall be less than ten percent (10%). If the percentage for overhead and profit charged for work added by Contract Changes for this contract has been negotiated to less than 10%, the negotiated rate shall then apply to credits as well.
- 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.
  4. Written Affirmative Action Plans as required in Article 1.4.

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:

Bill Berthold  
Frontenac Engineering Group  
2725 Sutton Blvd  
St. Louis, MO 63143  
Telephone: (314) 504-4442  
Email: [billb@fe-stl.com](mailto:billb@fe-stl.com)

Construction Representative:

Kevin Hultberg  
Division of Facilities Management, Design and Construction  
10325 Business 21 North  
Hillsboro, MO 63050  
Telephone: (636) 524-8528  
Email: [Kevin.Hultberg@oa.mo.gov](mailto:Kevin.Hultberg@oa.mo.gov)

Project Manager:

Ryan Abbott  
Division of Facilities Management, Design and Construction  
301 West High Street, Room 730  
Jefferson City, Missouri 65101  
Telephone: (573) 298-1967  
Email: [Ryan.Abbott@oa.mo.gov](mailto:Ryan.Abbott@oa.mo.gov)

Contract Specialist:

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

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

### 4.0 FURNISHING CONSTRUCTION DOCUMENTS:

- A. The Owner will furnish the Contractor with approximately 6 complete sets of drawings and specifications at no charge.
- B. The Owner will furnish the Contractor with approximately 6 sets of explanatory or change drawings at no charge.
- C. The Contractor may make copies of the documents as needed with no additional cost to the Owner.

### 5.0 SAFETY REQUIREMENTS

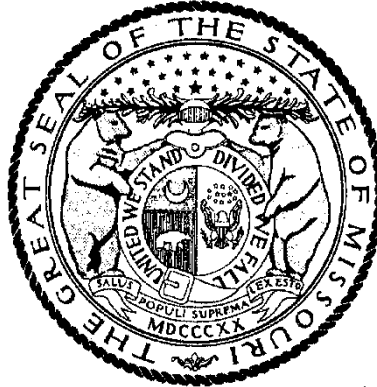
Contractor and subcontractors at any tier shall comply with RSMo 292.675 and Article 1.3, E, of Section 007213, General Conditions.



# Missouri

## Division of Labor Standards

### WAGE AND HOUR SECTION



MICHAEL L. PARSON, Governor

# Annual Wage Order No. 29

Section 090  
**REYNOLDS COUNTY**

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

Original Signed by \_\_\_\_\_

Todd Smith, Director  
Division of Labor Standards

Filed With Secretary of State: \_\_\_\_\_ **March 10, 2022**

Last Date Objections May Be Filed: **April 11, 2022**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$23.75*
Boilermaker	\$23.75*
Bricklayer	\$23.75*
Carpenter	\$23.75*
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$23.75*
Plasterer	
Communications Technician	\$23.75*
Electrician (Inside Wireman)	\$23.75*
Electrician Outside Lineman	\$23.75*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$23.75*
Glazier	\$23.75*
Ironworker	\$23.75*
Laborer	\$23.75*
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$23.75*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$23.75*
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$23.75*
Plumber	\$23.75*
Pipe Fitter	
Roofer	\$23.75*
Sheet Metal Worker	\$23.75*
Sprinkler Fitter	\$23.75*
Truck Driver	\$23.75*
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 Section 290.210 RSMo.

Heavy Construction Rates for  
REYNOLDS County

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$23.75*
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$23.75*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$23.75*
General Laborer	
Skilled Laborer	
Operating Engineer	\$23.75*
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$23.75*
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. 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 Section 290.210 RSMo.

# 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.

# JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

## 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 the construction of six (6) new full-service cabins along with the development and improvement of roadways, utility infrastructure, and sanitary sewer infrastructure for the development of the new Cabins Area. More specifically, the work includes:
- Earthwork, culverts and asphalt and concrete paving of new roadways and parking areas.
  - Protection of the endangered species habitat area.
  - New sanitary sewerage collection system, duplex grinder pump, force main.
  - Underground electrical and water services.
  - Siltation Control and Site Restoration.
1. Project Location: 148 Taum Sauk Trail, Middle Brook, MO 63656
  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 April 11, 2023 were prepared for the Project by Frontenac Engineering Group, Inc. 2725 Sutton Blvd, Maplewood, MO. 63143.
- C. The Work consists of Grubbing, Earthwork, Asphalt & Concrete paving, Electrical, Plumbing, Carpentry for six (6) new cabins.
- D. The work sequence shall consist of:
- Install siltation control and Habitat Protection.
  - Clearing and grubbing
  - Earthwork and preparation of cabins site and roadways.
  - Cabins Construction.
  - Utility and sewer infrastructure.
  - Site Restoration.
- E. The Work will be constructed under a single prime contract.
- F. Description of Base Bid and Alternates:

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### 1. **Base Bid:**

Six (6) new full-service cabins, roadways and pavements, utility services, sanitary sewerage system, storm-water drainage, habitat protection, siltation control, and site restoration.

### 2. **Alternates:**

- a. **Alternate No. 1** – Bathrooms 103, 203: Install Ceramic Tile floor and base in lieu of sheet flooring and base. Install ceramic tile shower and base interior with grab bars, seating, corner shelf, curtain, and curtain rod along with modified floor framing in lieu of prefabricated ADA shower unit with built in shelf, grab bars, seating, curtain, and curtain rod which requires no framing modification. Bathrooms 206: Install Ceramic Tile floor and base in lieu of sheet flooring and base. Install ceramic tile tub/shower surround and corner shelf, curtain, and curtain rod in lieu of prefabricated tub shower surround with built in shelf, curtain, and curtain rod.
- b. **Alternate No. 2**- Install wood wainscot and wood ceiling in Living 100, 200 and Kitchenette 101, 201 in lieu of painted gypsum board.

## 1.3 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. An endangered wildlife habitat area is located adjacent to the project area. It is critical that construction activity does not impact this area. 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, Trails, and Entrances: Keep driveways and entrances, and bicycle trail 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: Use of the existing building is not allowed.
- D. Use of the Construction Entrance, Staging Area, and Job Trailer Area: Maintain these areas in clean and good condition throughout construction. Repair roadways during construction to maintain access and clean conditions.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### 1.4 OCCUPANCY REQUIREMENTS

- A. Owner Access: The Owner will require access to 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 conflict with the Owner's operations.

### 1.5 OWNER-FURNISHED PRODUCTS

- A. The following items will be furnished by the Owner and installed by the Contractor:
  - 1. Range Exhaust Hoods.
- B. The following items will be furnished by the Owner and installed by the Owner:
  - 1. Appliances including ranges, dishwashers & microwave ovens.
- C. All other items shall be furnished and installed by the Contractor including curtain rods and curtains.

### 1.6 MISCELLANEOUS PROVISIONS

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

##### 3.1 SCHEDULE OF PRODUCTS ORDERED IN ADVANCE

- A. Range Exhaust Hoods

##### 3.2 SCHEDULE OF ALTERNATES

- A. **Alternate No. 1** – Bathrooms 103, 203: Install Ceramic Tile floor and base in lieu of sheet flooring and base. Install ceramic tile shower and base interior with grab bars, seating, corner shelf, curtain, and curtain rod along with modified floor framing in lieu of prefabricated ADA shower unit with built in shelf, grab bars, seating, curtain, and curtain rod which requires no framing modification. Bathrooms 206: Install Ceramic Tile floor and base in lieu of sheet flooring and base. Install ceramic tile tub/shower surround and corner shelf, curtain, and curtain rod in lieu of prefabricated tub shower surround with built in shelf, curtain, and curtain rod.
- B. **Alternate No. 2**- Install wood wainscot and wood ceiling in Living 100, 200 and Kitchenette 101, 201 in lieu of painted gypsum board

**END OF SECTION 011000**

# JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

## SECTION 012100 – ALLOWANCES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

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

#### 1.3 WEATHER ALLOWANCE

- A. Included within the completion period for this project are a specified number of "bad weather" days (see Schedule of Allowances).
- B. The Contractor's progress schedule shall clearly indicate the bad weather day allowance as an "activity" or "activities". In the event weather conditions preclude performance of critical work activities for 50% or more of the Contractor's scheduled workday, that day shall be declared unavailable for work due to weather (a "bad weather" day) and charged against the above allowance. Critical work activities will be determined by review of the Contractor's current progress schedule.
- C. The Contractor's Representative and the Construction Representative shall agree monthly on the number of "bad weather" days to be charged against the allowance. This determination will be documented in writing and be signed by the Contractor and the Construction Representatives. If there is a failure to agree on all or part of the "bad weather" days for a particular month, that disagreement shall be noted on this written document and signed by each party's representative. Failure of the Contractor's representative to sign the "bad weather" day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the "bad weather" day determination contained in that document.
- D. There will be no modification to the time of contract performance due solely to the failure to deplete the "bad weather" day allowance.



**JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)**

- E. Once this allowance is depleted, a no cost Change Order time extension will be executed for "bad weather" days, as defined above, encountered during the remainder of the Project.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

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

**3.2 PREPARATION**

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

**3.3 SCHEDULE OF ALLOWANCES**

- A. Weather Allowance: Included within the completion period for this Project 30 "bad weather" days.

**END OF SECTION 012100**

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 012200 – UNIT PRICES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.
- B. Quantities of Units to be included in the Base Bid are indicated in Section 004322 – Unit Prices.

##### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for Unit Prices.
- B. Related Sections include the following:
  - 1. Division 1 Section "Allowances" for procedures for using Unit Prices to adjust quantity allowances.
  - 2. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Contract Changes.
  - 3. Division 31-312000 Section Earthwork "Rock Removal" for procedures for measurement and payment for Bulk Rock Excavation.

##### 1.3 DEFINITIONS

- A. Unit Price is an amount proposed by bidders, stated on the Bid Form Attachment 004322 a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

##### 1.4 PROCEDURES

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

**JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)**

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

**3.1 LIST OF UNIT PRICES**

Unit Price No. 1 – Trench excavation and backfill for 4” water, 3” electric, and 2” sanitary force main in lieu of directional boring if necessary.

1. Description: Excavation for Utility Trenches according to Division 31 Section 312000.
2. Unit of Measurement: Linear Feet
3. Base Bid Quantity: 0 Linear Feet

Unit Price No. 2 – Removal and replacement at unsuitable subgrade material beneath pavements with compacted crushed rock.

1. Description: Sub-Base and Base Courses under pavements and walks according to Division 31 Section 312000.
2. Unit of Measurement: Cubic Yards
3. Base Bid Quantity: 150 Cubic Yards

**END OF SECTION 012200**

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 012300 - ALTERNATES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

##### 1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

##### 1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into 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 indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 – Bathrooms 103, 203: Install Ceramic Tile floor and base in lieu of sheet flooring and base. Install ceramic tile shower and base interior with grab bars, seating, corner shelf, curtain, and curtain rod along with modified floor framing in lieu of prefabricated ADA shower unit with built in shelf, grab bars, seating, curtain, and curtain rod which requires no framing modification. Bathrooms 206: Install Ceramic Tile floor and base in lieu of sheet flooring and base. Install ceramic tile tub/shower surround and corner shelf, curtain, and curtain rod in lieu of prefabricated tub shower surround with built in shelf, curtain, and curtain rod.
  
- B. Alternate No. 2- Install wood wainscot and wood ceiling in Living 100, 200 and Kitchenette 101, 201 in lieu of painted gypsum board.

END OF SECTION 012300

**SECTION 012600 – CONTRACT MODIFICATION PROCEDURES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

- A. This Section specifies administrative and procedural requirements for handling and processing Contract Modifications.
- B. Related Sections include the following:
  - 1. Division 1, Section 012100 "Allowances" for procedural requirements for handling and processing Allowances.
  - 2. Division 1, Section 012200 "Unit Prices" for administrative requirements for using Unit Prices.
  - 3. Division 1, Section 013115 "Project Management Communications" for administrative requirements for communications.
  - 4. Division 0, Section 007213, Article 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

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written notice within ten (10) working days, shall waive the Contractor's right to seek additional time or cost under Article 4, "Changes in the Work" of the General Conditions.

### **1.4 MINOR CHANGES IN THE WORK**

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

### **1.5 PROPOSAL REQUESTS**

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

### **1.6 CHANGE ORDER PROCEDURES**

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

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 012600**

## SECTION 013100 – COORDINATION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

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

#### 1.3 COORDINATION

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



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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.

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### 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. Special Pre-Excavation Conferences: Contractor shall conduct a special pre-excavation conference at the Project Site before each excavation activity and directional boring activity to determine potential impacts on the endangered wildlife Fen Area.
1. Attendees: General Contractor, Excavating Contractor, Directional Boring Contractor, Utility Contractor, Sewer Contractor, Designer, Special Soil Consultant, Construction Representative, and Missouri State Parks Staff shall attend this meeting prior to beginning any new excavation, boring, or trenching activity. Advise Designer and Construction Representative of scheduled meeting dates.
  2. Agenda: Review plans and schedules for earthwork, grading, excavation, boring and trenching activities under consideration including requirements for the following:

### 1.6

- A. Regular 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 plans and schedules for earthwork, grading, excavation, boring and trenching activities under consideration including requirements for the following:
    - a. Wildlife Protection

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- b. Preservation of the Protected Fen Area and related soil conditions and profiles.
  - c. Review seasonal limitations on earthwork and culvert installation.
    - i. No earthwork or culvert installation shall be performed between June 1 and July 31 in order to protect endangered wildlife in the protected Fen Area.
  - d. Review requirements for Special Soil Consultant on-site observation and notification prior to beginning work.
  - e. Review response plan and notification in the event of a breach of the protected Fen Area.
  - f. Review that all materials and equipment required to address a breach of the protected Fen Area (The Fen First Aid Kit) are on site.
  - g. Submittals
  - h. Possible conflicts.
  - i. Time Schedules
  - j. Weather Limitations
  - k. Space and Access Limitations.
  - l. Testing and Inspection Requirements.
  - m. Installation Procedures.
  - n. Coordination with other work.
  - o. Required Performance Results.
  - p. Protection of endangered wildlife
  - q. Protection of construction and personnel
  - 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.

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6. Project name
7. Name and address of Contractor
8. Name and address of Designer
9. RFI number including RFIs that were dropped and not submitted
10. RFI description
11. Date the RFI was submitted
12. Date Designer's response was received
13. Identification of related DSI or Proposal Request, as appropriate

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 013100**

**SECTION 013115 - PROJECT MANAGEMENT COMMUNICATIONS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

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

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intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).

- G. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using E-Builder® to send messages. Communication functions are as follows:
1. Document Integrity and Revisions:
    - a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
    - b. The system shall make it easy to identify revised or superseded documents and their predecessors.
    - c. Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
  2. Document Security:
    - a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties communication except for Administrative Users. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!**
  3. Document Integration:
    - a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
  4. Reporting:
    - a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
  5. Notifications and Distribution:
    - a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.
  6. Required Document Types:
    - a. RFI, Request for Information.
    - b. Submittals, including record numbering by drawing and specification section.
    - c. Transmittals, including record of documents and materials delivered in hard copy.
    - d. Meeting Minutes.
    - e. Application for Payments (Draft or Pencil).
    - f. Review Comments.
    - g. Field Reports.
    - h. Construction Photographs.
    - i. Drawings.
    - j. Supplemental Sketches.
    - k. Schedules.
    - l. Specifications.

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- m. Request for Proposals
  - n. Designer's Supplemental Instructions
  - o. Punch Lists
- H. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents shall be submitted by transmission in electronic form to the E-Builder® web site by licensed users.
- a. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier shall respond to documents received in electronic form on the web site, and consider them as if received in paper document form.
  - b. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.
  - c. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.
- I. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:
- 1. Providing suitable computer systems for each licensed user at the users normal work location<sup>1</sup> with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
  - 2. Each of the above referenced computer systems shall have the following minimum system<sup>2</sup> and software requirements:
    - a. Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)
      - 1) Operating System: Windows XP or newer
      - 2) Internet Browser: Internet Explorer 6.01SP2+ (Recommend IE7.0+)
      - 3) Minimum Recommend Connection Speed: 256K or above
      - 4) Processor Speed: 1 Gigahertz and above
      - 5) RAM: 512 mb
      - 6) Operating system and software shall be properly licensed.
      - 7) Internet Explorer version 7 (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.
      - 8) Adobe Acrobat Reader (current version is a free distribution for download).
      - 9) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

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

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

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**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION (Not Applicable.)**

**END OF SECTION 013115**



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**SECTION 013200 – SCHEDULES**

**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.

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- 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

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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
  13. June 1 to July 31 Earthwork Suspension for habitat protection.
- 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. Site Work
    - b. Structural completion.
    - c. Permanent space enclosure
    - d. Completion of mechanical installation
    - e. Completion of the electrical portion of the Work
    - f. Substantial Completion

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### 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

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8. Requirements for taking samples
  9. Unique characteristics of each service
- C. Distribution: Distribute the schedule to the Owner, Architect, and each party involved in performance of portions of the Work where inspections and tests are required.

**END OF SECTION 013200**

## SECTION 013300 – SUBMITTALS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 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

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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



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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 two (2) sets of prints, black and white, glossy; 8"x10" size; mounted on 8½"x11" soft card stock with left edge binding margin for 3-hole punch.

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

### 1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

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

### PART 2 - PRODUCTS (Not Applicable)

### PART 3 - EXECUTION

#### 3.1 REQUIRED SUBMITTALS

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

SPEC SECTION	TITLE	CATEGORY
013200	Schedules	Construction Schedule
013200	Schedules	Schedule of Values
013200	Schedules	List of Subcontractors
013200	Schedules	Major Material Suppliers
024119	Selective Demolition	Operation / Maintenance Manual
024119	Selective Demolition	Sample
033000	Cast-In-Place Concrete	Certification
033000	Cast-In-Place Concrete	Shop Drawings
055000	Metal Fabrication	Shop Drawings
055313	Bar Gratings	Shop Drawings
057300	Decorative Metal Railings	Shop Drawings
061000	Rough Carpentry	Product Data
061000	Rough Carpentry	Operation / Maintenance Manual
061000	Rough Carpentry	Certification
061323	Heavy Timber Construction	Product Data
061323	Heavy Timber Construction	Certification
061600	Sheathing	Product Data
061600	Sheathing	Warranty
061753	Shop-Fabricated Wood Trusses	Shop Drawings
061800	Glue-Laminated Construction	Product Data

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064113	Wood-Veneer Faced Architectural Cabinets	Shop Drawings
064113	Wood-Veneer Faced Architectural Cabinets	Product Data
072100	Thermal Insulation	Product Data
072100	Thermal Insulation	Certification
072100	Thermal Insulation	Operation / Maintenance Manual
073113	Asphalt Shingles	Shop Drawings
073113	Asphalt Shingles	Sample
074646	Fiber Cement Siding	Product Data
079200	Joint Sealants	Shop Drawings
081713	Integrated Metal Doors Opening Assemblies	Sample
083113	Access Doors and Frames	Product Data
085414	Fiberglass Clad Wood Double Hung Windows	Sample
087100	Door Hardware	Shop Drawings
087100	Door Hardware	Product Data
089543	Insulated Flood Vents	Product Data
093013	Ceramic Tiling	Shop Drawings
096516	Resilient Sheet Flooring	Sample
096519	Resilient Tile Flooring	Shop Drawings
096519	Resilient Tile Flooring	Product Data
099300	Staining and Transparent Finishes	Product Data
102800	Toilet and Bath Accessories	Shop Drawings
102800	Toilet and Bath Accessories	Product Data
123661	Simulated Stone Countertops	Product Data
211313	Fire Sprinkler System	Product Data
221113	Facility Water Distribution Piping	Product Data
221116	Domestic Water Piping	Product Data
221313	Facility Sanitary Sewers	Product Data
223330	Domestic Water Heaters	Product Data
223330	Domestic Water Heaters	Warranty
224100	Residential Plumbing Fixtures	Product Data
224100	Residential Plumbing Fixtures	Warranty
230713	HVAC Insulation	Product Data
232300	Refrigerant Piping Systems	Product Data
233423	Power Ventilators	Product Data
235413	Electric Furnaces	Product Data
235413	Electric Furnaces	Certification
235413	Electric Furnaces	Warranty
238143	Air Source Heat Pumps	Product Data
238143	Air Source Heat Pumps	Certification
238143	Air Source Heat Pumps	Warranty
260519	Conductors and Cable	Product Data

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260529	Hangers and Supports for Electrical Systems	Product Data
260533	Raceways, Fittings and Boxes	Product Data
262416	Panelboards	Shop Drawings
262416	Panelboards	Product Data
262728	Safety Switches	Product Data
321216	Asphalt Paving	Product Data
321216	Asphalt Paving	Certification
321313	Concrete Paving	Product Data
321313	Concrete Paving	Certification
321373	Concrete Paving Joint Sealants	Product Data
321373	Concrete Paving Joint Sealants	Sample
321713	Parking Bumpers	Operation / Maintenance Manual
321723	Pavement Markings	Operation / Maintenance Manual
329200	Seeding & Mulching	Certification
330500	Common Work Results for Utilities	Product Data
330500	Common Work Results for Utilities	Certification
334100	Storm Utility Drainage Piping	Product Data
334100	Storm Utility Drainage Piping	Certification
334500	Duplex Grinder Pump Station	Product Data
334500	Duplex Grinder Pump Station	Certification
334500	Duplex Grinder Pump Station	Warranty

**END OF SECTION 013300**

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### SECTION 013513.31 – SITE SECURITY AND HEALTH REQUIREMENTS (DNR)

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUBMITTALS

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

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

##### 3.1 ACCESS TO THE SITE

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

##### 3.2 FIRE PROTECTION, SAFETY, AND HEALTH CONTROLS

- A. The Contractor shall take all necessary precautions to guard against and eliminate possible fire hazards.
  - 1. Onsite burning is prohibited.
  - 2. The Contractor shall store all flammable or hazardous materials in proper containers located outside the buildings or offsite, if possible.
  - 3. The Contractor shall provide and maintain, in good order, during construction fire extinguishers as required by the National Fire Protection Association. In areas of

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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 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.

**END OF SECTION 013513.31**

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 013515 – ENDANGERED SPECIES HABITAT PROTECTION

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUBMITTALS

- A. List of required submittals:
  - 1. Materials Safety Data Sheets for all directional boring drilling fluids, grouts, and additives. All materials must be non-toxic to insects and wildlife.
  - 2. Schedule of proposed activities.
  - 3. Product submittals for items listed in the Fen First Aid Kit.

#### PART 2 - MATERIALS AND EQUIPMENT

- A. Fen First Aid Kit: The Contractor shall furnish and maintain the following materials and equipment, on-site, to be used in the event the soil profile of the protected Fen Habitable Area is breached due to trenching, boring, excavation, or other construction activities:
  - 1. Forty-Eight (48) fifty-pound sacks of Bentonite grout.
  - 2. Four (4) 4' x 4' Anti-Seep Collars constructed of 1/16" Gum Rubber stretched on a wooden frame.
  - 3. One (1) 3-inch gasoline powered trash pump with fifty feet of suction hose and one hundred feet of discharge hose.
  - 4. One (1) "Mini" excavator machine with 1-foot and 2-foot-wide buckets.
  - 5. Shovels and assorted hand tools for digging.
  - 6. Emergency Contact names and cell phone numbers for:
    - a. Local State Parks Staff
    - b. FMDC Project Manager
    - c. State Parks Naturalist
    - d. Soils Consultant
    - e. Designer
- B. Upon Substantial Completion of Construction, Items 1 & 2 shall become the property of the Owner, if unused.

#### PART 3 - EXECUTION

##### 3.1 ACCESS TO THE SITE

- A. The Contractor shall arrange with Facility Representatives to establish procedures for the protection of endangered wildlife habitat adjacent to work areas at the Facility.

## **JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)**

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

### **3.2 WILDLIFE HABITAT PROTECTION CONTROLS**

- A. The Contractor shall take all necessary precautions to guard against and eliminate possible breach of the Fen Area soil profile.
  - 1. Access to the Fen Area is prohibited.
  - 2. The Contractor shall store all flammable or hazardous materials in proper containers in a location where they will not drain into the Fen Area if they leak.
  - 3. The Contractor shall provide and maintain, in good order, during construction the items listed in the Fen First Aid Kit.
- B. The Contractor shall promptly notify all persons the Emergency Contacts List in the event of a breach or potential breach of the Fen Area.
- C. An on-site conference is required to discuss Fen Area protection measures prior to beginning earthwork, excavation, trenching, or boring operations.
- 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, or on-site.
- 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. 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.
- G. 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.

**END OF SECTION 013515**



**JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)**

**SECTION 014110 – STORM WATER POLLUTION PREVENTION PLAN (SWPPP) Project  
Specific**

This Section should be filled out by the Designer and/or Project Manager for the specific project. It should be filled out to incorporate all requirements of the Missouri DNR Land Disturbance Permit No. MOR100038 for the Office of Administration, Division of Facilities Management Design and Construction projects where over one (1) acre of land is disturbed as defined in the Permit.

**SWPPP to follow.**

**END OF SECTION 014110**

**STORMWATER POLLUTION  
PREVENTION PLAN**

**JOHNSON'S SHUT-INS STATE PARK  
SIX NEW FULL-SERVICE CABINS  
Project #: X2206-01**

**MISSOURI STATE PARKS  
148 TAUM SAUK TRAIL  
MIDDLE BROOK, MO 63656**

**APRIL 11, 2023**

Prepared by: Dave Welton, PE  
Reviewed by: William K. Berthold, PE, PLS

Frontenac Engineering Group, Inc.  
2725 Sutton Avenue  
St. Louis, Missouri 63143  
Phone: (314) 644-2200

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1.0 OWNER  
Missouri State Parks  
148 Taum Sauk Trail  
Middle Brook, MO 63656  
[krista.kennon@dnr.mo.gov](mailto:krista.kennon@dnr.mo.gov)

LOCAL CONTRACTOR  
Unknown at this Time  
Contractor Address  
Contractor Address  
Contractor Phone

EMERGENCY 24-HR CONTACT  
Company Name: Missouri State Parks  
Contact Person: Krista Kennon  
148 Taum Sauk Trail  
Middle Brook, MO 63656  
[krista.kennon@dnr.mo.gov](mailto:krista.kennon@dnr.mo.gov)

2.0 SITE ADDRESS  
148 Taum Sauk Trail  
Middle Brook, MO 63656

1,200 feet north of the Johnson's Shut-Ins Visitor Center Entrance.

3.0 SITE MAP  
Civil Engineering Drawings dated April 11, 2023 indicate the project areas, areas to be disturbed, existing uses, location and names of water bodies and flood plains, and locations of BMP's.

4.0 GRADING PLAN  
The proposed grading plan with all required information is included in the attached Civil Engineering Drawings.

5.0 NATURAL RESOURCE MAP  
A NRCS Natural Resource Map is included in Appendix A.

6.0 P-FACTORS FOR RUNOFF (15-YEAR 20-MIN PI)  
Existing = 12.4 CFS  
  
Proposed = 13.65 CFS

7.0 AREA OF LAND TO BE DISTURBED  
Area = 3.5 ACRES

8.0 SITE DRAINAGE PATTERNS  
Existing and Proposed Site Drainage patterns are included in the drawings.

9.0 SITE ACCESS

Access to the site is from the existing entrance off of Highway N and construction entrance on Highway M. The contractor shall limit disturbance.

10.0 EROSION AND SEDIMENT CONTROL BMP's

The following BMP's will be utilized during construction:

- A. Compost Filter Roll Sock on downhill slopes adjacent to project limits.
- B. Outlet Protection.
- C. Seeding & Mulch, any area left undisturbed for a period greater than 30 days. Seeding shall be annual grass such as oats or rye.
- D. Temporary Construction Entrance
- E. Construction Washdown Area

11.0 POTENTIAL POLLUTANT BMP's

- A. Petroleum Products, if stored on site during construction, will be stored in an approved tank with containment.
- B. Temporary toilets will be provided for construction workers.
- C. No pesticides or herbicides are proposed.

12.0 POST GRADING BMP's

- A. All disturbed areas will be seeded and mulched as soon as final grading is completed. Siltation control filter roll will be maintained until grass is established. Bare areas will be re-seeded and mulched.

13.0 TEMPORARY PARKING

The contractor shall park vehicles on paved/rocked surfaces only.

14.0 SEQUENCE AND SCHEDULE

- A. Install Siltation Filter Roll: 1 Week
- B. Clear and Grub: 1 Week
- C. Excavation and Grading: 6 Weeks
- D. Utility and Sewer Construction: 12 Weeks
- E. Paving and General Construction: 60 Weeks
- F. Finish Grading/Seed and Mulch: 2 Weeks

15.0 CONSTRUCTION EQUIPMENT CLEANING

The contractor shall power wash all construction equipment and vehicles prior to entering State Park property to prevent non-native seeds from entering the site.

16.0 UTILITY TRENCHING AND INSTALLATION

The utility trenching and installation shall be limited to the areas designated on the plans. The contractor shall limit disturbance to the designated areas. No disturbance outside of the designated areas will be permitted.

17.0 SEEDING MIXTURES AND RATES

The contractor shall use an **annual grass such as oats or rye** to stabilize the project according to the requirements below.

**SEEDING REQUIREMENTS**

Dates for Seeding												
Permanent Seeding	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Tall Fescue			O	O	O			O	O			
Smooth Brome			O	O	O			O	O			
Fescue & Brome			O	O	O			O	O			
Fescue, Rye & Bluegrass	A	A	O	O	O	P	P	O	O	P	P	A

Temporary Seeding	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Rye or Sudan	A	A	O	O	O	O	O	O	O	O	A	A
Oats		A	O	O	O	O	O	O	O			

O = Optimum seeding dates  
A = Acceptable seeding dates  
P = Permitted seeding dates with reseeding 2 months later - Initially use 50% of seed and 75% of fertilizer. Reseed with additional 75% seed and remaining fertilizer.

Minimum Fertilizer and Seeding Rates		
Permanent Seeding*	Pounds per acre	Pounds Per 1000 sq. ft.
Tall Fescue	300	7.0
Smooth Brome	200	4.6
Mixture # 1	250	5.7
Mixture # 2	210	4.8

Mixture # 1 = Tall Fescue @ 100 pounds per acre and Brome @ 150 pounds per acre.  
Mixture # 2 = Tall Fescue @ 100 pounds per acre, Perennial Rye grass @ 100 pounds per acre, and Kentucky Blue grass @ 10 pounds per acre.  
\* = Seeding rate for slopes in excess of 20% (5:1), shall be 10 pounds per 1000 sq. ft.

Temporary Seeding	Pounds per acre	Pounds Per 1000 sq. ft.
Rye or Sudan	150	3.5
Oats	200	2.5

Fertilizer	Permanent Seeding (pounds per acre)	Temporary Seeding (pounds per acre)
Nitrogen	45	30
Phosphate	65	30
Potassium	65	30
Lime - ENM	600	600

ENM = Effective neutralizing material per State evaluation of quarried rock.

18.0 PROVISIONS FOR MAINTENANCE

- A. Cleaning and maintenance of sediment basins and upstream swales.
- B. Cleaning and maintenance of temporary entrance and parking area.
- C. Inspection and maintenance of silt filter roll.

19.0 FAILURE RESPONSE PLAN

In the event of a BMP failure, the following procedure shall be followed:

- A. Inspector or Contractor to notify each other by cell phone of failure immediately.
- B. Inspector to inspect failure at site and provide written direction to contractor for repair and remediation and copy owner.
- C. Inspector to contact Missouri Department of Natural Resources to report failure of the site BMP(s). Inspector is mandated to provide DNR with a copy of the written directions and course of action.
- D. Contractor to repair failure within 24 hours.
- E. Inspector to re-inspect within 48 hours and provide written notice of approval to contractor and owner.

Special Inspector: Designated State Parks Representative

20.0 INSPECTION SCHEDULE AND PROCEDURE

Site Inspections Reports: The permittee shall ensure the land disturbance site is inspected on a regular schedule and within a reasonable time period (not to exceed 72 hours) following heavy rains. Regularly scheduled inspections shall be at a minimum once per week. For disturbed areas that have not been finally stabilized, all installed BMP's and other pollution control measures shall be inspected for proper installation, operation, and maintenance. Locations where storm water leaves the site shall be inspected for evidence of erosion or sediment deposition. Any deficiencies shall be noted in a weekly report of the inspection(s) and corrected within seven calendar days of the inspection report. The permittee shall promptly notify the site contractors responsible for operation and maintenance of BMP's of deficiencies.

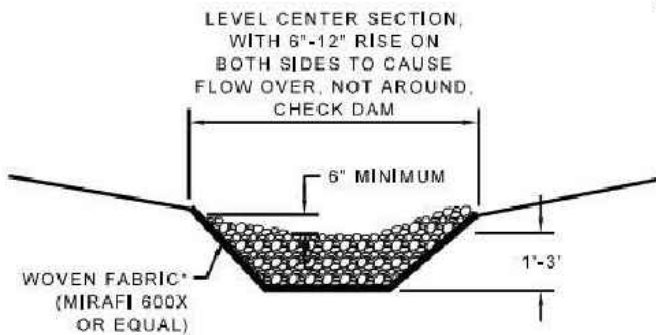
A log of each inspection shall be kept. The inspection report is to include the following minimum information: inspector's name, date of inspection, observations relative to the effectiveness of the BMP's, actions taken or necessary to correct deficiencies, and listing of areas where land disturbance operations have permanently or temporarily stopped. The inspection report shall be signed by the permittee or by the person performing the inspection, if duly authorized to do so.

# APPENDIX A

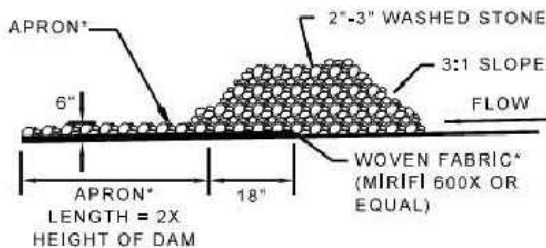


NEW	REVISIONS			
1/15/04	10/10/11	1/1/16		

\* FABRIC AND APRON INSTALLED ON LAST CHECK DAM IN NEWLY SEEDED AREAS.

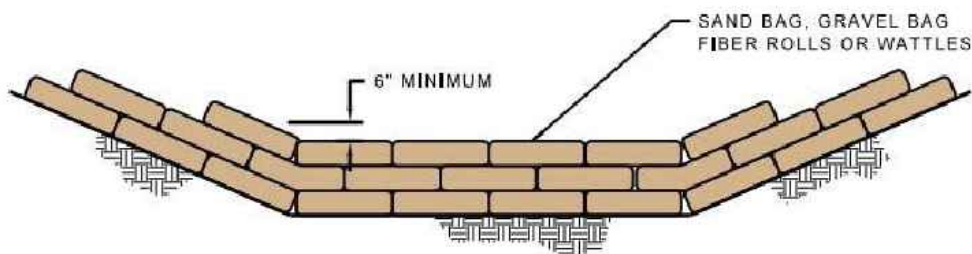


**CROSS SECTION**



**PROFILE**

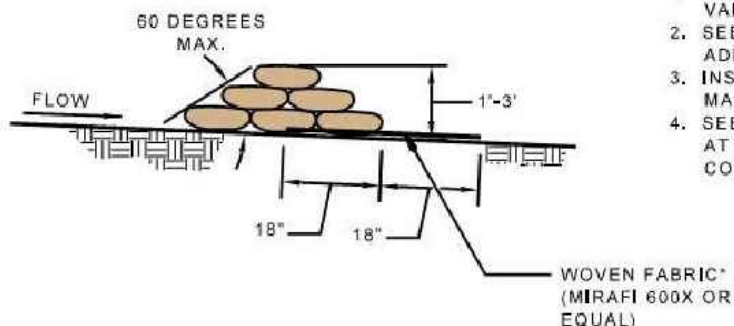
**ROCK CHECK DAM**



**CROSS SECTION**

**GENERAL NOTES**

1. NUMBER OF BAGS AND ARRANGEMENT MAY VARY WITH ON-SITE CONDITIONS.
2. SEE GRAVEL BAG OR WATTLE BMP FOR ADDITIONAL INFORMATION.
3. INSTALL GEOTEXTILE FABRIC PER MANUFACTURER'S SPECIFICATIONS.
4. SEE ADDITIONAL GEOTEXTILE REQUIREMENTS AT THE END OF THE SEDIMENT & EROSION CONTROL MANUAL.



**PROFILE**

**SAND BAG OR GRAVEL BAG  
FILTER ROLLS OR WATTLES  
CHECK DAM**

TYPICAL BMP DETAIL

**CHECK DAM**

## **CHECK DAM**

**PHYSICAL DESCRIPTION** - A small dam built within a drainage swale or temporary diversion channel designed to pond water and cause sediment to settle out. Dams can be constructed of rock, sand bags, filter rolls / wattles, triangular dikes, or gravel bags. Silt fence shall not be used to construct check dams.

**WHERE BMP IS TO BE INSTALLED** - At intervals along drainage swales or channels. The top of the downstream check dam should be level with the base of the upstream check dam.

### **CONDITIONS FOR EFFECTIVE USE OF BMPs**

Type of Flow:	Moderate concentrated flow
Contributing Area:	Maximum of 2 acres
Channel Slope:	Maximum of 2%

**WHEN BMP IS TO BE INSTALLED** - Prior to disturbance of natural vegetation in contributing drainage area; immediately after construction of drainage way.

For additional information see Section 806.30 of St. Louis County's Standard Specification for Road and Bridge Construction.

### **INSTALLATION / CONSTRUCTION PROCEDURES**

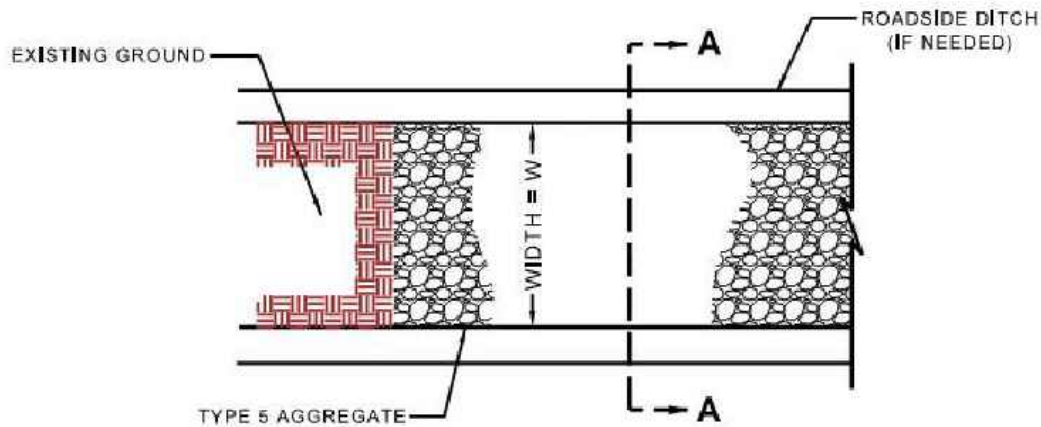
- ✓ Grade drainage way and compact area of check dam.
- ✓ Place rock, sand bags, filter rolls / wattles or gravel bags to required configuration perpendicular to flow.

### **O&M PROCEDURES**

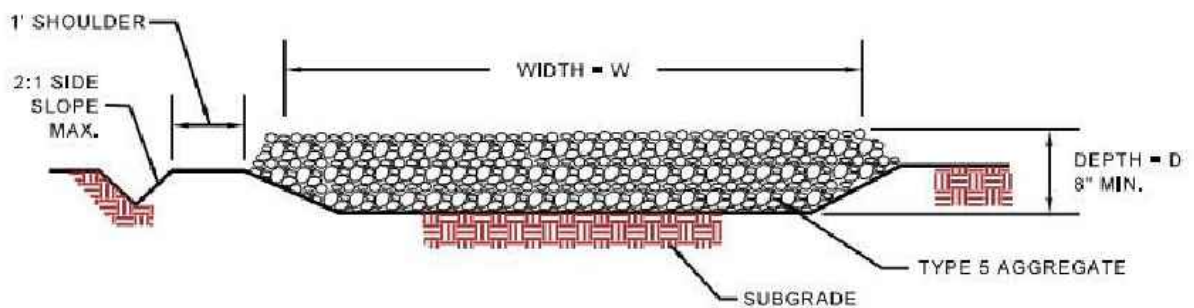
- ✓ Inspect every week and after every storm.
- ✓ Remove trash and leaf accumulation.
- ✓ Remove sediment buildup once it reaches ½ depth of check dam or 12" depth, whichever is less.
- ✓ Restore dam structure to original configuration to protect banks.
- ✓ Replace rock on upstream face of dam if ponding does not drain in reasonable timeframe.

**SITE CONDITIONS FOR REMOVAL** - Remove after contributing drainage areas have been adequately stabilized and vegetation is adequately established in drainage way. Re-grade and vegetate area of check dam.

NEW	REVISIONS				
1/15/04	7/1/04	8/2/07	10/10/11	1/1/16	



**PLAN VIEW**



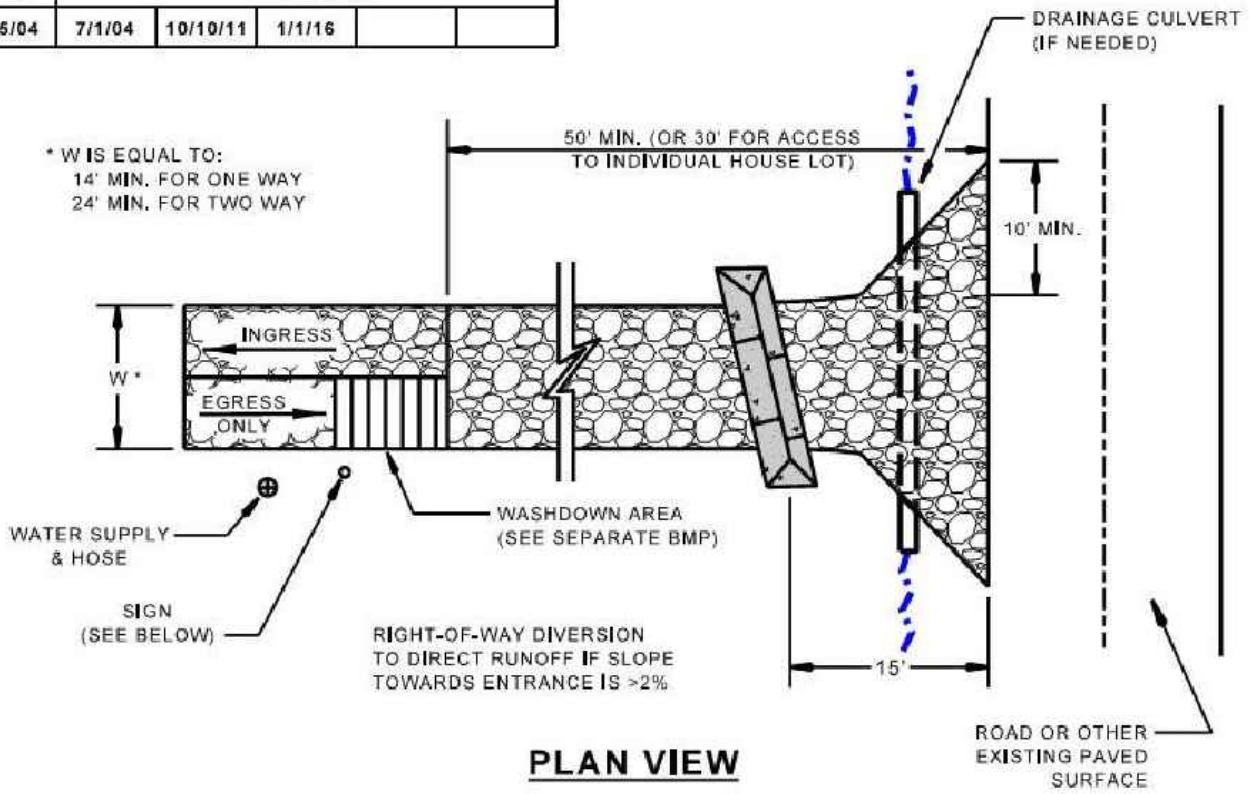
**SECTION A-A**

**GENERAL NOTES**

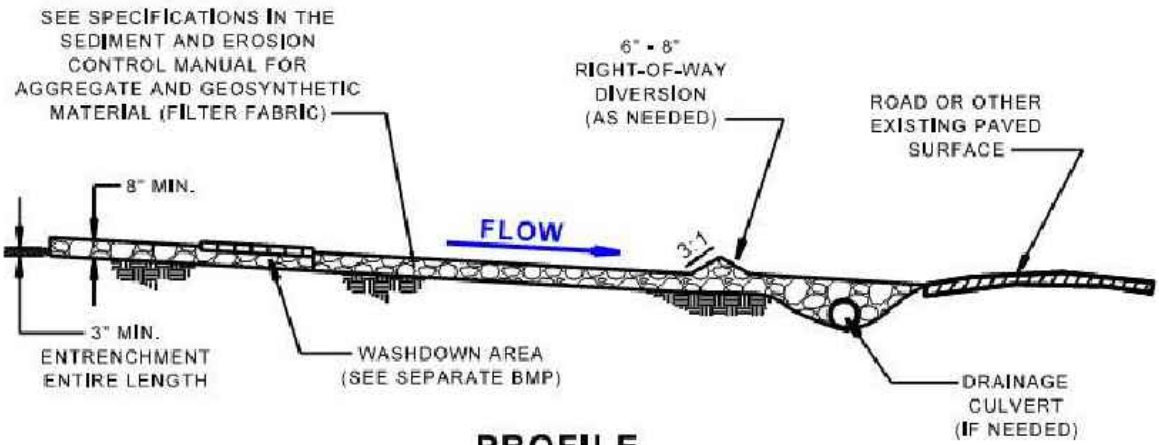
- 1) SEE PLANS FOR CONSTRUCTION ROAD LOCATION, D AND W DIMENSIONS.
- 2) **MINIMUM WIDTH IS 14 FEET FOR ONE-WAY TRAFFIC AND 24 FEET FOR TWO-WAY TRAFFIC. TWO-WAY TRAFFIC WIDTHS SHALL BE INCREASED A MINIMUM OF 4 FEET FOR TRAILER TRAFFIC, DEPENDING ON THE TYPE OF VEHICLE OR EQUIPMENT, SPEEDS, LOADS, CLIMATIC AND OTHER CONDITIONS UNDER WHICH VEHICLES AND EQUIPMENT OPERATE AN INCREASE IN THE MINIMUM WIDTH MAY BE REQUIRED.**
- 3) ROADWAY SHALL FOLLOW THE CONTOUR OF THE NATURAL TERRAIN TO THE EXTENT POSSIBLE.
- 4) GRADE ROAD AND DITCHES TO PROVIDE POSITIVE DRAINAGE AND PREVENT RUNOFF FROM LEAVING THE CONSTRUCTION SITE.
- 5) ASPHALTIC CONCRETE OR PORTLAND CEMENT CONCRETE MAY BE REQUIRED FOR LONG TERM PROJECTS OR UNSTABLE SOILS.

**TYPICAL BMP DETAIL  
CONSTRUCTION  
ROAD**

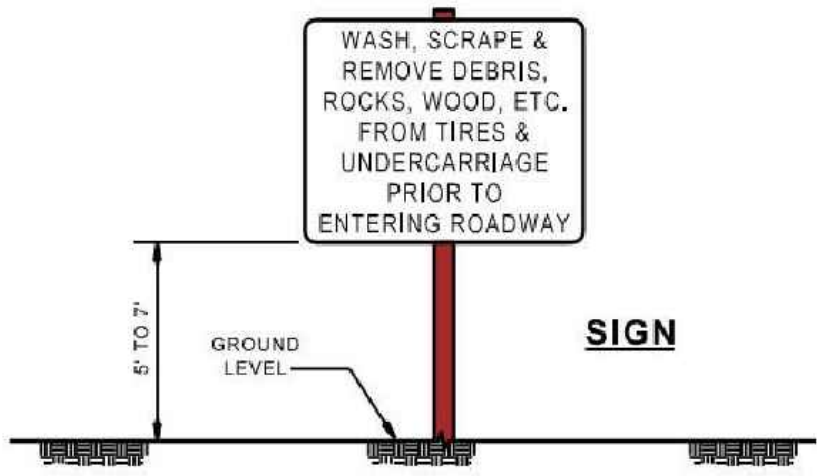
NEW	REVISIONS			
1/15/04	7/1/04	10/10/11	1/1/16	



**PLAN VIEW**



**PROFILE**



**SIGN**

TYPICAL BMP DETAIL  
**CONSTRUCTION  
ENTRANCE**



## **CONSTRUCTION ENTRANCE**

**PHYSICAL DESCRIPTION** - A stabilized entrance to a construction site designed to minimize the amount of sediment tracked from the site on vehicles and equipment. Stabilization generally consists of aggregate over geogrid and geosynthetic material. Mud and sediment fall off of tires as they travel along the stabilized entrance; however, additional measures in the form of a washdown area should also be included on site. The stabilized entrance also distributes the axle load of vehicles over a larger area; thereby mitigating the rutting impact vehicles normally have on unpaved areas. See additional information in the "Construction Site Access Requirements" section of this manual.

**WHERE BMP IS TO BE INSTALLED** - At locations where it is safe for construction vehicles and equipment to access existing streets – preferably at location of future streets or drives.

### **CONDITIONS FOR EFFECTIVE USE OF BMPs**

Drainage: Ditches or pipes, if needed, sized for 15 year, 20 minute storm; HGL 6" below surface of entrance

**WHEN BMP IS TO BE INSTALLED** - First order of work, along with washdown area, prior to vehicles or equipment accessing unpaved areas.

### **INSTALLATION / CONSTRUCTION PROCEDURES**

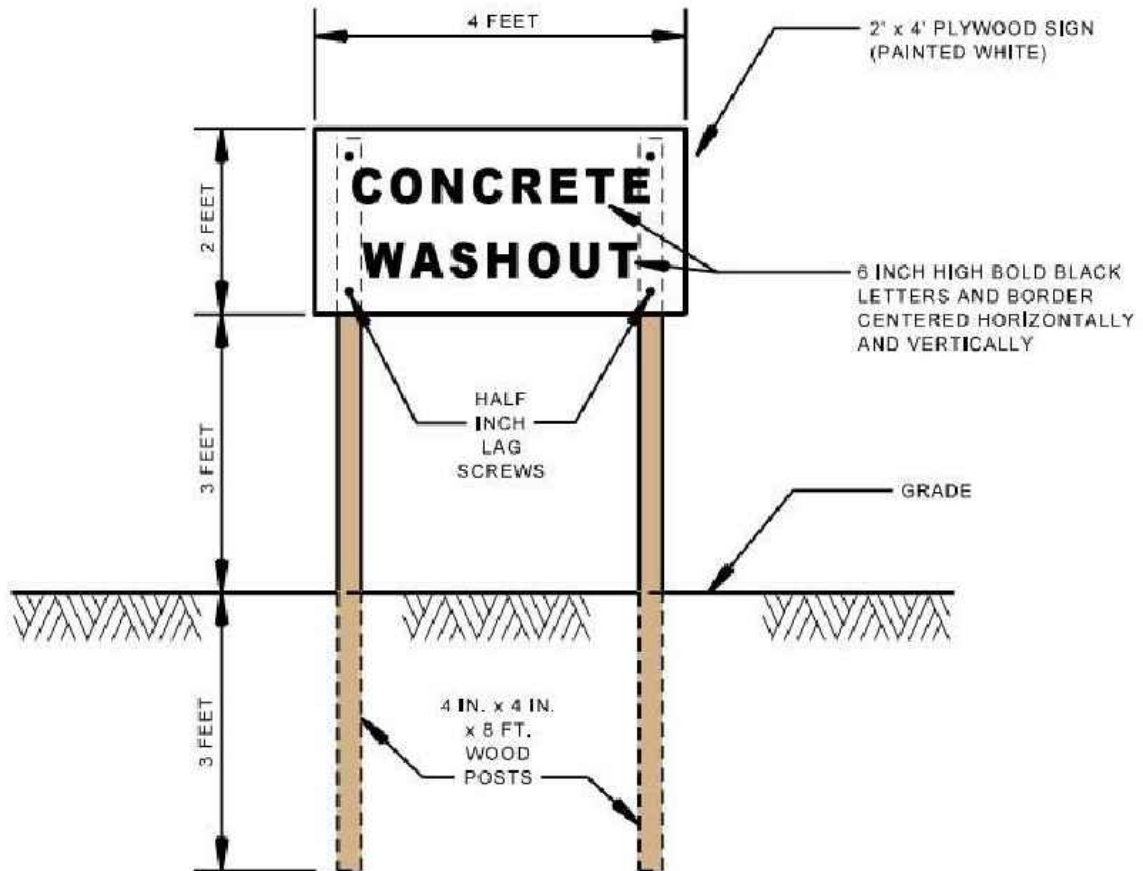
- ✓ Grade and compact area of construction entrance.
- ✓ Install culvert under entrance if needed to maintain positive drainage.
- ✓ Place geosynthetic material next to compacted soil, lay geogrid on top of this, and cover with aggregate, forming diversion across entrance if needed to direct runoff away from roadway.
- ✓ See Washdown Station BMP for additional steps.

### **O&M PROCEDURES:**

- ✓ Immediately remove any mud or debris tracked onto paved surfaces.
- ✓ Remove sediment and clods of dirt from construction entrance continuously.
- ✓ Replace rock if necessary to maintain clean surface.
- ✓ Repair settled areas.

**SITE CONDITIONS FOR REMOVAL** - Remove when vehicles and equipment will no longer access unpaved areas.

NEW	REVISIONS				
4/15/08	10/10/11	1/1/16			



**CONCRETE WASHOUT SIGN DETAIL  
(OR EQUIVALENT AS APPROVED BY COUNTY)**

**GENERAL NOTES**

- 1) DO NOT SCALE DRAWING. FOLLOW DIMENSIONS.
- 2) ACTUAL LAYOUT DETERMINED IN THE FIELD
- 3) THE "CONCRETE WASHOUT" SIGN SHALL BE INSTALLED WITHIN 30 FEET OF EACH TEMPORARY CONCRETE WASHOUT FACILITY.

**TYPICAL BMP DETAIL  
CONCRETE WASTE  
MANAGEMENT  
(CONCRETE WASHOUT SIGN)**

## **CONCRETE WASTE MANAGEMENT**

**DESCRIPTION** - The purpose of this specification is to set forth procedures and practices designed to eliminate the discharge of concrete waste materials to storm drainage systems, drainage areas, streets or watercourses, which shall be required of the contractor.

**APPROPRIATE APPLICATION OF BMP** - Concrete waste management procedures and practices will be implemented on construction projects as follows:

- Where concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Where slurries containing Portland cement concrete (PCC), asphaltic concrete (AC) or bituminous concrete (BC) are generated, such as from saw cutting, coring, grinding, grooving and hydro-concrete demolition.
- Where concrete trucks and other concrete-coated equipment are washed on-site, when approved by the Resident Engineer or Construction Inspector.
- Where mortar-mixing station exist.

### **AWARENESS / ENFORCEMENT**

- Contractor's and / or permit holder's superintendent or representative shall oversee and enforce concrete waste management procedures.
  - Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.
- The site superintendent shall make drivers aware of the presence of the concrete waste management facilities. The site superintendent should post signage indicating the location and designated use of the concrete waste management areas, and provide careful oversight to inspect for evidence of improper dumping of concrete waste and wash water.

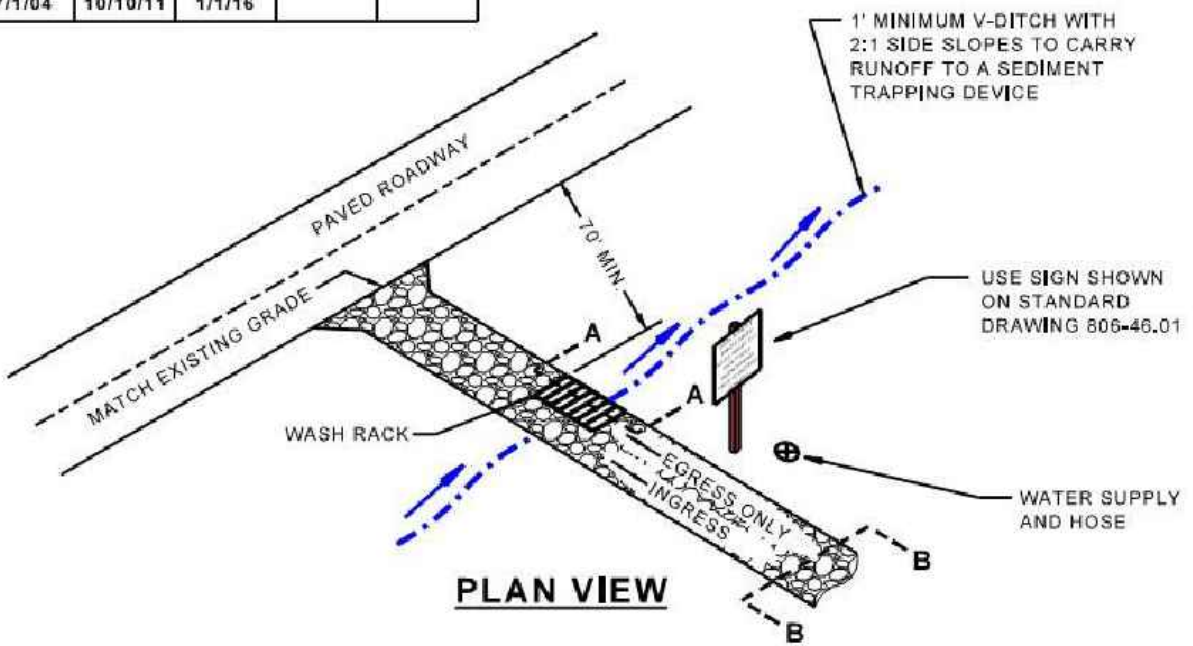
### **IMPLEMENTATION**

- Contractors, private individuals, public agencies, etc. using concrete material, shall incorporate requirements for concrete waste management into material supplier and subcontractor agreements. Include requirements in contracts with concrete delivery companies that drivers must use designated concrete washout facilities.
- Store dry and wet materials under cover, away from drainage areas.
- Avoid mixing excess amounts of fresh concrete.
- Do not allow excess concrete to be dumped on-site, except in designated areas.
- Cover the structures before predicted rainstorms to prevent overflows.
- Monitor on site concrete waste storage and disposal procedures at least weekly or as directed by the Resident Engineer or Construction Inspector.

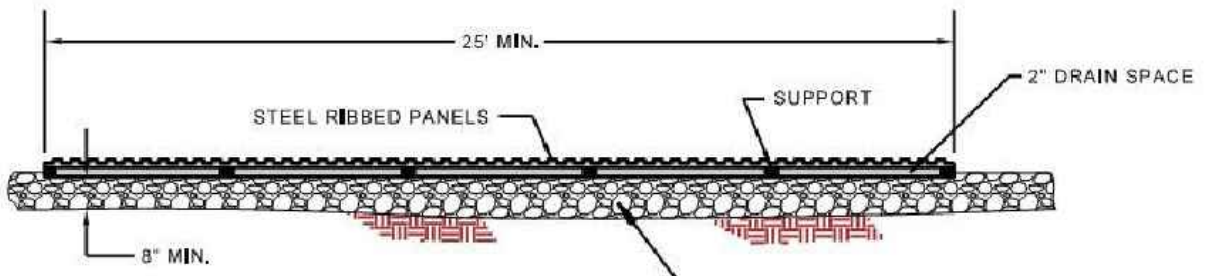
- Locate concrete washout facilities in an area that allows convenient access for concrete trucks, preferably near the area where the concrete is being poured. Appropriate gravel or rock should cover paths to concrete washout facilities if the facilities are located on undeveloped property. These areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills. The number of facilities you install should depend on the expected demand for storage capacity. On large sites with extensive concrete work, place washouts in multiple locations for ease of use. If the dried concrete washout is buried on the site it shall have a 2-foot cover minimum. The 2-foot cover shall match with surrounding finished grade.
- Concrete washed out in areas other than those designated for such activity, shall be cleaned up by the contractor.
- Install signage adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Perform washout of concrete mixers, delivery trucks and other delivery systems in designated areas only.
- Wash out concrete from concrete pumper bins into concrete pumper trucks and discharge into designated washout area.
- Equipment that cannot be easily moved, such as concrete pavers, shall only be washed in designated areas that do not drain to waterways or storm drain systems.
- Backfill and repair holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities.
- Wash out concrete on site into a future designated final concrete pour location. This location cannot be within 50 feet of a storm or sanitary sewer; or water course; or where it can drain off site. The washout cannot jeopardize the integrity of the final concrete pour. Concrete to be removed from the site shall be disposed of in conformance with the provisions in Standard Specification Manual, Section 202, all as directed by the Engineer. No additional payment will be made for complying with the above specification.
- A self-contained and watertight container may be used to control, capture, and contain concrete wastewater and washout material. The container must be portable and temporary, damage resistant, protect against spills and leaks, and sized to handle solids and wash water to prevent overflow. The container should be emptied and cleaned when 75% of its capacity is reached. After all liquids evaporate or are pumped or vacuumed, and the remaining slurry solidified, the Contractor may bury the solids on site. On County roadway projects, the solids may be buried on site if approved by the Engineer. In either case, solids shall be buried a minimum of 2 feet below finished grade. Disposal of container contents that are removed from the site shall be made at an approved landfill. In order to prevent overflows caused by natural occurrences and to provide security for safety purposes and against acts of vandalism, the container shall be covered at the end of each workday and remain covered until the beginning of the next workday. The cover shall remain on site with the container at all times. Container shall be free of liquids during any on-site relocation process or transport to another site. On County roadway projects, location(s) for the container shall be approved by the Engineer.



NEW	REVISIONS			
1/15/04	7/1/04	10/10/11	1/1/16	

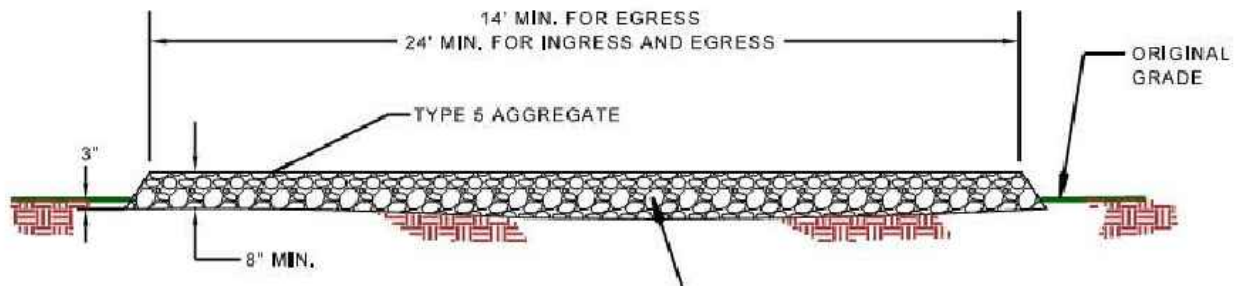


**PLAN VIEW**



**SECTION A-A**

SEE SPECIFICATION IN THE SEDIMENT AND EROSION CONTROL MANUAL FOR AGGREGATE & GEOSYNTHETIC MATERIAL (FILTER FABRIC)



**SECTION B-B**

SEE SPECIFICATION IN THE SEDIMENT AND EROSION CONTROL MANUAL FOR AGGREGATE & GEOSYNTHETIC MATERIAL (FILTER FABRIC)

<b>TYPICAL BMP DETAIL</b>
<b>WASHDOWN STATION</b>

## **WASHDOWN STATION**

**PHYSICAL DESCRIPTION** - An area located at construction entrances designed to wash sediment from the tires and undercarriage of exiting vehicles and prevent sediment from being tracked onto existing roadways.

**WHERE BMP IS TO BE INSTALLED** - Across or immediately adjacent to exit paths from unpaved construction sites.

### **CONDITIONS FOR EFFECTIVE USE OF BMPs**

Drainage: Downstream BMPs sized to treat dirty runoff from washdown station

**WHEN BMP IS TO BE INSTALLED** - First order of work, along with construction entrance, prior to vehicles or equipment accessing unpaved areas.

### **INSTALLATION/CONSTRUCTION PROCEDURES**

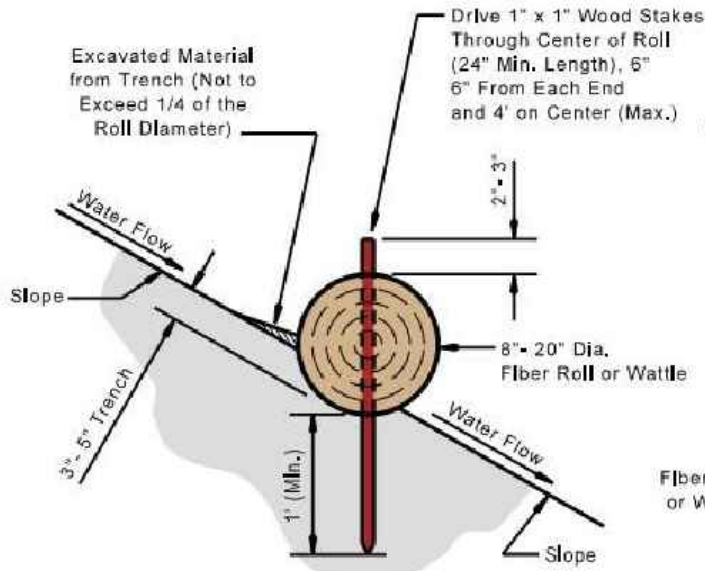
- ✓ Grade and compact area for drainage under washdown pad.
- ✓ Install steel-ribbed plate on frame or other support to allow a 2" drain space.
- ✓ Grade and vegetate downstream BMPs (V-ditch shown on detail).
- ✓ Install water supply and hose.
- ✓ Post sign in advance of station indicating that all exiting vehicles and equipment must use station prior to exiting site.

### **O&M PROCEDURES:**

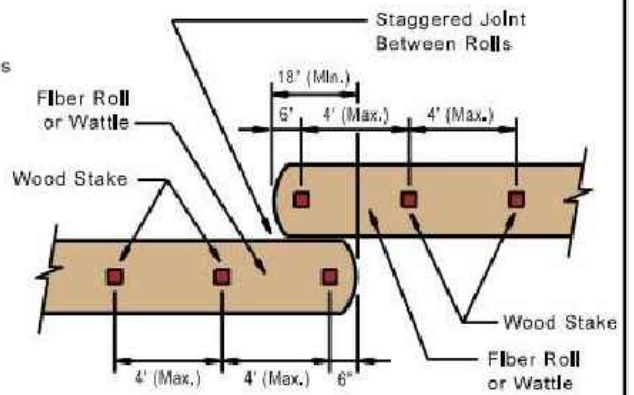
- ✓ Remove sediment daily.
- ✓ Repair settled areas.
- ✓ Replace rock if necessary to maintain clean surface.

**SITE CONDITIONS FOR REMOVAL** - Remove when vehicles and equipment will no longer access unpaved areas.

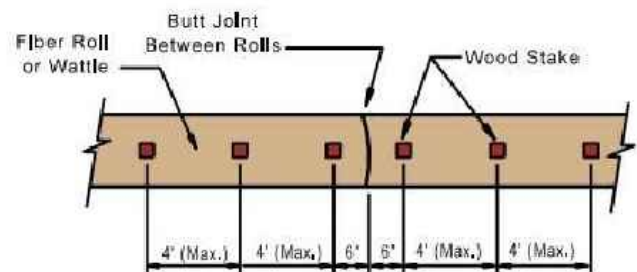
NEW	REVISIONS			
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**FIBER ROLL SECTION & STAKING (TYPE 1)**

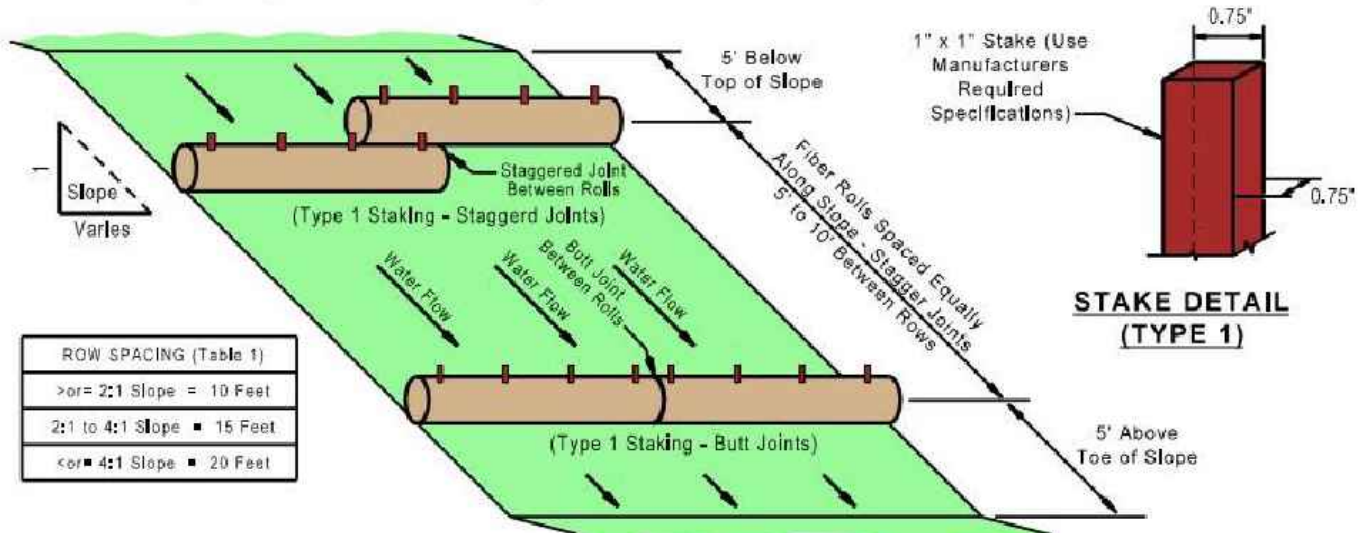


**STAKING WITH STAGGERED JOINTS (TYPE 1)**



**STAKING WITH BUTT JOINTS (TYPE 1)**

Note: Construct a "J-hook" at each end of a continuous run of fiber rolls or wattles, by turning the end of the roll uphill, to prevent storm water runoff and solids from flowing around the ends, when water behind the roll ponds up to a level even with the top of the roll.



ROW SPACING (Table 1)
> or = 2:1 Slope = 10 Feet
2:1 to 4:1 Slope = 15 Feet
< or = 4:1 Slope = 20 Feet

**INSTALLATION AND SPACING (TYPE 1 STAKING)**

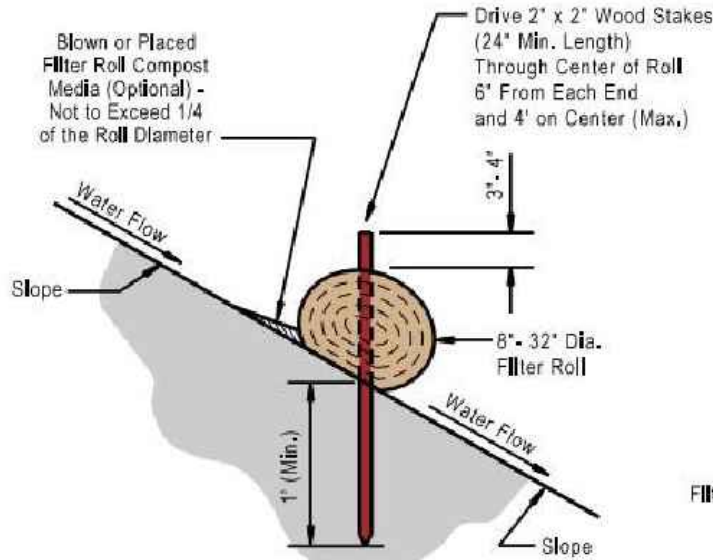
**GENERAL NOTES**

- 1) Do not scale drawing, follow dimensions.
- 2) Row spacing for slope installations should be determined by site conditions such as slope gradient and soil type (see Table 1 for row spacing).
- 3) Installations as shown above are designed for slopes of 1:10 and steeper.
- 4) Netting, filter sock or outer cover of rolls must be constructed of photodegradable or biodegradable material.
- 5) Fiber Rolls and Wattles shall contain straw, flax, coconut fiber (coir), rice straw or aspen excelsior. In a tight tubular roll, specifically designed for removal of solids from storm water runoff, fill material must be biodegradable and contain no chemical additives.
- 6) Fiber Rolls or Wattles may be weighted for use around street inlets (Internal roll weight or by placing a weight, such as a concrete block, on the down stream side of the roll). Weight must not be placed on top of the roll, smashing or flattening the roll.
- 7) Follow the roll manufacturers instructions and recommendations for the staking, installation and maintenance of all Fiber Rolls or Wattles.

**TYPICAL BMP DETAIL FIBER ROLLS AND WATTLES (TYPE 1 STAKING)**

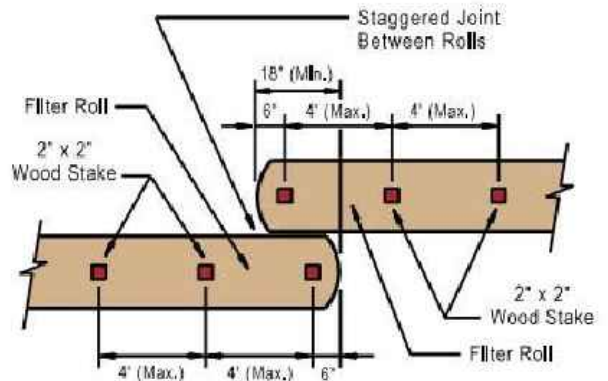


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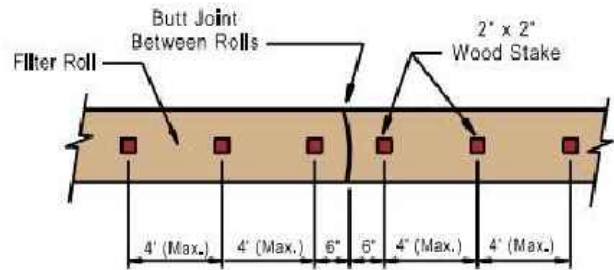


**FILTER ROLL SECTION & STAKING**  
**(TYPE 4)**

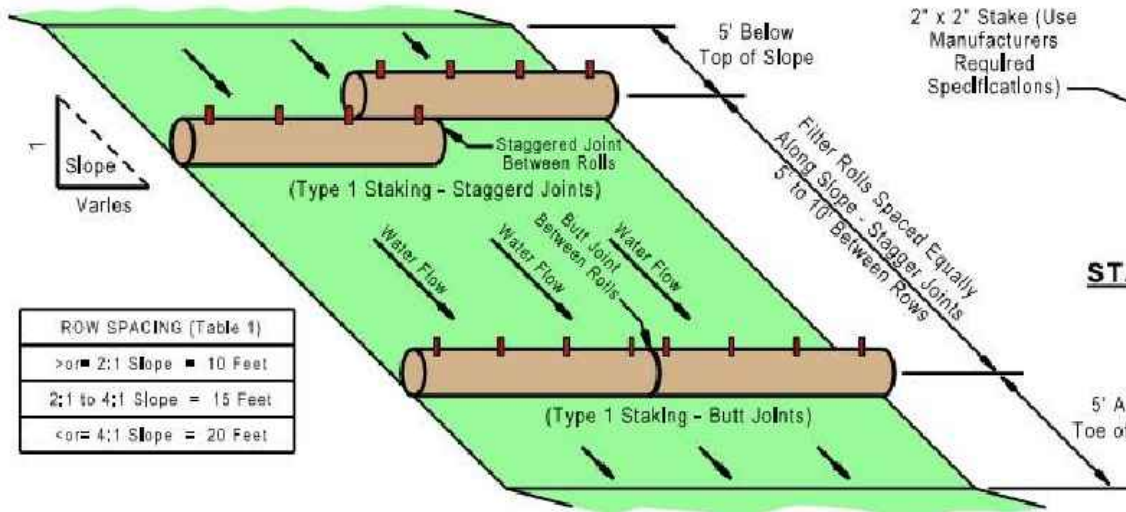
Note: Construct a "J-hook" at each end of a continuous run of filter rolls by turning the end of the roll uphill, to prevent storm water runoff and solids from flowing around the ends, when water behind the roll ponds up to a level even with the top of the sock.



**STAKING WITH STAGGERED JOINTS**  
**(TYPE 4)**



**STAKING WITH BUTT JOINTS**  
**(TYPE 4)**



**STAKE DETAIL**  
**(TYPE 4)**

ROW SPACING (Table 1)	
> or = 2:1 Slope	= 10 Feet
2:1 to 4:1 Slope	= 15 Feet
< or = 4:1 Slope	= 20 Feet

**GENERAL NOTES**

**INSTALLATION AND SPACING**  
**(TYPE 4 STAKING)**

- Do not scale drawing, follow dimensions.
- Row spacing for slope installations should be determined by site conditions such as slope gradient and soil type (see Table 1 for row spacing).
- Installations as shown above are designed for slopes of 1:10 and steeper.
- Netting, filter sock or outer cover of rolls must be constructed of photodegradable or biodegradable material.
- Filter rolls or filter socks shall contain a biodegradable coarse composted or filter material in a tight tubular roll, specifically designed for removal of solids from storm water runoff. Fill shall be free of any refuse, contaminants or other materials toxic to plant growth.
- Filter rolls or filter socks may be weighted for use around street inlets (internal roll weight or by placing a weight, such as a concrete block, on the down stream side of the roll). Weight must not be placed on top of the roll, smashing or flattening the roll.
- Follow the roll manufacturers instructions and recommendations for the sizing, installation and maintenance of all filter rolls or filter socks.

**TYPICAL BMP DETAIL**  
**FILTER ROLLS**  
**(FILTER SOCKS)**  
**(TYPE 4 STAKING)**

## **FIBER ROLLS AND FILTER ROLLS**

**PHYSICAL DESCRIPTION** - A fiber roll, also known as a wattle, consists of straw, flax, coconut fiber (coir), rice straw or other similar materials bound in a tight photodegradable or biodegradable tubular roll or filter sock. A filter roll consists of a biodegradable, coarse composted or filter material bound in a tight photodegradable or biodegradable tubular roll or filter sock. They intercept runoff, reduce flow velocity, remove sediment from the runoff, and reduce soil erosion. Fiber rolls and filter rolls must be prefabricated.

**WHERE BMP IS TO BE INSTALLED** - Installed on erodible slopes, at top of and toe of slopes, around the perimeter of the site, and around temporary stockpiles, as final barrier to sediment being carried off site. Spacing of rolls along slopes is relative to slope. Filter rolls and fiber rolls may also be used at drain inlets, swales and other concentrated flow areas to prevent sediment, silt, and other solids in storm water runoff from entering the storm sewer system. Rolls may also be used as mini check dams in unlined ditches and swales.

### **CONDITIONS FOR EFFECTIVE USE OF BMPs**

Type of Flow:	Sheet flow and concentrated flow
Contributing Slope:	For slopes, use the following row spacing:
	2:1 (H:V) or steeper: 10 feet
	Between 2:1 and 4:1 (H:V): 15 feet
	4:1 (H:V) or flatter: 20 feet

**WHEN BMP IS TO BE INSTALLED** - Prior to disturbance of natural vegetation and at intervals during construction of fill slopes. Fiber rolls and filter rolls should not be used on slopes subject to creep, slumping or landslide. Rolls are difficult to move once saturated.

### **INSTALLATION / CONSTRUCTION PROCEDURES**

- ✓ Calculate required roll diameter, length and row spacing based on slope and the manufacturers recommendations.
- ✓ Dig trench to required depth for fiber rolls (filter rolls do not require trench).
- ✓ Place fiber rolls in trench or filter rolls directly on slope.
- ✓ Stake the fiber rolls or filter rolls as shown on detail drawings.
- ✓ Place excavated soil (fiber roll) or filter roll material along the upside of rolls as shown on detail drawings, not to exceed  $\frac{1}{4}$  of the roll diameter.

### **O&M PROCEDURES**

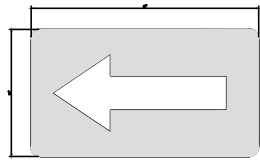
- ✓ Inspect every week and after every storm.
- ✓ Remove sediment buildup deeper than  $\frac{1}{2}$  the exposed roll height.
- ✓ Replace or repair split, torn, unraveling, slumping or damaged rolls.
- ✓ Repair or replace unstable or broken wood stakes.
- ✓ Stabilize any areas susceptible to undermining.
- ✓ Extend rows or add additional rolls if necessary to provide adequate protection.

**SITE CONDITIONS FOR REMOVAL** - After permanent vegetation of slope is established, remove rolls, collect and dispose of sediment accumulation, re-grade trench area to blend with adjacent ground, and vegetate. Rolls do not have to be removed if approved construction or grading plans call for rolls to permanently be left in place (must be fully biodegradable).



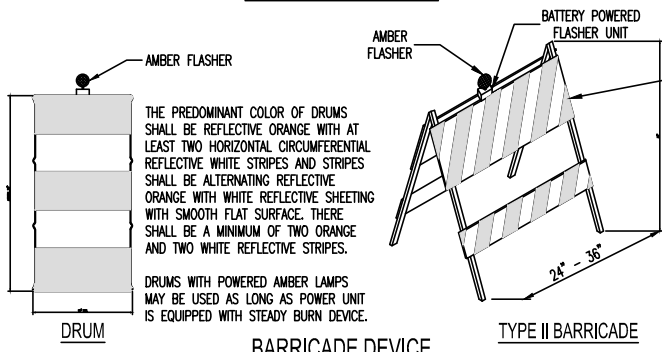
CONE

NOTE:  
COLOR MUST BE PREDOMINANTLY  
ORANGE, FLUORESCENT RED -  
ORANGE OR FLUORESCENT  
YELLOW - ORANGE IN COLOR



ARROW W1-6

CHANNELING DEVICE



DRUM

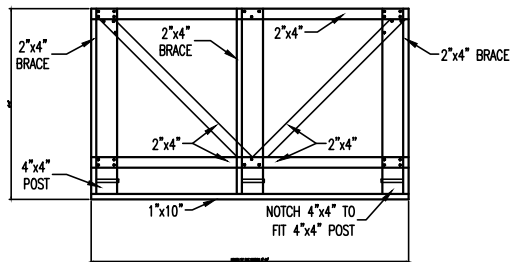
BARRICADE DEVICE

TYPE II BARRICADE

REFLECTIVE ORANGE STRIPES  
ALTERNATING WITH WHITE  
REFLECTIVE SHEETING

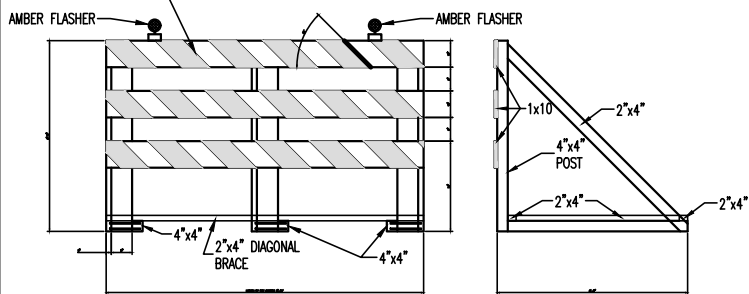
THE PREDOMINANT COLOR OF DRUMS  
SHALL BE REFLECTIVE ORANGE WITH AT  
LEAST TWO HORIZONTAL CIRCUMFERENTIAL  
REFLECTIVE WHITE STRIPES AND STRIPES  
SHALL BE ALTERNATING REFLECTIVE  
ORANGE WITH WHITE REFLECTIVE SHEETING  
WITH SMOOTH FLAT SURFACE. THERE  
SHALL BE A MINIMUM OF TWO ORANGE  
AND TWO WHITE REFLECTIVE STRIPES.

DRUMS WITH POWERED AMBER LAMPS  
MAY BE USED AS LONG AS POWER UNIT  
IS EQUIPPED WITH STEADY BURN DEVICE.



PLAN

STRIPES SHALL SLOPE DOWNWARD IN DIRECTION  
TRAFFIC WILL PASS. ALL STRIPES SLOPE SOME  
DIRECTION USING 6" WIDE - ALTERNATING ORANGE AND  
WHITE REFLECTIVE STRIPES ACROSS ENTIRE FRONT.



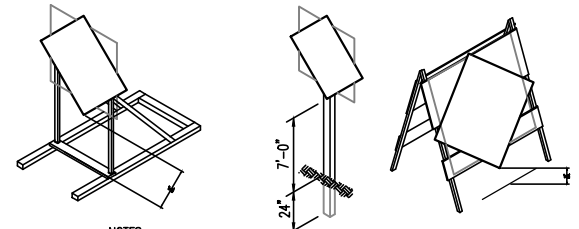
FRONT ELEVATION

END ELEVATION

TYPE III BARRICADE

GENERAL NOTES:

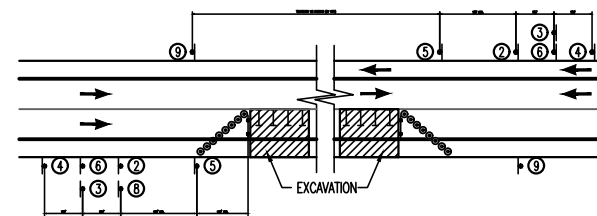
- 1) ALL SIGNS (EXCEPT #2) SHALL BE INSTALLED ON 2 lb. U-CHANNEL POSTS WITH BOTTOM OF SIGN 7" ABOVE GRADE AND AT THE LOCATION INDICATED.
- 2) THE CONTRACTOR WILL BE RESPONSIBLE FOR MAINTAINING ALL TRAFFIC CONTROL DEVICES.
- 3) NO DIRECT PAYMENT WILL BE MADE FOR CUTTING HOLES OR DRIVING POSTS OR FOR FILLING HOLES AFTER REMOVAL OF POSTS.
- 4) PAYMENT FOR CONES, SIGNAGE, BARRICADES OR PORTABLE FLASHERS WILL BE PAID FOR IN LUMP SUM UNDER ITEM "TRAFFIC CONTROL DEVICES".
- 5) STRIPES FOR BARRICADES SHALL BE SLOPING DOWNWARD AT AN ANGLE OF 45 DEGREES IN THE DIRECTION TRAFFIC WILL PASS.
- 6) DRUMS MAY BE SUBSTITUTED FOR TYPE II BARRICADES OR CONES. LIGHTED AS REQUIRED.
- 7) FLAGMAN WILL BE REQUIRED WHENEVER CONTRACTOR OPERATIONS REQUIRES TEMPORARY LAND BLOCKAGES SUCH AS HAULING, PLACEMENT, AND FINISHING OPERATIONS.
- 8) CONTRACTOR SHALL FURNISH ALL SIGNS, POSTS, BARRICADES, DRUMS, CONES, FLASHER HARDWARE, MOUNTING DEVICES, AND LABOR NECESSARY FOR INSTALLATION.
- 9) ALL SIGNS MUST EITHER BE RETROREFLECTIVE OR ILLUMINATED IF USED AT NIGHT TO SHOW SIMILAR SHAPE AND COLOR BOTH DAY AND NIGHT.



NOTES:  
NO DIRECT PAYMENT WILL BE MADE FOR RELOCATION OF PORTABLE MOUNTED  
SIGNS. LONGITUDINAL SPACING OF SIGNS SHOWN IN THE PLANS ARE MINIMUM  
AND MAY BE ADJUSTED TO MEET EXISTING CONDITIONS.

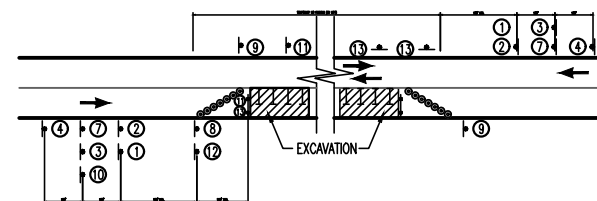
PORTABLE SIGN MOUNTING

SIGN SCHEDULE			
INDICATOR	COLOR	DESCRIPTION	SIGN NO.
(1)	B/Y	RIGHT / LEFT LANE ENDS	W 9 - 1
(2)	B/O	FLAGMAN AHEAD (PORTABLE SIGN MOUNTING)	W 20 - 7
(3)	B/W	ROAD CLOSED TO THRU TRAFFIC	R 11 - 4
(4)	B/O	ROAD WORK AHEAD	W 20 - 1
(5)	B/Y	TWO WAY TRAFFIC (WITH PLAQUE)	W 6 - 3
(6)	B/Y	ROAD NARROWS	W 5 - 1
(7)	B/O	ONE LANE ROAD AHEAD	W 20 - 4
(8)	B/Y	ARROW (LEFT / RIGHT)	W 1 - 6
(9)	B/O	END CONSTRUCTION	G 20 - 2
(10)	B/O	ROAD CLOSED AHEAD	W 20 - 4
(11)	R/W	DO NOT ENTER	W 1 - 6
(12)	B/O	ROAD CLOSED	G 20 - 2
(13)	B/O	ONE WAY	G 20 - 2



TYPICAL 38' - HALF WIDTH CLOSURE  
ADVANCE SIGN PLACEMENT

- Ⓢ = CONSTRUCTION SIGN  
SEE SIGN SCHEDULE
- = TYPE II BARRICADE 25'  
MAX. SPACING ALTERNATE  
BARRICADE TO BE LIGHTED
- ↔ = TYPE III BARRICADE w/  
TWO AMBER FLASHERS
- = CHANNELIZING DEVICE  
10' MAX. SPACING



TYPICAL 26' - HALF WIDTH CLOSURE  
ADVANCE SIGN PLACEMENT

- Ⓢ = ONE WAY TRAFFIC SIGNAGE  
CONSTRUCTION SIGN SEE  
SIGN SCHEDULE
- Ⓢ = CONSTRUCTION SIGN  
SEE SIGN SCHEDULE
- = TYPE II BARRICADE 25'  
MAX. SPACING ALTERNATE  
BARRICADE TO BE LIGHTED
- ↔ = TYPE III BARRICADE w/  
TWO AMBER FLASHERS
- = CHANNELIZING DEVICE  
10' MAX. SPACING

TRAFFIC CONTROL DEVICES  
SCALE: N.T.S.

## SEEDING

**PHYSICAL DESCRIPTION** - Establishment of vegetation by spreading grass seed designed to protect exposed soil from erosion by eliminating direct impact of precipitation and slowing overland flow rates. Once established, the vegetative cover will also filter pollutants from the runoff. Use only perennial vegetation for final stabilization.

**WHERE BMP IS TO BE INSTALLED** - To exposed soil after a phase of rough or finish grading has been completed, or areas where no activity will occur for 30 days.

### **CONDITIONS FOR EFFECTIVE USE OF BMPs**

Type of Flow:	Sheet flow
Contributing Slope Length:	30 foot maximum for 3:1 slopes 50 foot maximum for slope between 3:1 and 10:1 100 foot maximum for slopes under 10%
Minimum Rates:	See attached chart(s)
Acceptable Dates:	See attached chart

**WHEN BMP IS TO BE INSTALLED** - Immediately after rough or finished grading is completed.

### **INSTALLATION / CONSTRUCTION PROCEDURES**

- ✓ Install upstream BMPs to protect area to be seeded.
- ✓ Rough grade area and remove all debris larger than 1-inch in diameter and concentrated areas of smaller debris.
- ✓ Install stabilization grids, if needed.
- ✓ Mix soil amendments (lime, fertilizer, etc.) into top 3 to 6 inches of soil as needed.
- ✓ Plant seed ¼ to ½ inch deep.
- ✓ Roll lightly to firm surface.
- ✓ Cover seeded area with mulch unless seeding completed during optimum spring and summer dates.
- ✓ Install additional stabilization (netting, bonded fiber matrix, etc.) as required.
- ✓ Water immediately - enough to soak 4 inches into soil without causing runoff.
- ✓ If contract / permit allows seeding to be used for final stabilization, only perennial vegetation seeds shall be used.
- ✓ For additional information see Sections 805 and 806.50 of St. Louis County's Standard Specification for Road and Bridge Construction.

### **O&M PROCEDURES:**

- ✓ Inspect every week and after every storm
- ✓ Protect area from vehicular and foot traffic
- ✓ Reseed areas that have not sprouted within 21 days of planting.
- ✓ Repair damaged or eroded areas and reseed and stabilize as needed
- ✓ Do not mow until 4 inches of growth occurs
- ✓ During the first 4 months, mow no more than ⅓ the grass height
- ✓ Re-fertilize during 2<sup>nd</sup> growing season

**SITE CONDITIONS FOR REMOVAL** - Does not require removal, but temporary seeding can be removed immediately prior to work returning to an area

**TYPICAL DETAILS** - Minimum seeding rates and acceptable dates for work attached.

### **INSTALLATION / CONSTRUCTION PROCEDURES**

- ✓ Excavate diversion area except for area of upstream connection.
- ✓ Compact as required to place diversion properly.
- ✓ Install pipe bedding or channel lining as required.

## SEEDING REQUIREMENTS

### Dates for Seeding

Temporary Seeding	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Rye or Sudan	A	A	O	O	O	O	O	O	O	O	A	A
Oats		A	O	O	O	O	O	O	O			

O = Optimum seeding dates

A = Acceptable seeding dates

P = Permitted seeding dates with reseeding 2 months later - Initially use 50% of seed and 75% of fertilizer. Reseed with additional 75% seed and remaining fertilizer.

### Minimum Fertilizer and Seeding Rates

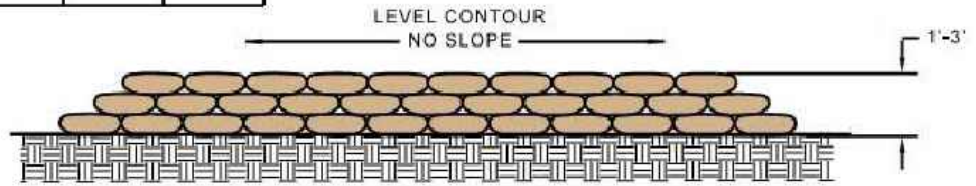
Temporary Seeding	Pounds per acre	Pounds Per 1000 sq. ft.
Rye or Sudan	150	3.5
Oats	200	2.5

Fertilizer	Permanent Seeding (pounds per acre)	Temporary Seeding (pounds per acre)
Nitrogen	45	30
Phosphate	65	30
Potassium	65	30
Lime - ENM	600	600

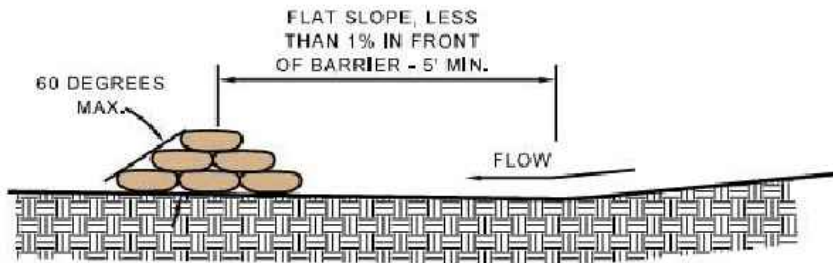
ENM = Effective neutralizing material per State evaluation of quarried rock.



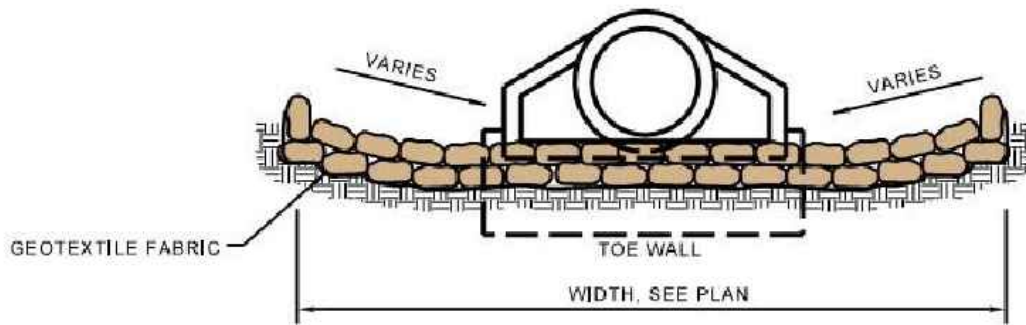
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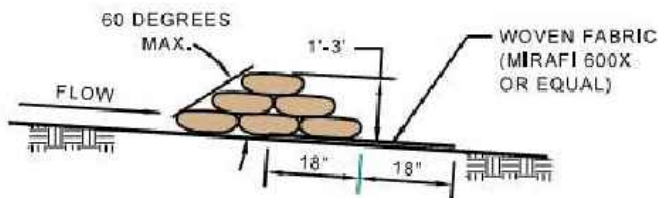
**ELEVATION**



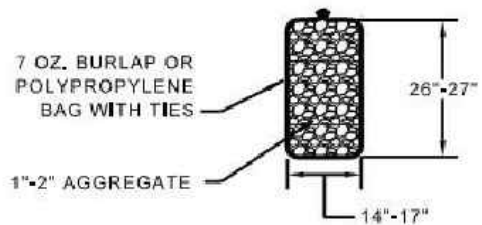
**GRAVEL BAGS AS SILT FENCE**



**GRAVEL BAGS AS ROCK OUTLET PROTECTION**

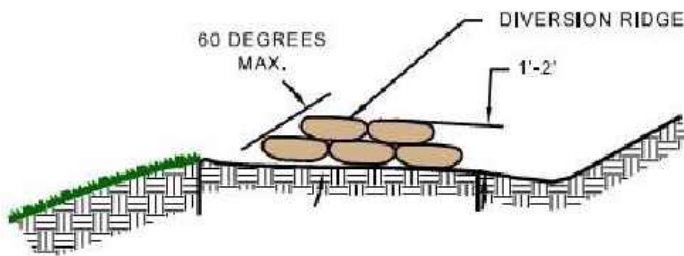


**GRAVEL BAGS AS CHECK DAM**



**GRAVEL BAG**

NOTE: FILL BAGS 2/3 FULL, 60 LBS. MAX. WEIGHT



**GRAVEL BAGS AS DIVERSION RIDGE**

TYPICAL BMP DETAIL

**GRAVEL BAGS**

## **GRAVEL BAGS**

**PHYSICAL DESCRIPTION** - Open mesh nylon or burlap bags of gravel designed to pond water and cause sediment to settle out. Gravel bags can be used alone or as a part of other best management practices. Single Gravel Bag Inlet Protection, 806-45.10; Double Gravel Bag Inlet Protection, 806-45.11.

**WHERE BMP IS TO BE INSTALLED** - Suitable for multiple uses including disrupting concentrated flows, redirecting concentrated flows, capturing sediment by ponding, and anchoring other devices. Can be used in place of silt fence, rock check dams, rock outlet protection, ridge diversions, inlet protection, and level spreader, or as part of the structure of sediment basins, sediment traps, storm drain diversions, and structural stabilization of streams.

**CONDITIONS FOR EFFECTIVE USE OF BMPs** - Type of flow: sheet flow and concentrated flow.

**WHEN BMP IS TO BE INSTALLED** - Dependent upon function it is designed to perform.

### **INSTALLATION / CONSTRUCTION PROCEDURES**

- ✓ Fill bags approximately  $\frac{2}{3}$  full.
- ✓ Grade and stabilize soil on which bags are to be placed.
- ✓ Install centerline of bags on bottom row.
- ✓ Place remaining bags on each side of center - minimum width of bottom row is 3 bags.
- ✓ Place upper rows of bags, staggering ends in brick-like pattern.

### **O&M PROCEDURES**

- ✓ Inspect every week and after every storm.
- ✓ Replace and stabilize any damaged bags or bags that have moved out of place.
- ✓ When silt builds up in front of a row of gravel bags performing the function of silt fence, move the row of bags in front of the sediment buildup. This "new row" will capture additional sediment and keep concentrated flows from reaching the previous sediment deposit.
- ✓ Remove sediment at rows of bags used as weirs or lips. Bags may be repositioned to facilitate removal of sediment.

**SITE CONDITIONS FOR REMOVAL** - Completion of upstream work and vegetation of contributing runoff areas.

**TYPICAL DETAIL** - 806-45.08 (Detail for multiple inlet devices including gravel bags)  
806-55.17

**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. Temporary project identification signs and bulletin boards
  - 6. Waste disposal services
  - 7. Rodent and pest control
  - 8. 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. Environmental protection
  - 4. Habitat Protection Area First Aid Kit

**1.3 SUBMITTALS**

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

## **JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)**

- 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:
  - 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.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sized and thicknesses indicated.
- C. 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.
- D. Water: Provide potable water approved by local health authorities.

### 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.

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1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- J. Habitat Protection Area First Aid Kit: Provide habitat protection materials and equipment, on-site, as described in Section 013515 Endangered Species Habitat Protection.

### 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 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.

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1. Install electric power service underground, except where overhead service must be used.
  2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125V, AC 20ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
- E. Temporary Electric Power Service: The Contractor will provide electric power for construction lighting and power tools.
- 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 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.

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1. Shield toilets to ensure privacy.
  2. Provide separate facilities for male and female personnel.
  3. Provide toilet tissue materials for each facility.
- K. 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.
- L. Drinking-Water Facilities: Provide temporary potable drinking-water.
- M. 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: Limited areas for storage of building materials are available onsite. The Contractor shall provide his own security. Specific locations for storage and craning operations will be discussed at the Pre-Bid Meeting and the Pre-Construction Meeting.
- D. 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.



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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.
- E. Construction Parking: Parking at the site will be provided in the areas designated at the Pre-Construction Meeting.
- F. 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.
- G. 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.
- H. 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.
- I. 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.

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2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.
- J. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.
- K. 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.
- L. 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

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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. 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.
- G. 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.
- H. Habitat Protection: Provide habitat protection in accordance with Section 013515 Endangered Species Habitat Protection.

### 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

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subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances as required by the governing authority.

3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
  - a. Replace air filters and clean inside of ductwork and housing.
  - b. Replace significantly worn parts and parts subject to unusual operating conditions.
  - c. Replace lamps burned out or noticeably dimmed by hours of use.

**END OF SECTION 015000**

**SECTION 017400 – CLEANING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

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

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

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

**PART 3 - EXECUTION**

**3.1 PROGRESS CLEANING**

- A. General
  - 1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
  - 2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
  - 3. At least 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.

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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-

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

**END OF SECTION 017400**

**SECTION 017900 - DEMONSTRATION AND TRAINING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

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

**1.3 INFORMATIONAL SUBMITTALS**

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

**1.4 CLOSEOUT SUBMITTALS**

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



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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:

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- 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.

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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.

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- 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.

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

**END OF SECTION 017900**

# JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

## SECTION 024119 - SELECTIVE DEMOLITION

### 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. Demolition and removal of selected site elements.

- B. Related Requirements:

- 1. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.

#### 1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

#### 1.4 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.

#### 1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Black River Conference Room; 148 Taum Sauk Trail, Middle Brook, MO 63656.
  - 1. Review areas where existing construction is to remain and requires protection.

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### 1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Interruption of utility services. Indicate how long utility services will be interrupted.
  - 2. Coordination for shutoff, capping, and continuation of utility services.

### 1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. Hazardous materials will be removed by Owner before start of the Work.
  - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

## 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.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

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### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
  - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary of Work."
  - 2. Owner will arrange to shut off indicated services/systems when requested by Contractor.
  - 3. Arrange to shut off indicated utilities with utility companies.

### 3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

### 3.4 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

### 3.5 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.



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3.6 CLEANING

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

3.7 SELECTIVE DEMOLITION SCHEDULE

- A. Existing Items to Remain: Concrete bike trail at new road crossing.

**END OF SECTION 024119**

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

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

1.2 DEFINITIONS

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

- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement
7. Aggregates.
8. Admixtures:
  - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
9. Color pigments.
10. Fiber reinforcement.
11. Vapor retarders.
12. Floor and slab treatments.
13. Liquid floor treatments.
14. Curing materials.

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- a. Include documentation from color pigment manufacturer, indicating that proposed methods of curing are recommended by color pigment manufacturer.
  15. Joint fillers.
  16. Repair materials.
- B. Design Mixtures: For each concrete mixture, include the following:
1. Mixture identification.
  2. Minimum 28-day compressive strength.
  3. Durability exposure class.
  4. Maximum w/cm.
  5. Calculated equilibrium unit weight, for lightweight concrete.
  6. Slump limit.
  7. Air content.
  8. Nominal maximum aggregate size.
  9. Steel-fiber reinforcement content.
  10. Synthetic micro-fiber content.
  11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
  12. Intended placement method.
  13. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Shop Drawings:
1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
    - a. Location of construction joints is subject to approval of the Architect.
    - b. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- 1.4 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For the following:
1. Installer: Include copies of applicable ACI certificates.
  2. Ready-mixed concrete manufacturer.
  3. Testing agency: Include copies of applicable ACI certificates.
- B. Material Certificates: For each of the following, signed by manufacturers:
1. Cementitious materials.
  2. Admixtures.
  3. Fiber reinforcement.
  4. Curing compounds.
  5. Floor and slab treatments.

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6. Bonding agents.
7. Adhesives.
8. Vapor retarders.
9. Semirigid joint filler.
10. Joint-filler strips.
11. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Silica fume.
6. Performance-based hydraulic cement.
7. Aggregates.
8. Admixtures:

D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

E. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

F. Preconstruction Test Reports: For each mix design.

G. Field quality-control reports.

### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

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1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.
- D. Field Quality-Control Testing Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

### 1.6 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
1. Include the following information in each test report:
    - a. Admixture dosage rates.
    - b. Slump.
    - c. Air content.
    - d. Seven-day compressive strength.
    - e. 28-day compressive strength.
    - f. Permeability.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301 (ACI 301M).

### 1.8 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 306.1 and as follows.
1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  2. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
  3. Do not use frozen materials or materials containing ice or snow.
  4. Do not place concrete in contact with surfaces less than 35 deg F (1.7 deg C), other than reinforcing steel.
  5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:
1. Maintain concrete temperature at time of discharge to not exceed 95 deg F (35 deg C).

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2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### PART 2 - PRODUCTS

#### 2.1 CONCRETE, GENERAL

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

#### 2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

#### 2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
  2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
  3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

#### 2.4 CONCRETE MATERIALS

- A. Source Limitations:
  1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.

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2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

### B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I.
2. Fly Ash: ASTM C618, Class C or F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Silica Fume: ASTM C1240 amorphous silica.

### C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

### D. Lightweight Aggregate: ASTM C330/C330M, 3/4-inch (19-mm) nominal maximum aggregate size.

### E. Air-Entraining Admixture: ASTM C260/C260M.

### F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
7. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

## 2.5 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.
- B. Sheet Vapor Retarder, Class C: ASTM E1745, Class C; not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

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### 2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids in accordance with ASTM D2240.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
  - 1. Types I and II, nonload bearing Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

### 2.7 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3 mm) and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand, as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested in accordance with ASTM C109/C109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
  - 4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested in accordance with ASTM C109/C109M.

### 2.8 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301 (ACI 301M).



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1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash or Other Pozzolans: 25 percent by mass.
  2. Slag Cement: 50 percent by mass.
  3. Silica Fume: 10 percent by mass.
  4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
  5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
  2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  3. Use water-reducing admixture in pumped concrete and concrete with a w/cm below 0.50.
  4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
  5. Use permeability-reducing admixture in concrete mixtures where indicated.

### 2.9 CONCRETE MIXTURES

- A. Footings: Normal-weight concrete used for footings, grade beams, and tie beams.
1. Exposure Class: ACI 318 (ACI 318M).
  2. Minimum Compressive Strength: 3000 psi (20.7 MPa) at 28 days.
  3. Maximum w/cm: 0.45.
  4. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
  5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch (19-mm) nominal maximum aggregate size.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

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### 3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
  - 1. Daily access to the Work.
  - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
  - 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
  - 4. Security and protection for test samples and for testing and inspection equipment at Project site.

### 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.
  - 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 ANSI/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.

### 3.4 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
  - 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
  - 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M), but not to exceed the amount indicated on the concrete delivery ticket.

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1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. 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.
1. If a section cannot be placed continuously, provide construction joints as indicated.
  2. Deposit concrete to avoid segregation.
  3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
  4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301 (ACI 301M).
    - a. Do not use vibrators to transport concrete inside forms.
    - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer.
    - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    - d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

### 3.5 CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 (ACI 301M) and ACI 306.1 for cold weather protection during curing.
  2. Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
  3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h (1 kg/sq. m x h), calculated in accordance with ACI 305.1, before and during finishing operations.

### 3.6 TOLERANCES

- A. Conform to ACI 117 (ACI 117M).

### 3.7 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.

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2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
  3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
    - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
      - 1) Project name.
      - 2) Name of testing agency.
      - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
      - 4) Name of concrete manufacturer.
      - 5) Date and time of inspection, sampling, and field testing.
      - 6) Date and time of concrete placement.
      - 7) Location in Work of concrete represented by samples.
      - 8) Date and time sample was obtained.
      - 9) Truck and batch ticket numbers.
      - 10) Design compressive strength at 28 days.
      - 11) Concrete mixture designation, proportions, and materials.
      - 12) Field test results.
      - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
      - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Headed bolts and studs.
  2. Verification of use of required design mixture.
  3. Concrete placement, including conveying and depositing.
  4. Curing procedures and maintenance of curing temperature.
  5. Verification of concrete strength before removal of shores and forms from beams and slabs.
  6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.

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- a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M:
  - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - b. Perform additional tests when concrete consistency appears to change.
3. Slump Flow: ASTM C1611/C1611M:
  - a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - b. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;
  - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C1064/C1064M:
  - a. One test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.
6. Compression Test Specimens: ASTM C31/C31M:
  - a. Cast and laboratory cure two sets of two 6-inch (150 mm) by 12-inch (300 mm) or 4-inch (100 mm) by 8-inch (200 mm) cylinder specimens for each composite sample.
  - b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M.
  - a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
  - b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
  - c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa) if specified compressive strength is 5000 psi (34.5 MPa), or

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no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi (34.5 MPa).

10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
11. Additional Tests:
  - a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
  - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
    - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301 (ACI 301M), Section 1.6.6.3.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

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## SECTION 055000 - METAL FABRICATIONS

### 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. Steel framing and supports for mechanical and electrical equipment.

- B. Products furnished, but not installed, under this Section include the following:

- 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
  - 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

- C. Related Requirements:

- 1. 06130 Heavy Timber Construction
  - 2. 057300 Decorative Railings
  - 3. 055313 Bar Gratings

#### 1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

- 1. Non-slip aggregates and non-slip-aggregate surface finishes.
  - 2. Paint products.

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3. Grout.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:

1. Steel framing and supports for mechanical and electrical equipment.

C. Samples for Verification: For each type and finish of extruded nosing.

### 1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

### 1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

### 1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design ladders.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F ambient; 180 deg F, material surfaces.



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### 2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- F. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- G. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
  - 1. Size of Channels: 1-5/8 by 1-5/8 inches, unless otherwise indicated.
  - 2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33 with G90 coating; 0.108-inch nominal thickness, unless otherwise indicated.
- I. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

### 2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A with hex nuts, ASTM A 563 and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 with hex nuts, ASTM F 594 and, where indicated, flat washers; Alloy Group 1.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in

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concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

- F. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.
- G. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches, by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches, o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

### 2.4 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 containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3500 psi.

### 2.5 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.

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- 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 and contour of welded surface matches that of adjacent surface.
- 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.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

### 2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.
- C. Galvanize miscellaneous framing and supports where indicated.

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### 2.7 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime miscellaneous steel trim.

### 2.8 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

### 2.9 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

### 2.10 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

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### 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. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  - 1. Cast Aluminum: Heavy coat of bituminous paint.
  - 2. Extruded Aluminum: Two coats of clear lacquer.

#### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

#### 3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

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- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

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## SECTION 055313 - BAR GRATINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Metal bar gratings.
  - 2. Grating frames and supports.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, sections, and attachment details.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Certificates:
  - 1. Mill Certificates: Signed by manufacturers of stainless steel certifying that products furnished comply with requirements.
  - 2. Welding certificates.
- B. Delegated design engineer qualifications.

#### 1.4 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
    - a. AWS D1.2/D1.2M.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. McNichols or approved equal

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### 2.2 PERFORMANCE REQUIREMENTS

### 2.3 METAL BAR GRATINGS

- A. Bar Grating, Press-Locked, Rectangular Bar, GCM-1-150-CLOSE MESH, ADA Compliant- by McNichols or approved equal:
  - 1. Bearing Bar Spacing: 7/16 inches (11 mm) o.c.
  - 2. Bearing Bar Depth: 1-1/2 inches (38 mm).
  - 3. Bearing Bar Thickness: 3/16 inch (4.8 mm) .
  - 4. Crossbar Spacing: 4 inches (102 mm) o.c.

### 2.4 GRATING FRAMES AND SUPPORTS

- A. Fabricate from metal shapes, plates, and bars of welded construction to sizes, shapes, and profiles indicated and as necessary to receive gratings. Miter and weld connections for perimeter angle frames. Cut, drill, and tap units to receive hardware and similar items.
  - 1. Unless otherwise indicated, fabricate from same basic metal as gratings.
- B. Galvanize steel frames and supports in the following locations:
  - 1. Interior, where indicated on drawings.

### 2.5 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless steel fasteners for fastening aluminum.
  - 2. Provide stainless steel fasteners for fastening stainless steel.

### 2.6 ALUMINUM

- A. General: Provide alloy and temper recommended by aluminum producer for type of use indicated, with not less than the strength and durability properties of alloy, and temper designated below for each aluminum form required.
- B. Extruded Bars and Shapes: ASTM B221 (ASTM B221M), alloys as follows:
  - 1. Alloy 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
  - 2. Alloy 6061-T1, for grating crossbars.
- C. Aluminum Sheet: ASTM B209 (ASTM B209M), Alloy 5052-H32.



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### 2.7 FABRICATION

- A. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- B. Fit exposed connections accurately together to form hairline joints.

### 2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- B. Fit exposed connections accurately together to form hairline joints.
- C. Corrosion Protection: With a heavy coat of bituminous paint, coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals.

### 3.2 INSTALLATION OF METAL BAR GRATINGS

- A. Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

END OF SECTION 055313

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## SECTION 057300 - DECORATIVE METAL RAILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Steel and iron decorative railings.

#### 1.2 ACTION SUBMITTALS

- A. Product Data:
  - 1. Metal finishes.
- B. Samples: For each type of exposed finish required.
- C. Shop Drawings showing elevations and details
- D. Samples: For each type of exposed finish required.
- E. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For delegated-design professional engineer.
- B. Welding certificates.
- C. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.

#### 1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

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B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

- a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
- b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

- a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
- b. Infill load and other loads need not be assumed to act concurrently.

### 2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

### 2.3 STEEL AND IRON DECORATIVE RAILINGS

- A. Tubing: ASTM A500/A500M (cold formed) or ASTM A513/A513M, Type 5.
- B. Bars: Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.
- C. Plates, Shapes, and Bars: ASTM A36/A36M.
- D. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

### 2.4 FASTENERS

- A. Fastener Materials:
  1. Ungalvanized-Steel Railing Components: Plated-steel fasteners complying with ASTM F1941/F1941M, Class Fe/Zn 5 for electrodeposited zinc coating where concealed; Type 304 stainless steel fasteners where exposed.
  2. Hot-Dip Galvanized-Steel Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
  3. Dissimilar Metal Railing Components: Type 316 stainless steel fasteners.

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### 2.5 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: Cast-iron center of handrail 2-1/2 inches (63.5 mm) from face of railing /wall.
- B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- E. Epoxy Intermediate Coat: Complying with MPI#77 and compatible with primer and topcoat.
- F. Polyurethane Topcoat: Complying with MPI#72 and compatible with undercoat.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

### 2.6 FABRICATION

- A. Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.
- B. Connections: Fabricate railings with welded connections unless otherwise indicated.
- C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.
- D. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.
- E. Form changes in direction as follows:
  - 1. As detailed.
  - 2. By bending
- F. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- G. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

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- H. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.
- J. Stainless Steel Cable Guard Infill: Fabricate cable guard infill assemblies in the shop to field-measured dimensions with fittings machine swaged.
  - 1. Minimize amount of turnbuckle take-up used for dimensional adjustment, so maximum amount is available for tensioning cable.
  - 2. Tag cable assemblies and fittings to identify installation locations and orientations for coordinated installation.

### 2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
  - 1. Hot-dip G90 galvanize exterior steel and iron railings, including hardware, after fabrication.
  - 2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
  - 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner and as follows:
  - 1. Comply with SSPC-SP 16.
- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
  - 1. Fit exposed connections together to form tight, hairline joints.
  - 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
  - 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
  - 4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.

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5. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
  6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3 m).
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

### 3.2 ATTACHING RAILINGS

- A. Attach handrails to walls with wall brackets, except where end flanges are used. Provide brackets with 2 1/4-inch (38-mm) clearance from inside face of handrail and finished wall surface.
- B. Secure wall brackets and railing end flanges to building construction as follows:
1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  2. For hollow masonry anchorage, use toggle bolts.
  3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

### 3.3 CLEANING

- A. Clean by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 057300

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## SECTION 061000 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Framing with dimension lumber.
  - 2. Framing with engineered wood products.
  - 3. Exterior Sheathing with air infiltration barrier
  - 4. Wood blocking, cants, and nailers.
  - 5. Wood grounds.
  - 6. Plywood backing panels.

#### 1.3 DEFINITIONS

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

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

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2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

### 1.5 QUALITY ASSURANCE

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

### 1.6 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 - PRODUCTS

### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
  3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
  1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering



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analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
  - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
  - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  - 2. Wood sills, blocking, stripping and similar concealed members in contact with masonry or concrete.

### 2.3 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
  - 1. Use treatment that does not promote corrosion of metal fasteners.
  - 2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.
- E. Application: Treat items indicated on Drawings, and the following:

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1. Plywood backing panels.

### 2.4 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent.
- B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species.
- C. Framing Other Than Non-Load-Bearing Interior Partitions: No. 2 grade and any of the following species:
  1. Hem-fir (north); NLGA.
  2. Southern pine; SPIB.
  3. Douglas fir-larch; WCLIB or WWPA.
  4. Mixed southern pine; SPIB.
  5. Spruce-pine-fir; NLGA.
  6. Douglas fir-south; WWPA.
  7. Hem-fir; WCLIB or WWPA.
  8. Douglas fir-larch (north); NLGA.
  9. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
- D. Framing Other Than Non-Load-Bearing Interior Partitions: See drawings.
- E. Exposed Exterior and Interior Framing Indicated to Receive a Stained or Natural Finish: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

### 2.5 ENGINEERED WOOD PRODUCTS

- A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
  1. Extreme Fiber Stress in Bending, Edgewise: Per drawings.
  2. Modulus of Elasticity, Edgewise: Per drawings.

### 2.6 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
  1. Blocking.
  2. Nailers.
  3. Grounds.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber and any of the following species:

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1. Mixed southern pine; SPIB.
2. Western woods; WCLIB or WWPA.
3. Northern species; NLGA.
4. Eastern softwoods; NeLMA.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

### 2.7 Exterior wood Fascia Board

1. General: Provide exterior wood fascia board at the upper roof with the following design criteria:
  - a. #1 or better Doug Fir

### 2.8 SHEATHING

1. General: Provide exterior plywood sheathing as indicated on drawings.
2. Provide Proprietary Zip System R-Sheathing: Proprietary insulated sheathing with Air Infiltration Barrier applied over osb and insulation board in the factory by Huber Engineering Woods as indicated on the drawings.
  - a. R-6 sheathing with accessories to install per manufacturer.

### 2.9 SHEATHING ACCESSORIES

- A. Zip Systems R-Sheathing: . Proprietary panel accessories to complete installation.
1. Zip System Flashing Tape, Zip System Stretch Tape, and Zip system Liquid Flash
  2. Application: Provide at all exterior wood stud walls unless otherwise indicated on the drawings.

### 2.10 PLYWOOD BACKING PANELS

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

### 2.11 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

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- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

### 2.12 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

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- E. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- F. Comply with AWWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- G. 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.
- H. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

### 3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

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

### 3.3 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.

END OF SECTION 061000

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## SECTION 061323 - HEAVY TIMBER CONSTRUCTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes framing using timbers.

#### 1.2 DEFINITIONS

- A. Timbers: Lumber of 5 inches nominal (114 mm actual) or greater in least dimension.
- B. Inspection agencies, and the abbreviations used to reference them, include the following:
  - 1. NELMA - Northeastern Lumber Manufacturers Association.
  - 2. NLGA - National Lumber Grades Authority.
  - 3. SPIB - Southern Pine Inspection Bureau.
  - 4. WCLIB - West Coast Lumber Inspection Bureau.
  - 5. WWPA - Western Wood Products Association.

#### 1.3 SUBMITTALS

- A. Certificates of Inspection: Issued by lumber grading agency for exposed timber not marked with grade stamp.
- B. Certificates of Chain-of-Custody: Signed by mill certifying that timber was obtained from forests certified by a Forest Stewardship Council-accredited certification body to be in compliance with the Forest Stewardship Council's FSC 1.2 "Principles and Criteria." Include evidence that mill is certified for chain-of-custody by a Forest Stewardship Council-accredited certification body.

#### 1.4 QUALITY ASSURANCE

- A. Timber Standard: Comply with AITC 108, "Standard for Heavy Timber Construction."
- B. Forest Certification: Provide timber obtained from forests certified by a Forest Stewardship Council-accredited certification body to be in compliance with the Forest Stewardship Council's FSC 1.2 "Principles and Criteria."

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of heavy timber construction to avoid extended on-site storage and to avoid delaying the Work.

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### PART 2 - PRODUCTS

#### 2.1 HEAVY TIMBER, GENERAL

- A. General: Comply with DOC PS 20 and grading rules of lumber grading agencies certified by American Lumber Standards Committee Board of Review, as applicable.
  - 1. Factory mark each item of timber with grade stamp of grading agency.
  - 2. For exposed timber indicated to receive a stained or natural finish, apply grade stamps to surfaces that will not be exposed to view or omit grade stamps and provide certificates of grade compliance issued by grading agency.

#### 2.2 TIMBER

- A. Timber Species and Grade: Douglas fir-larch or Douglas fir-larch (North); No. 1 Dense , NLGA, WCLIB, or WWPA.
- B. Moisture Content: Provide timber with 19 percent maximum moisture content at time of dressing.
- C. Dressing: Provide dressed timber (S4S).
- D. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts.
  - 1. Use sealer that meets or exceeds VOC and chemical component limits of Green Seal requirements.
- E. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.
  - 1. Use sealer that meets or exceeds VOC and chemical component limits of Green Seal requirements.

#### 2.3 TIMBER CONNECTORS

- A. General: Unless otherwise indicated, fabricate from the following materials:
  - 1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.
  - 2. Round steel bars complying with ASTM A 575, Grade M 1020.
  - 3. Hot-rolled steel sheet complying with ASTM A 1011, Structural Steel, Type SS, Grade 33.
- B. Provide bolts, 3/4 inch (19 mm), unless otherwise indicated, complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); nuts complying with ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.
- C. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil (0.05-mm) dry film thickness.

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- D. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A123/A123M or ASTM A153/A153M. Provide G90 coating to all metal fabrications and fasteners.

### 2.4 FABRICATION

- A. Shop fabricate members by cutting and restoring exposed surfaces to match specified surfacing. Pre-drill for fasteners and assembly of units.
  - 1. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
- B. Seal Coat: After fabricating and surfacing each unit, apply a saturation coat of penetrating sealer on surfaces of each unit.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Erect heavy timber construction true and plumb. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
- B. Fit members by cutting and restoring exposed surfaces to match specified surfacing. Pre-drill for fasteners and assembly of units.
  - 1. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
  - 2. Coat crosscuts with end sealer.
- C. Install timber connectors as indicated.
  - 1. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.

### 3.2 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged heavy timber framing if repairs are not approved by Architect.

END OF SECTION 061323



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## SECTION 061600 - SHEATHING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Wall sheathing.
  - 2. Roof sheathing.
  - 3. Subflooring.
  - 4. Underlayment.
  - 5. Sheathing joint and penetration treatment.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
  - 1. Wood-preservative-treated plywood.
  - 2. Insulated panels

### PART 2 - PRODUCTS

#### 2.1 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPA 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 plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- C. Application: Treat items indicated on Drawings.

#### 2.2 WALL SHEATHING

- A. Plywood Sheathing: , Exterior, Structural I sheathing.

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- B. Zip Systems R-Sheathing as manufactured by Huber Engineered Woods or approved equal: Air infiltration Barrier is built into the wall panel. Proprietary panel accessories to complete installation.
  - 1. R-6 Insulated Panel, 1 ½" 4'x8', 9', or 10'
  - 2. Zip System Flashing Tape, Zip System Stretch Tape, and Zip system Liquid Flash
  - 3. Application: Provide at all exterior wood stud walls unless otherwise indicated on the drawings.

### 2.3 ROOF SHEATHING

- A. Plywood Sheathing: , Exterior sheathing.

### 2.4 SUBFLOORING AND UNDERLAYMENT

- A. Plywood Combination Subfloor-Underlayment: DOC PS 1, Exposure 1, Structural I, Underlayment single-floor panels.
- B. Plywood Subflooring: DOC PS 1, Exposure 1, Structural I single-floor panels or sheathing.
- C. Underlayment: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 1/4 inch (6.4 mm) over smooth subfloors and not less than 3/8 inch (9.5 mm) over board or uneven subfloors.
  - 1. Plywood Underlayment for Resilient Flooring: DOC PS 1, with fully sanded face.
  - 2. Plywood Underlayment for Ceramic Tile: DOC PS 1, Exterior, C-C Plugged, not less than 5/8-inch (15.9-mm) nominal thickness.

### 2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
  - 2. For roof and wall] sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

### 2.6 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sheathing Tape for Foam-Plastic Sheathing: Pressure-sensitive plastic tape recommended by sheathing manufacturer for sealing joints and penetrations in sheathing.

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### 2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Wood Framing: Formulation complying with ASTM D3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
  - 2. ICC-ES evaluation report for fastener.
- D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

### 3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Combination Subfloor-Underlayment:
    - a. Glue and nail to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch (3 mm) apart at edges and ends.
  - 2. Subflooring:
    - a. Glue and nail to wood framing.
    - b. Screw to cold-formed metal framing.
    - c. Space panels 1/8 inch (3 mm) apart at edges and ends.
  - 3. Wall and Roof Sheathing:

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- a. Nail to wood framing.
  - b. Screw to cold-formed metal framing.
  - c. Space panels 1/8 inch (3 mm) apart at edges and ends.
4. Underlayment:
- a. Nail to subflooring.
  - b. Space panels 1/32 inch (0.8 mm) apart at edges and ends.
  - c. Fill and sand edge joints of underlayment receiving resilient flooring immediately before installing flooring.

### 3.3 INSULATED PANEL SHEATHING INSTALLATION

- A. Comply with manufacturer's written instructions.
- B. Apply sheathing tape to joints between foam-plastic sheathing panels and at items penetrating sheathing. Apply at upstanding flashing to overlap both flashing and sheathing.

### 3.4 PARTICLEBOARD UNDERLAYMENT INSTALLATION

- A. Comply with CPA's recommendations for type of subfloor indicated. Fill and sand gouges, gaps, and chipped edges. Sand uneven joints flush.
  1. Fastening Method: Glue and nail underlayment to subflooring.

### 3.5 HARDBOARD UNDERLAYMENT INSTALLATION

- A. Comply with CPA's recommendations and hardboard manufacturer's written instructions for preparing and applying hardboard underlayment.
  1. Fastening Method: Nail underlayment to subflooring.

END OF SECTION 061600

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Wood products.
  - 2. Preservative-treated lumber.

#### 1.2 ALLOWANCES

- A. Provide wood truss bracing under the Metal-Plate-Connected Truss Bracing Allowance as specified in Section 012100 "Allowances."

#### 1.3 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For wood-preservative-treated lumber, metal-plate connectors, metal truss accessories, and fasteners.
  - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification from treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to truss fabricator.
- B. Shop Drawings: Show fabrication and installation details for trusses.
  - 1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
  - 2. Show ductwork pathways to remain clear and free of bracing as indicated on the Mechanical Drawings.
  - 3. Indicate sizes, stress grades, and species of lumber.
  - 4. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
  - 5. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
  - 6. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
  - 7. Show splice details and bearing details.

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- C. Delegated Design Submittals: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For metal connector-plate manufacturer and fabricator.
- B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.
- C. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.
- D. Evaluation Reports: For the following, from ICC-ES:
  - 1. Wood-preservative-treated lumber.
  - 2. Metal-plate connectors.
  - 3. Metal truss accessories.

### 1.6 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
  - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.
- C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
  - 1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
  - 2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
  - 3. Provide for air circulation around stacks and under coverings.

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- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.
- B. Structural Performance: Metal-plate-connected wood trusses are to be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
  - 1. Design Loads: As indicated.
  - 2. Maximum Deflection under Design Loads:
    - a. Roof Trusses: Vertical deflection of 1/360 of span.
- C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

#### 2.2 WOOD PRODUCTS

- A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  - 1. Factory mark each piece of lumber with grade stamp of grading agency.
  - 2. Provide dressed lumber, S4S.
  - 3. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Minimum Chord Size for Roof Trusses: 2 by 6 inches nominal (38 by 140 mm actual) for top chords.
- C. Minimum Specific Gravity for Top Chords: 0.55.
- D. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

#### 2.3 METAL CONNECTOR PLATES

- A. Fabricate connector plates to comply with TPI 1.

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- B. Hot-Dip Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch (0.9 mm) thick.
  - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
  - 1. Use for wood-preserved-treated lumber and where indicated.

### 2.4 FASTENERS

- A. Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  - 1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
  - 2. Where trusses are exposed to weather, in ground contact, made from pressure-preserved treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.

### 2.5 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Allowable design loads, as published by manufacturer, are to comply with or exceed those indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors are to be punched for fasteners adequate to withstand same loads as framing anchors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
  - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
  - 1. Use for wood-preserved-treated lumber and where indicated.
- D. Truss Tie-Downs: Bent strap tie for fastening roof trusses to wall studs below, 1-1/2 inches (38 mm) wide by 0.050 inch (1.3 mm) thick.



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- E. Truss Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening roof trusses to wall studs below, 2-1/4 inches (57 mm) wide by 0.062 inch (1.6 mm) thick. Tie fits over top of truss and fastens to both sides of truss, top plates, and one side of stud below.
- F. Roof Truss Clips: Angle clips for bracing bottom chord of roof trusses at non-load-bearing walls, 1-1/4 inches (32 mm) wide by 0.050 inch (1.3 mm) thick. Clip is fastened to truss through slotted holes to allow for truss deflection.
- G. Floor Truss Hangers: U-shaped hangers, full depth of floor truss, with 1-3/4-inch- (44-mm-) long seat; formed from metal strap 0.062 inch (1.6 mm) thick with tabs bent to extend over and be fastened to supporting member.
- H. Roof Truss Bracing/Spacers: U-shaped channels, 1-1/2 inches (38 mm) wide by 1 inch (25 mm) deep by 0.040 inch (1.0 mm) thick, made to fit between two adjacent trusses and accurately space them apart, and with tabs having metal teeth for fastening to trusses.
- I. Drag Strut Connectors: Angle clip with one leg extended for fastening to the side of girder truss.
  - 1. Angle clip is 3 by 3 by 0.179 by 8 inches (76 by 76 by 4.55 by 203 mm) with extended leg 8 inches (203 mm) long. Connector has galvanized finish.
  - 2. Angle clip is 3 by 3 by 0.239 by 10-1/2 inches (76 by 76 by 6.07 by 267 mm) with extended leg 10-1/2 inches (267 mm) long. Connector has painted finish.

### 2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 92 percent zinc dust by weight.

### 2.7 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
  - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

### 2.8 SOURCE QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.

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1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
  2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.
- B. Correct deficiencies in Work that special inspections indicate do not comply with the Contract Documents.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.
- G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
  1. Anchor trusses to girder trusses as indicated.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
  1. Install bracing to comply with Section 061000 "Rough Carpentry."
- J. Install wood trusses within installation tolerances in TPI 1.
- K. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- L. Replace wood trusses that are damaged or do not comply with requirements.
  1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

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### 3.2 REPAIRS AND 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 wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- C. Repair damaged galvanized coatings on exposed surfaces in accordance with ASTM A780/A780M and manufacturer's written instructions.

### 3.3 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections to verify that temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

END OF SECTION 061753

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## SECTION 061800 - GLUED-LAMINATED CONSTRUCTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Structural glued-laminated timber.
  - 2. Timber connectors.
  - 3. Factory finishing.

#### 1.2 ACTION SUBMITTALS

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

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in ANSI A190.1.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: An AITC- or APA-EWS-licensed firm.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with provisions in AITC 111.
- B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

### PART 2 - PRODUCTS

#### 2.1 STRUCTURAL GLUED-LAMINATED TIMBER

- A. General: Provide structural glued-laminated timber that complies with ANSI A190.1 and ANSI 117 or research/evaluation reports acceptable to authorities having jurisdiction.
  - 1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.
  - 2. Provide structural glued-laminated timber made with wet-use adhesive complying with ANSI A190.1.

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- B. Species and Grades for Structural Glued-Laminated Timber: Douglas fir-larch that complies with structural properties indicated.
- C. Species and Grades for Beams:
  - 1. Species and Beam Stress Classification: Douglas fir-larch, 24F-1.8E.
  - 2. Lay-up: Balanced.
- D. Appearance Grade: Architectural, complying with AITC 110.

### 2.2 TIMBER CONNECTORS

- A. Materials: Unless otherwise indicated, fabricate from the following materials:
  - 1. Structural-steel shapes, plates, and flat bars complying with ASTM A36/A36M.
  - 2. Round steel bars complying with ASTM A575, Grade M 1020.
  - 3. Hot-rolled steel sheet complying with ASTM A1011/A1011M, Structural Steel, Type SS, Grade 33.
- B. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil (0.05-mm) dry film thickness.
- C. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A123/A123M or ASTM A153/A153M.

### 2.3 MISCELLANEOUS MATERIALS

- A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.
- B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

### 2.4 FABRICATION

- A. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.
- B. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.
- C. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.
- D. Factory Finishing:
  - 1. Water repellent.

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2. Film-forming two-coat urethane.
3. Semitransparent stain.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
  1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.
- B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

#### 3.2 ADJUSTING

- A. Repair damaged surfaces after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Architect.

#### 3.3 PROTECTION

- A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.
  1. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION 061800

# JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

## SECTION 064013 - EXTERIOR ARCHITECTURAL WOODWORK

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Exterior standing and running trim
2. Exterior stairs.
3. Wood furring, blocking, shims, and hanging strips for installing exterior architectural woodwork items that are not concealed within other construction.
4. Shop finishing of exterior architectural woodwork.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

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

##### 1. Wood-Preservative Treatment:

- a. Include data and warranty information from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- b. Indicate type of preservative used and net amount of preservative retained.
- c. Include chemical-treatment manufacturer's written instructions for finishing treated material and manufacturer's written warranty.

##### B. Shop Drawings:

1. Include dimensioned plans, elevations, sections, and attachment details.
2. Apply AWI Quality Certification Program label to Shop Drawings.

##### C. Samples: For each exposed product and for each color and finish specified.

#### 1.4 INFORMATIONAL SUBMITTALS

##### A. Qualification Data: For architectural woodwork manufacturer and Installer.

##### B. Field quality-control reports.

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### 1.5 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: AWI Quality Certification Program WI Certified Compliance Program certificates.

### 1.6 QUALITY ASSURANCE

- A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program
- B. Installer Qualifications: Fabricator of products.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Build mockups of typical exterior architectural woodwork as shown on Drawings
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.

## PART 2 - PRODUCTS

### 2.1 ARCHITECTURAL WOODWORK MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Cabinet Masters, Ironton, MO
  - 2. Cohen Architectural Woodworking, St. James, MO
  - 3. WoodByrne Cabinetry, St. Louis, MO
  - 4. Approved Equal

### 2.2 ARCHITECTURAL WOODWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of exterior architectural woodwork indicated for construction, finishes, installation, and other requirements.
  - 1. Provide labels and certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.

### 2.3 EXTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Custom .



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- B. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- C. Wood Species: Douglas Fir or Douglas Fir Larch
  - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (76 mm) wide.
  - 2. Wood Moisture Content: 9 to 15percent.

### 2.4 EXTERIOR STAIRS

- A. Architectural Woodwork Standards Grade: Economy.
- B. Hand select wood for freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot holes, shake, splits, torn grain, and wane.
- C. Stair Treads: 1-1/4-inch- (32-mm-)thick, kiln-dried, pressure-preservative-treated stepping with half-round or rounded edge nosing, of any of the following:
  - 1. Douglas fir, NLGA, WCLIB, or WWPA C & Btr VG (Vertical Grain) stepping.
  - 2. Hem-fir, NLGA, WCLIB, or WWPA C & Btr VG (Vertical Grain) stepping.
  - 3. Southern pine, SPIB B & B stepping.
  - 4. Grade Characteristics:
    - a. Sound; small pin knots, worm holes, and fixed knots allowed.
    - b. Straight grained and parallel cut.
    - c. Free of heart centers.
    - d. No decay, incipient decay, honeycomb, knot holes, shakes, splits, or wane.
    - e. No discoloration.
- D. Stair Risers: 3/4-inch- (19-mm-) thick, kiln-dried, pressure-preservative-treated finish boards, of any of the following:
  - 1. Douglas fir, NLGA, WCLIB, or WWPA C & Btr or Superior finish.
  - 2. Hem-fir, NLGA, WCLIB, or WWPA C & Btr or Superior finish.
  - 3. Southern pine, SPIB B & B.

### 2.5 WOOD MATERIALS

- A. Hardboard: ANSI A135.4.
- B. Softwood Plywood: DOC PS 1, exterior.

### 2.6 PRESERVATIVE-TREATED-WOOD MATERIALS

- A. Preservative-Treated-Wood Materials: Provide with water-repellent preservative treatment complying with AWPA N1 (dip, spray, flood, or vacuum-pressure treatment).

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1. Preservative Chemicals: 3-iodo-2-propynyl butyl carbamate (IPBC), combined with a compatible EPA-registered insecticide.
  2. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
- B. Extent of Preservative-Treated Wood Materials: Treat wood materials unless otherwise indicated on Drawings.

### 2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated, acceptable to authorities having jurisdiction, and that 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 (38 mm) into wood substrate.
1. Use stainless steel or fasteners with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329/F2329M] unless otherwise indicated.
  2. For pressure-preservative-treated wood, use stainless steel fasteners.
- B. Nails: ASTM F1667.
- C. Power-Driven Fasteners: ICC-ES AC70.
- D. Wood Screws and Lag Screws: ASME B18.2.1, ASME B18.6.1, or ICC-ES AC233.
- E. Carbon-Steel Bolts: ASTM A307 with ASTM A563 (ASTM A563M) hex nuts and, where indicated, flat washers all hot-dip zinc coated.
- F. Stainless Steel Bolts: ASTM F593, Alloy Group 1 or 2; with ASTM F594, Alloy Group 1 or 2 (ASTM F836M, Grade A1 or Grade A4) hex nuts and, where indicated, flat washers.

### 2.8 MISCELLANEOUS MATERIALS

- A. Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
1. Wood-Preservative Treatment: By pressure process, AWPA U1; Use Category UC3b.
    - a. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
    - b. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
    - c. Mark lumber with treatment quality mark of an inspection agency approved by the American Lumber Standards Committee's (ALSC) Board of Review.

### 2.9 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

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- B. Fabricate exterior architectural woodwork to dimensions, profiles, and details indicated.
  - 1. Ease edges to radius indicated for the following:
    - a. Edges of Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.
    - b. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).
- C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.
  - 1. Disassemble components only as necessary for shipment and installation.
  - 2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

### 2.10 SHOP PRIMING

- A. Preparations for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing exterior architectural woodwork, as applicable to each unit of work.
- B. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.
- C. Exterior Architectural Woodwork for Opaque Finish: Shop prime all surfaces with one coat of wood primer as specified in Section 099113 "Exterior Painting."
- D. Exterior Architectural Woodwork for Transparent Finish:
  - 1. Shop seal surfaces to be concealed
  - 2. Shop seal exposed surfaces with stain (if specified), other required pretreatments, and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing."

### 2.11 SHOP FINISHING

- A. Finish exterior architectural woodwork with transparent finish as indicated on Drawings at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing exterior architectural woodwork, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of exterior architectural woodwork. Apply two coats to end-grain surfaces.
- C. Transparent Finish: Comply with Section 099300 "Staining and Transparent Finishing."

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### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Before installation, condition exterior architectural woodwork to average prevailing humidity conditions at Project site.
- B. Before installing exterior architectural woodwork, examine shop-fabricated work for completion, and complete work as required, including removing packing and backpriming concealed surfaces.

#### 3.2 INSTALLATION

- A. Grade: Install exterior architectural woodwork to comply with same grade as item to be installed.
- B. Assemble exterior architectural woodwork, and complete fabrication at Project site to the extent that it was not completed during shop fabrication.
- C. Install exterior architectural woodwork level, plumb, true in line, and without distortion.
  - 1. Shim as required with concealed shims.
  - 2. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Standing and Running Trim:
  - 1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
  - 2. Do not use pieces less than 60 inches (1500 mm) long, except where shorter single-length pieces are necessary.
  - 3. Scarf running joints and stagger in adjacent and related members.
- E. Scribe and cut exterior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- F. Preservative-Treated Wood Materials: Where field cut or drilled, treat cut ends and drilled holes according to AWPA M4.
- G. Fire-Retardant-Treated Wood Materials: Install fire-retardant-treated materials to comply with chemical treatment manufacturer's written instructions.
- H. Anchor exterior architectural woodwork to anchors or blocking built in or directly attached to substrates.
  - 1. Secure with countersunk, concealed fasteners and blind nailing.
  - 2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with exterior architectural woodwork.
  - 3. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.
  - 4. For shop-finished items, use filler matching finish of items being installed.

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- I. Stair and Railing Installation:
  - 1. Treads and Risers:
    - a. Install stair tread with crown side up (bark side down).
    - b. Secure treads and risers by gluing and nailing to carriages.
      - 1) Extend treads over carriages and finish with bullnose edge.
    - c. Countersink nail heads, fill flush, and sand filler.
  - 2. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced and with adjacent rows staggered.
  - 3. Install stairs with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and with no more than 3/8-inch (10-mm) variation between largest and smallest treads and risers within each flight.
- J. Touch up finishing work specified in this Section after installation of exterior architectural woodwork.
  - 1. Fill nail holes with matching filler where exposed.
  - 2. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.
- K. Field Finishing: See Section 099300 "Staining and Transparent Finishing" for final finishing of installed exterior architectural woodwork.

### 3.3 FIELD QUALITY CONTROL

END OF SECTION 064013

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

#### 1.1 SUMMARY

##### A. Section Includes:

1. Interior standing and running trim. And Vertical Wainscot Panels and trim (ADD ALT #2)
2. Interior frames and jambs.
3. Wood furring, blocking, shims, and hanging strips for installing interior architectural woodwork items that are not concealed within other construction.
4. Shop finishing of interior architectural woodwork.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

##### A. Product Data: For the following:

1. Anchors.
2. Adhesives.
3. Shop finishing materials.

##### B. Shop Drawings:

1. Include the following:
  - a. Dimensioned plans, elevations, and sections.
  - b. Attachment details.
2. Apply AWI Quality Certification Program label to Shop Drawings.

- ##### C. Samples: For each exposed product and for each shop-applied color and finish specified.

#### 1.4 INFORMATIONAL SUBMITTALS

- ##### A. Qualification Data: For architectural woodwork manufacturer and Installer.

##### B. Product Certificates: For the following:

1. Composite wood products.
2. Adhesives.

- ##### C. Field quality-control reports.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### 1.5 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: AWI Quality Certification Program WI Certified Compliance Program certificates.

### 1.6 QUALITY ASSURANCE

- A. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program
- B. Installer Qualifications: Fabricator of products.
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
  - 1. Build mockups of typical exterior architectural woodwork as shown on Drawings
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.

### 1.7 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of the construction period.
- B. Limitations with Humidity Control: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70percent during the remainder of the construction period.

## PART 2 - PRODUCTS

### 2.1 ARCHITECTURAL WOODWORK MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Cabinet Masters, Ironton, MO
  - 2. Cohen Architectural Woodworking, St. James, MO
  - 3. WoodByrne Cabinetry, St. Louis, MO
  - 4. Approved Equal

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### 2.2 ARCHITECTURAL WOODWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of exterior architectural woodwork indicated for construction, finishes, installation, and other requirements.
  - 1. Provide labels and certificates from AWI certification program indicating that woodwork and installation complies with requirements of grades specified.

### 2.3 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Custom.
- B. Hardwood Lumber:
  - 1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated on Drawings. Refer to Interior Finish Legend for wood species locations.
  - 2. Species: Select Red Oak.
  - 3. Cut: Rift cut/rift sawn.
  - 4. Wood Moisture Content: 5 to 10 percent.
  - 5. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
  - 6. For trim items other than base wider than available lumber, use veneered construction. Do not glue for width.
  - 7. For base wider than available lumber, glue for width. Do not use veneered construction.
  - 8. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.
- C. Softwood Lumber:
  - 1. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated. Refer to Interior Finish Legend for wood species locations.
  - 2. Species: Douglas fir or Douglas Fir Larch Select. Match existing wood wainscot at Black River Visitor's Center.
  - 3. Cut: Plain sawn.
  - 4. Wood Moisture Content: 5 to 10percent.
  - 5. Provide split species on trim that faces areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
  - 6. For trim items other than base wider than available lumber, use veneered construction. Do not glue for width.
  - 7. For rails thicker than available lumber, use veneered construction. Do not glue for thickness.
  - 8. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (76 mm) wide.



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### 2.4 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Custom.
- B. Wood Species and Cut: Match species and cut indicated for other types of transparent-finished architectural woodwork located in same area of building unless otherwise indicated.
  - 1. Species: Select Red oak.
  - 2. Cut: Rift cut/riфт sawn
  - 3. Wood Moisture Content: 5 to 10percent.
  - 4. Provide split species on frames and jambs that face areas with different wood species, matching each face of woodwork to species and cut of finish wood surfaces in areas finished.
- C. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.
  - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches (76 mm) wide.

### 2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Nailers: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage.
  - 1. Provide metal expansion sleeves or expansion bolts for post-installed anchors.
  - 2. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- D. Installation Adhesive: Product recommended by fabricator for each substrate for secure anchorage.

### 2.6 FABRICATION

- A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- B. Fabricate interior architectural woodwork to dimensions, profiles, and details indicated.
  - 1. Ease edges to radius indicated for the following:
    - a. Edges of Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.
    - b. Edges of Rails and Similar Members More Than 3/4 Inch (19 mm) Thick: 1/8 inch (3 mm).

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

- C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site.
  - 1. Disassemble components only as necessary for shipment and installation.
  - 2. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.

### 2.7 SHOP PRIMING

- A. Preparations for Finishing: Comply with the Architectural Woodwork Standards for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.
- B. Interior Architectural Woodwork for Transparent Finish: Shop-seal concealed surfaces with required pretreatments and first coat of finish as specified in Section 099300 "Staining and Transparent Finishing."
  - 1. Backpriming: Apply one coat of sealer, compatible with finish coats, to concealed surfaces of woodwork.

### 2.8 SHOP FINISHING

- A. Finish interior architectural woodwork with transparent finish at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with Architectural Woodwork Standards, Section 5 for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing interior architectural woodwork, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of interior architectural woodwork. Apply two coats to end-grain surfaces.
- C. Transparent Finish:
  - 1. Architectural Woodwork Standards Grade: Custom.

Finish System - 7 is durable and has good chemical resistance.

- 2. Finish System - 7: Vinyl, Catalyzed.
- 3. Finish System - 8: Acrylic Cross Linking, Water Based.
- 4. Finish System - 9: UV Curable, Acrylated Epoxy, Polyester, or Urethane.
- 5. Finish System - 10: UV Curable, Water Based.
- 6. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter in accordance with ASTM D523.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Before installation, condition interior architectural woodwork to humidity conditions in installation areas for not less than 72 hours prior to beginning of installation.
- B. Before installing interior architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming of concealed surfaces.

#### 3.2 INSTALLATION

- A. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.
- B. Assemble interior architectural woodwork and complete fabrication at Project site to the extent that it was not completed during shop fabrication.
- C. Install interior architectural woodwork level, plumb, true in line, and without distortion.
  - 1. Shim as required with concealed shims.
  - 2. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates.
  - 1. Secure with countersunk, concealed fasteners and blind nailing.
  - 2. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with interior architectural woodwork.
  - 3. For shop-finished items, use filler matching finish of items being installed.
- F. Standing and Running Trim:
  - 1. Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible.
  - 2. Do not use pieces less than 60 inches (1500 mm) long, except where shorter single-length pieces are necessary.
  - 3. Scarf running joints and stagger in adjacent and related members.
  - 4. Fill gaps, if any, between top of base and wall with [plastic wood filler; sand smooth; and finish same as wood base if finished.
  - 5. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).

END OF SECTION 064023

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 064113 - WOOD-VENEER-FACED ARCHITECTURAL CABINETS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

###### A. Section Includes:

1. Wood cabinets for transparent finish
2. Cabinet hardware and accessories.
3. Wood furring, blocking, shims, and hanging strips for installing architectural cabinets that are not concealed within other construction.
4. Shop finishing.

##### 1.2 PREINSTALLATION MEETINGS

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

##### 1.3 ACTION SUBMITTALS

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

- ###### B. Shop Drawings: For architectural cabinets.

1. Include plans, elevations, sections, and attachment details.
2. Apply AWI Quality Certification Program label to Shop Drawings.

- ###### C. Samples: For each exposed product and for each color and finish specified.

##### 1.4 INFORMATIONAL SUBMITTALS

- ###### A. Qualification Data: For manufacturer and Installer.

- ###### B. Research reports.

- ###### C. Field quality control reports.

##### 1.5 CLOSEOUT SUBMITTALS

- ###### A. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### 1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Licensed participant in AWT's Quality Certification Program.

### 1.7 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Environmental Limitations with Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F (16 and 32 deg C) and relative humidity between 43 and 70 percent during the remainder of the construction period.

## PART 2 - PRODUCTS

### 2.1 ARCHITECTURAL WOODWORK MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Cabinet Masters, Ironton, MO
  - 2. Cohen Architectural Woodworking, St. James, MO
  - 3. WoodByrne Cabinetry, St. Louis, MO
  - 4. Approved Equal

### 2.2 CABINETS, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of architectural cabinets indicated for construction, finishes, installation, and other requirements.

### 2.3 WOOD CABINETS FOR TRANSPARENT FINISH

- A. Architectural Woodwork Standards Grade: Custom.
- B. Type of Construction: Face frame.

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- C. Wood for Exposed Surfaces:
  - 1. Species: Select Red oak.
  - 2. Cut: Plain sliced/plain sawn.
  - 3. Grain Direction: Vertically for fixed panels, horizontally for horizontal trim and faces
  - 4. Matching of Veneer Leaves: Book match.
  - 5. Veneer Matching within Panel Face: Running match.

### 2.4 CABINET HARDWARE AND ACCESSORIES

- A. Shelf Supports: Rakks Inside Wall Mount EH support Bracket as noted on drawings.
  - 1. Black Powder Coat finish.
- B. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

### 2.5 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

### 2.6 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

### 2.7 SHOP FINISHING

- A. General: Finish architectural cabinets at manufacturer's shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. General: Drawings indicate items that are required to be shop finished. Finish these items at manufacturer's shop as specified in this Section. See Section 099300 "Staining and Transparent Finishing" for field finishing of architectural cabinets.

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- C. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished. See Section 099300 "Staining and Transparent Finishing" for material and application requirements.
- D. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural cabinets, as applicable to each unit of work.
  - 1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- E. Transparent Finish:
  - 1. Architectural Woodwork Standards Grade: Custom.
  - 2. Finish: System - precatalyzed lacquer.
  - 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
  - 4. Staining: None required.
  - 5. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.
- B. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.
- C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with cabinet surface.
  - 1. For shop-finished items, use filler matching finish of items being installed.
- D. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) using concealed shims.
  - 1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
  - 2. Install cabinets without distortion so doors and drawers fit openings and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 3. Maintain veneer sequence matching of cabinets with transparent finish.
  - 4. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips.

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- E. Shop Finishes: Touch up finishing after installation of architectural cabinets. Fill nail holes with matching filler.
- F. Field Finishing: See Section 099300 "Staining and Transparent Finishing" for finishing of installed architectural cabinets.

END OF SECTION 064113



# JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

## SECTION 072100 - THERMAL INSULATION

### PART 1- GENERAL

- A. SUMMARY This Section includes the following:
- 1) Extruded Polystyrene Foam -plastic board insulation
  - 2) Polyisocyanurate foam-plastic-board insulation
  - 3) Spray applied 2 lb closed cell Foam
  - 4) Mineral wool board/ blanket- 2x4 stud cavity walls
  - 5) Vapor Barrier
  - 6) Vent Insulation Baffle
  - 7) Insulation Fasteners

#### 1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Product test reports.
- C. Research/evaluation reports.

#### 1.3 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

### PART 2 - PRODUCTS

#### 2.1 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standard.

#### 2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION

- A. Extruded Polystyrene Board Insulation, Type XPS: ASTM C578, Type X, 15-psi minimum compressive strength; unfaced.
- B. Manufacturers and products:
1. Styrofoam Brand XPS
  2. Thermax Brand XPS
  3. Owens Corning Foamular

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4. or approved equal.

- C. Flame-Spread Index: Not more than 25 when tested in accordance with ASTM E84.
  - 1. Smoke-Developed Index: Not more than 450 when tested in accordance with ASTM E84.
  - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- D. Applications:
  - 1. Use at perimeters of exterior foundations and vault walls.

### 2.3 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

- A. Manufacturers and products:
  - 1. Johns Manville AP Foil Faced polyisocyanurate foam
  - 2. Thermax sheathing
  - 3. Rmax Insulation
  - 4. or approved equal.
- B. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- C. Polyisocyanurate Board Insulation, Foil Faced : ASTM C1289, foil faced, Type I, Class 1 or 2.
  - 1. Labeling: Provide identification of mark indicating R-value of each.
- D. Applications:

### 2.4 SPRAY APPLIED 2 LB CLOSED CELL POLYURETHANE INSULATION

- A. Spray applied 2lb closed cell polyurethane: ASTM C1338, ASTM E119, NFPA 286:
  - 1. Icynene Proseal with Flame Seal, Johns Manville Corbond III, or Biobased 1701 Spray foam, or equal as approved.
  - 2. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
  - 3. Applications:
    - 1. Underside of roof deck and at exterior attic walls.
    - 2. Contractor's option to use at Floor Cavity.

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### 2.5 MINERAL-WOOL BOARD INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Isolatek International.
  - 2. Roxul Inc.
  - 3. Thermafiber, Inc.; an Owens Corning company.
  - 4. Approved Equal.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- C. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
  - 1. Nominal density of 4 lb/cu. ft., Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F.

### 2.6 MINERAL-WOOL BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Industrial Insulation Group, LLC (IIG-LLC).
  - 2. Roxul Inc.
  - 3. Thermafiber, Inc.; an Owens Corning company.
  - 4. Approved Equal.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 20 percent.
- C. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

### 2.7 VAPOR RETARDERS

- A. Polyamide layer, permanence rating of 1 perm or less when tested in accordance with ASTM E 96 Desiccant Method, and increases to greater than 10 perms using the ASTM E 96 Water Method, with surface burning characteristics maximum flame spread index of 20, and maximum smoke developed index of 55.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following for the interior side wall vapor barrier:
    - 1. Certainteed Corporation, MemBrain Smart Vapor Retarder.
    - 2. Approved Equal.

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- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following for the interior side floor vapor retarder
  - 1. Tremco 10 mil
  - 2. Approved Equal.
- D. Vault Floor barrier: 10 mil, Class A vapor barrier installed according to the manufactures written instructions. Barrier <.01 perms.

### 2.8 INSULATION VENTING BAFFLE

- A. Polyamide layer, permanence rating of 1 perm or less when tested in accordance with ASTM E 96 Desiccant Method, and increases to greater than 10 perms using the ASTM E 96 Water Method, with surface burning characteristics maximum flame spread index of 20, and maximum smoke developed index of 55.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following for the interior side of the roof deck: ADO Products Durovent, Owens Corning, Raft R Mate, or approved equal.

### 2.9 INSULATION FASTENERS

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. AGM Industries, Inc.
    - 2. Gemco.
    - 3. Approved Equal.
  - 2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
  - 3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.
- B. Adhesively Attached, Angle-Shaped, Spindle-Type Anchors: Angle welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - 1. Gemco.
    - 2. Approved Equal.

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2. Angle: Formed from 0.030-inch- thick, perforated, galvanized carbon-steel sheet with each leg 2 inches square.
  3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.
- C. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1. AGM Industries, Inc.
    2. Gemco.
  2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
    1. Ceiling plenums.
    2. Attic spaces.
- D. Insulation Standoff: Spacer fabricated from galvanized mild-steel sheet for fitting over spindle of insulation anchor to maintain air space of 1 inch between face of insulation and substrate to which anchor is attached.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    1. Gemco.
- E. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    1. AGM Industries, Inc.
    2. Gemco.
  2. Low emitting: VOC limit of 250g/L.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

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

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### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

### 3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation 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. Insulation to be installed tight to the exterior sheathing in the cavities formed by framing members. Provide spacer to keep the insulation in the stud cavity tight against the exterior sheathing.
  - 4. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

### 3.4 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
  - 1. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

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- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

### 3.5 INSTALLATION OF INSULATION BAFFELS

- A. Tightly fit baffles between roof framing to the underside of the deck to create a continuous air pathway from the open eave soffit to the roof ridge vent.
- B. Fasten per manufacturer's recommendations.

### 3.6 PROTECTION

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

END OF SECTION 072100

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## SECTION 073113 - ASPHALT SHINGLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Glass-fiber-reinforced asphalt shingles.
2. Underlayment materials.
3. Ridge vents.
4. Metal flashing and trim.

#### 1.2 PREINSTALLATION MEETINGS

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

#### 1.3 ACTION SUBMITTALS

##### A. Product Data: For the following:

1. Asphalt shingles.
2. Underlayment materials.
3. Ridge vents.
4. Asphalt roofing cement.
5. Elastomeric flashing sealant.

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

##### C. Samples: For each exposed product and for each color and blend specified.

#### 1.4 INFORMATIONAL SUBMITTALS

##### A. Product test reports.

##### B. Research reports for synthetic underlayment.

##### C. Sample warranty.

#### 1.5 CLOSEOUT SUBMITTALS

##### A. Maintenance data.



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### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized installer who is trained and approved by manufacturer.

### 1.7 WARRANTY

- A. Materials Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
  - 1. Materials Warranty Period: 40 years from date of Substantial Completion, prorated, with first 10 years nonprorated.
  - 2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to 110 mph (36 m/s) (45 m/s) for 5 years from date of Substantial Completion.
  - 3. Workmanship Warranty Period: Two years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
- B. Wind Resistance: Provide asphalt shingles that comply with requirements of ASTM D3161/D3161M, Class F, and with ASTM D7158/D7158M, Class H.

### 2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Impact-Resistant, Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-layer construction; glass-fiber reinforced, mineral-granule surfaced, and self-sealing; with impact resistance complying with UL 2218, Class 4.
  - 1. GAF-Elk Corporation of America; Prestique 40 High Definition Shingles series or approved equal.
  - 2. Strip Size: Manufacturer's standard.
  - 3. Algae Resistance: Granules resist algae discoloration.
  - 4. Color and Blends: Cool Weatheredwood.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

### 2.3 UNDERLAYMENT MATERIALS

- A. Organic Felt: Asphalt-saturated organic felts, nonperforated and complying with the following:
  - 1. ASTM D226/D226M: Type I.

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- B. Self-Adhering, Polymer-Modified Bitumen Sheet: ASTM D1970/D1970M, minimum 40-mil- (1.0-mm-) thick sheet; glass-fiber-mat-reinforced, polymer-modified asphalt; with slip-resistant top surface and release backing; cold applied.

### 2.4 RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard, rigid-section, high-density, UV-stabilized plastic ridge vent for use under ridge shingles.
  - 1. Cobra Snow Country or Cobra Snow Country Advanced Ridge Vent by GAF-Elk or approved equal.
  - 2. Minimum Net Free Area: 18 sq. inches (11613 sq. mm/m) per lineal foot
  - 3. Width: 9"

### 2.5 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D4586/D4586M Type II, asbestos free.
- B. Elastomeric Flashing Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints and remain watertight; recommended in writing by manufacturer for installation of flashing systems.
- C. Roofing Nails: ASTM F1667, aluminum, stainless steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- (3-mm-) diameter, sharp-pointed, with a 3/8- to 7/16-inch- (10- to 11-mm-) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through sheathing less than 3/4 inch (19 mm) thick.
  - 1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- D. Underlayment Nails: Aluminum, stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, 1-inch- (25-mm-) minimum diameter.
  - 1. Provide with minimum 0.0134-inch- (0.34-mm-) thick metal cap, 0.010-inch- (0.25-mm-) thick power-driven metal cap, or 0.035-inch- (0.89-mm-) thick plastic cap; and with minimum 0.083-inch- (2.11-mm-) thick ring shank or 0.091-inch- (2.31-mm-) thick smooth shank of length to penetrate at least 3/4 inch (19 mm) into roof sheathing or to penetrate through roof sheathing less than 3/4 inch (19 mm) thick.

### 2.6 METAL FLASHING AND TRIM

- A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
  - 1. Sheet Metal: Select from Manufacture's full range of Kynar coating color or Anodized Dark Bronze aluminum.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item unless otherwise indicated on Drawings.

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1. Vent-Pipe Flashings: ASTM B749, Type L51121, at least 1/16 inch (1.6 mm) thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least 4 inches (102 mm) from pipe onto roof.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF UNDERLAYMENT MATERIALS

- A. Comply with asphalt shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section or indicated on Drawings.
- B. Asphalt-Saturated Felt: Install on roof deck parallel with and starting at eaves and fasten with underlayment or roofing nails.
  1. Single-Layer Installation:
    - a. Lap sides a minimum of 4 inches (102 mm) over underlying course.
    - b. Lap ends a minimum of 4 inches (102 mm).
    - c. Stagger end laps between succeeding courses at least 72 inches (1829 mm).
  2. Double-Layer Installation:
    - a. Install a 19-inch- (483-mm-) wide starter course at eaves and completely cover with a 36-inch- (914-mm-) wide second course.
    - b. Install succeeding 36-inch- (914-mm-) wide courses lapping previous courses 19 inches (483 mm) in shingle fashion.
    - c. Lap ends a minimum of 4 inches (102 mm). Stagger end laps between succeeding courses at least 72 inches (1829 mm).
    - d. Apply a continuous layer of asphalt roofing cement over starter course and on felt surface to be concealed by succeeding courses as each felt course is installed. Apply at locations indicated on Drawings.
  3. Install felt underlayment on roof deck not covered by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.
    - a. Lap sides of felt over self-adhering sheet not less than 4 inches (102 mm) in direction that sheds water.
    - b. Lap ends of felt not less than 6 inches (152 mm) over self-adhering sheet.
  4. Install fasteners in a grid pattern of 12 inches (305 mm) between side laps with 6-inch (152-mm) spacing at side and end laps.
  5. Terminate felt extended up not less than 4 inches (102 mm) against other roof projections.
- C. Synthetic Underlayment:
  1. Install on roof deck parallel with and starting at the eaves.

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- a. Lap sides and ends as recommended in writing by manufacturer, but not less than 4 inches (102 mm) for side laps and 6 inches (152 mm) for end laps.
  - b. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer, but not less than 72 inches (1829 mm).
  - c. Fasten with underlayment nails in accordance with manufacturer's written instructions.
  - d. Cover underlayment within period recommended in writing by manufacturer.
2. Install in single layer on roofs sloped at 4:12 and greater.
  3. Install in double layer on roofs sloped at less than 4:12.
  4. Install synthetic underlayment on roof deck not covered by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.
    - a. Lap sides of underlayment over self-adhering sheet not less than 4 inches (102 mm) in direction to shed water.
    - b. Lap ends of underlayment not less than 6 inches (152 mm) over self-adhering sheet.
  5. Install fasteners in a grid pattern of 12 inches (305 mm) between side laps with 6-inch (152-mm) spacing at side and end laps.
  6. Terminate synthetic underlayment extended up not less than 4 inches (102 mm) against sidewalls, curbs, chimneys, and other roof projections.
- D. Self-Adhering, Polymer-Modified Bitumen Sheet: Install, wrinkle free, on roof deck in locations indicated on Drawings.
1. Comply with low-temperature installation restrictions of underlayment manufacturer.
  2. Install lapped in direction that sheds water.
    - a. Lap sides not less than 4 inches (102 mm).
    - b. Lap ends not less than 6 inches (152 mm), staggered 24 inches (610 mm) between succeeding courses.
    - c. Roll laps with roller.
  3. Cover underlayment within seven days.
- E. Metal-Flushed, Open-Valley Underlayment: Install two layers of minimum 36-inch- (914-mm-) wide underlayment centered in valley.
1. Use same underlayment as installed on field of roof.
  2. Stagger end laps between layers at least 72 inches (1829 mm).
  3. Lap ends of each layer at least 12 inches (305 mm) in direction that sheds water, and seal with asphalt roofing cement.
  4. Fasten each layer to roof deck with underlayment nails located as far from valley center as possible and only to extent necessary to hold underlayment in place until installation of valley flashing.
  5. Lap roof-deck underlayment over first layer of valley underlayment at least 6 inches (152 mm).

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### 3.2 INSTALLATION OF METAL FLASHING AND TRIM

- A. Install metal flashings and trim to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
  - 1. Install metal flashings in accordance with recommendations in ARMA's "Asphalt Roofing Residential Manual - Design and Application Methods" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
  - 2. Bed flanges of metal flashings using asphalt roofing cement or elastomeric flashing sealant.
- B. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

### 3.3 INSTALLATION OF ASPHALT SHINGLES

- A. Install asphalt shingles in accordance with manufacturer's written instructions and recommendations in ARMA's "Asphalt Roofing Residential Manual - Design and Application Methods" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
- B. Install first and remaining courses of laminated asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- C. Install first and remaining courses of three-tab-strip asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Fasten asphalt shingle strips with a minimum of six roofing nails, but not less than the number indicated in manufacturer's written instructions for roof slope and design wind speed indicated on Drawings and for warranty requirements specified in this Section.
  - 1. Locate fasteners in accordance with manufacturer's written instructions.
  - 2. When ambient temperature during installation is below 50 deg F (10 deg C) hand seal self-sealing asphalt shingles by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
  - 3. Do not nail asphalt shingles within 6 inches (152 mm) of valley center.
- E. Closed-Cut Valleys: Extend asphalt shingle strips from one side of valley 12 inches (305 mm) < beyond center of valley.
  - 1. Use one-piece shingle strips without joints in valley.
  - 2. Fasten with extra nail in upper end of shingle. Install asphalt shingle courses from other side of valley and cut back to a straight line 2 inches (51 mm) short of valley centerline.
  - 3. Trim upper concealed corners of cut-back shingle strips.
  - 4. Do not nail asphalt shingles within 6 inches (152 mm) of valley center.
  - 5. Set trimmed, concealed-corner asphalt shingles in a 3-inch- (76-mm-) wide bed of asphalt roofing cement.

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- F. Ridge Vents: Install continuous ridge vents over asphalt shingles in accordance with manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
  
- G. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing-shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds.
  - 1. Fasten with roofing nails of sufficient length to penetrate sheathing.
  - 2. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 074646 - FIBER-CEMENT SIDING

- A. Section includes fiber-cement siding and soffit.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For fiber- cement siding and soffit. including related accessories.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Product test reports.
- C. Research/evaluation reports.
- D. Sample warranty.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
  - 1. Build mockup of typical wall area as shown on Drawings.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 20 years from date of Substantial Completion.

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### PART 2 - PRODUCTS

#### 2.1 FIBER-CEMENT SIDING

- A. Fiber-Cement Siding: Siding made from fiber-cement board that does not contain asbestos fibers; complies with ASTM C 1186, Type A, Grade II; is classified as noncombustible when tested according to ASTM E 136; and has a flame-spread index of 25 or less when tested according to ASTM E 84.
1. Basis-of-Design Product: Fiber-Cement Board as manufactured by James Hardie Inc. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
    - a. Cemplank, Inc.
    - b. CertainTeed Corp.
  2. Horizontal Pattern: Boards 5.25" wide (4" exposure) by 12' planks lap siding.
    - a. Texture: Select Cedarmill.
  3. Factory Priming: Manufacturer's standard primer. Field painted finish coats.

#### 2.2 TRIM BOARDS

- A. Basis-of-Design Product: Harditrim boards as manufactured by James Hardie Building products. Subject to compliance with requirements, provide the named product or an equal product.
1. Type: XLD Boards Smooth
  2. Size: 1" thick
    - a. Base trim (as shown on drawings): 5.5" wide.
    - b. Window, corner, fascia, and frieze boards (as shown on drawings): 3.5" wide.
  3. Factory Priming: Manufacturer's standard primer. Field painted finish coats.

#### 2.3 VENTED SOFFIT PANELS

- A. Basis-of-Design Product: Hardie Soffit Panels as manufactured by James Hardie Building products. Subject to compliance with requirements, provide the named product or an equal product.
1. Type: Vented Cedarmill and Non-Vented Cedarmill
  2. Size: .25" thick
    - a. Width (as shown on drawings): 12" wide.
  3. Factory Priming: Manufacturer's standard primer. Field painted finish coats.

B.



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### 2.4 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration. Use Cor-a Vent or equal.
- B. Flashing: Provide aluminum flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
  - 1. Finish for Aluminum Flashing: High-performance organic finish.
- C. Fasteners:
  - 1. For fastening to wood, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
  - 2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch (6 mm), or three screw-threads, into substrate.
  - 3. For fastening fiber cement, use stainless-steel fasteners.
- D. Insect Screening for Soffit Vents: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh] .

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
  - 1. Install fasteners no more than 24 inches (600 mm) o.c.
- B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

#### 3.2 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 079200 - JOINT SEALANTS

#### 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. Silicone joint sealants.
2. Urethane joint sealants.
3. Mildew-resistant joint sealants.
4. Latex joint sealants.

###### B. Related Requirements:

1. Section 321373 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

##### 1.3 ACTION SUBMITTALS

###### A. Product Data: For each joint-sealant product.

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

###### C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

###### D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

##### 1.4 INFORMATIONAL SUBMITTALS

###### A. Qualification Data: For qualified testing agency.

###### B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.

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- C. Field-Adhesion-Test Reports: For each sealant application tested.
- D. Sample Warranties: For special warranties.

### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.
  - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.
- C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

### 1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

### 1.7 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

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1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

### PART 2 - PRODUCTS

#### 2.1 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. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
  1. Architectural sealants shall have a VOC content of 250 g/L or less.
  2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
  3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

#### 2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation.
    - b. Pecora Corporation.
    - c. Sika Corporation.
    - d. Approved Equal.

#### 2.3 NONSTAINING SILICONE JOINT SEALANTS

- A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.
- B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

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1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Dow Corning Corporation.
  - b. May National Associates, Inc.; a subsidiary of Sika Corporation.
  - c. Pecora Corporation.
  - d. Tremco Incorporated.
  - e. Approved Equal.

### 2.4 URETHANE JOINT SEALANTS

- A. Urethane, M, P, 25, T, NT: Multicomponent, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 25, Uses T and NT.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corporation-Construction Systems.
    - b. Pecora Corporation.
    - c. Tremco Incorporated.
    - d. Approved Equal.

### 2.5 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, Neutral-Curing Silicone Sealant: Type S (single component), NS (nonsag), Class 25; Use Related to Exposure NT; Uses Related to Joint Substrate G, A, and as applicable to joint substrate indicated O (use joint substrate - ceramic tile).
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Pecora Corporation; 898.
    - b. Tremco Incorporated, Tremsil 600 White
    - c. Approved Equal.

### 2.6 LATEX JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corporation-Construction Systems.
    - b. May National Associates, Inc.; a subsidiary of Sika Corporation.

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- c. Pecora Corporation.
- d. Tremco Incorporated.
- e. Approved Equal.

### 2.7 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, provide products by one of the following:
    - a. BASF Corporation-Construction Systems.
    - b. Construction Foam Products; a division of Nomaco, Inc.
    - c. Approved Equal.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

### 2.8 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 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

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

### 3.2 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. Cast stone.
    - d. Unglazed surfaces of ceramic tile.
    - e. 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.

### 3.3 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.

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- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind 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 according to 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 per Figure 8A in ASTM C 1193 unless otherwise indicated.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

### 3.4 CLEANING

- A. 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.

### 3.5 PROTECTION

- A. 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.



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### 3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Construction joints in cast-in-place concrete.
    - b. Control and expansion joints in unit masonry.
    - c. Joints in cast stone.
    - d. Joints in exterior insulation and finish systems.
    - e. Joints between metal panels.
    - f. Joints between different materials listed above.
    - g. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
    - h. Control and expansion joints in ceilings and other overhead surfaces.
    - i. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Nonstaining Silicone, S, NS, 50, NT.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
  - 1. Joint Locations:
    - a. Isolation joints in cast-in-place concrete slabs.
    - b. Control and expansion joints in tile flooring.
  - 2. Joint Sealant: Urethane, S, P, 25, T, NT.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints of exterior openings where indicated.
    - c. Vertical joints on exposed surface of interior walls and partitions.
    - d. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
    - e. Vertical and horizontal joints between dissimilar materials.
    - f. Other joints as indicated on Drawings.
  - 2. Joint Sealant: Acrylic latex.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
  - 1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.

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- b. Tile control and expansion joints where indicated.
  - c. Other joints as indicated on Drawings.
- 2. Joint Sealant: Silicone, mildew resistant, S, NS, 25, NT.
  - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 081433- STILE AND RAIL WOOD DOORS

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Exterior stile and rail wood doors with glass panels.
  - 2. Factory fitting of stile and rail wood doors and factory machining for hardware.
- B. Related Sections include the following:
  - 1. Division 6 Section "Interior Architectural Woodwork" for wood frames.
  - 2. Division 8 Section "Door Hardware."
  - 3. Division 8 Section "Glazing" for glass view panels in stile and rail wood doors.

##### 1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of construction and glazing.
  - 1. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data, including those for stiles, rails, panels, and moldings (sticking); and other pertinent data.
  - 1. Indicate dimensions and locations of mortises and holes for hardware.
  - 2. Indicate doors to be factory finished and finish requirements.
- C. Sample for Verification: As follows:
  - 1. For each wood species, provide set of three samples showing typical range of color and grain to be expected in the finished work.
    - a. Actual door face materials, approximately 8 by 10 inches (200 by 250 mm).
- D. Product Certificates: Signed by door manufacturers certifying that the products furnished comply with requirements.

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### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain stile and rail wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with the following standard:
  - 1. AWI Quality Standard: AWI's "Architectural Woodwork Quality Standards" for grade of door, construction, finish, and other requirements.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
  - 1. Individually package doors in plastic bags or cardboard cartons.
- B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with requirements of the referenced quality standard for Project's geographical location.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Stile and Rail Doors of Special Design and Construction:
    - a. Algoma Hardwoods Inc.
    - b. Eggers Industries; Architectural Door Division.
    - c. Marshfield Door Systems Inc.
    - d. Kolbe & Kolbe Windows and Doors
    - e. Or Approved Equal
  - 2. Additional Qualified Woodwork Fabricators: Subject to compliance with requirements of AWI standards, additional fabricators wishing to be bid shall submit qualification data to the Architect for approval prior to bidding.

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### 2.2 PERFORMANCE REQUIREMENTS

- A. Exterior Door Thermal Transmittance: Maximum whole fenestration product U-factor of 0.35 (1.98, according to AAMA 1503, ASTM E1423, or NFRC 100).

### 2.3 STILE AND RAIL DOORS OF SPECIAL DESIGN AND CONSTRUCTION

- A. Construction, General: Comply with the following requirements:
  - 1. Grade of Doors for Transparent Finish: Premium.
  - 2. Wood Species and Cut: American Red Oak, plain sawn or sliced.
  - 3. Match Between Veneer Leaves: Book Match
  - 4. Assembly of Veneer Leaves on Door Faces: Running Match
  - 5. Stile and Rail Construction for Transparent Finish: Veneered, finger-jointed hardwood core with edges of species indicated.
    - a. Provide either structural composite lumber cores or oak hardwood cores for doors with insulated glass lites.
- B. Interior Doors: Comply with the following requirements:
  - 1. Stile and Rail Widths: As indicated.
  - 2. Molding Profile: As indicated.

### 2.4 EXTERIOR STILE AND RAIL WOOD DOORS

- A. Exterior Stile and Rail Wood Doors: Exterior custom doors complying with the AWI, AWMAC, and WI's Architectural Woodwork Standards, and with other requirements specified.
  - 1. Performance Grade: WDMA I.S. 6A Extra Heavy Duty.
  - 2. Architectural Woodwork Standards Grade: Custom
  - 3. Panel Designs: As indicated on Drawings.
    - a. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval.
    - b. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
  - 4. Finish: Transparent
  - 5. Wood Species and Cut for Transparent Finish: Red oak, quarter sawed/sliced stiles and rails, plain sawed/sliced panels
  - 6. Match Between Veneer Leaves: Book Match
  - 7. Assembly of Veneer Leaves on Door Faces: Running Match
  - 8. Door Construction for Transparent Finish:
    - a. Stile and Rail Construction: Clear lumber; may be edge glued for width. Select lumber for similarity of grain and color, and arrange for optimum match between adjacent pieces.
  - 9. Stile and Rail Widths: As indicated on Drawings.

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10. Raised-Panel Thickness: As indicated on Drawings.
11. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.
12. Glass: Uncoated, clear, insulating-glass units made from two lites of 3.0-mm-thick, fully tempered glass with 1/4-inch (6.4-mm) interspace
13. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S. 6A and grade specified.

### 2.5 INTERIOR STILE AND RAIL WOOD DOORS

- A. Interior Stile and Rail Wood Doors Interior custom doors complying with AWI, AWMAC, and WI's Architectural Woodwork Standards and with other requirements specified.

1. Performance Grade: WDMA I.S. 6A Extra Heavy Duty.
2. Architectural Woodwork Standards Grade: Custom.
3. Panel Designs: Indicated on Drawings. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
4. Finish: Transparent.
5. Wood Species and Cut for Transparent Finish: Red oak, quarter sawed/sliced stiles and rails, plain sawed/sliced panels
6. Match Between Veneer Leaves: Book Match
7. Assembly of Veneer Leaves on Door Faces: Running Match
8. Door Construction for Transparent Finish:
  - a. Stile and Rail Construction: Clear lumber; may be edge glued for width. Select lumber for similarity of grain and color, and arrange for optimum match between adjacent pieces.
  - b. Stile and Rail Construction: Veneered, structural composite lumber or veneered, edge- and end-glued clear lumber. Select veneers for similarity of grain and color, and arrange for optimum match between adjacent pieces. Use veneers not less than 1/16 inch (1.6 mm) thick.
9. Stile and Rail Widths: As indicated on drawings.
10. Flat-Panel Thickness: 1/2 inch min (13 mm)
11. Molding Profile (Sticking): As selected by Architect from manufacturer's full range.
12. Mark, label, or otherwise identify stile and rail wood doors as complying with WDMA I.S. 6A and grade specified.

### 2.6 FABRICATION

- A. Fabricate stile and rail wood doors in sizes indicated for Project site fitting.
- B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/2 inch (13 mm) from bottom of door to top of decorative floor finish or

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- covering. Where threshold is shown or scheduled, provide 3/8 inch (10 mm) from bottom of door to top of threshold.
2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
- C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- D. Glazed Openings: Glaze doors at factory with glass of type and thickness indicated, complying with Division 8 Section "Glazing." Install glass using manufacturer's standard elastomeric glazing sealant complying with ASTM C 920. Secure glass in place with removable wood stops.
- 2.7 SHOP FINISHING
- A. Shop finish wood doors that are indicated to receive transparent finish. Comply with referenced AWI quality standard, including Section 1500 "Factory Finishing".
1. Refer to Division 8 Section "Flush wood Doors" and Division 9 Section "Painting" for finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine installed door frames before hanging doors.
1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
  2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or

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covering. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.

2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

### 3.3 ADJUSTING AND PROTECTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.

### 3.4 PROTECTION

- A. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08212



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### SECTION 081713 - INTEGRATED METAL DOOR OPENING ASSEMBLIES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes integrated metal door-opening assemblies consisting of doors, metal frame, operating hardware, and accessories. Lockable Storm Door at entry to cabins.

##### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each integrated metal door-opening assembly type.
  - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
- C. Samples: For integrated metal door-opening assemblies with factory-applied color finishes.
- D. Product Schedule: For integrated metal door-opening assemblies, 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.

##### 1.3 INFORMATIONAL SUBMITTALS

- A. Sample warranty.

##### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

##### 1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace integrated metal door-opening assembly and components that fail in materials or workmanship within specified warranty
  - 1. Warranty Period:
    - a. Integrated Metal Door-Opening Assemblies: Five years from date of Substantial Completion.
    - b. Operating Hardware: 10years from date of Substantial Completion.

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### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Larson Manufacturing Company, Single-Vent Dura Tech 278-SS
- B. Or approved equal.

#### 2.2 METAL DOOR-OPENING ASSEMBLIES

- A. Construct integrated metal door-opening assemblies using aluminum or hollow-metal doors and frames that comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, clearances, and as specified. Provide factory-installed hardware to the maximum extent practicable.
  - 1. Doors:
    - a. Type: As indicated in door and frame schedule.
    - b. Thickness: 1-3/8 inches (34.9 mm)
    - c. Face: Metallic-coated steel sheet, minimum thickness of 0.032 inch (0.8 mm).
    - d. Edge Construction: Model 1, Full Flush.
    - e. Core: Manufacturer's standard.
  - 2. Frames:
    - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.042 inch (1.0 mm).
    - b. Construction: Knocked down.
- B. Integrated Metal Door-Opening Assembly Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
- C. General: Provide integrated metal door-opening assembly hardware and levers, locks, closers, and gasketing for each integrated metal door-opening assembly, to comply with requirements in this Section.
  - 1. Integrated Metal Door-Opening Assembly Hardware Sets: Provide quantity, item, size, finish, or color indicated, as well as products complying with BHMA standard referenced.
  - 2. Opening-Force Requirements:
    - a. N) to release the latch; not more than 30 lbf (133 N) to set the door in motion; and not more than 15 lbf (67 N) to open the door to its minimum required width.
    - b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.
- D. Designations: Requirements for design, grade, function, finish, quantity, size, and other distinctive qualities of each type of integrated metal door-opening assembly hardware are indicated in Part 3 "Integrated Metal Door-Opening Assembly Hardware Sets" Article. Products are identified by using hardware designations as follows:

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1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Integrated Metal Door-Opening Assembly Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

### 2.3 INTEGRATED METAL DOOR-OPENING ASSEMBLY HARDWARE

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
  1. Construction: Pin and barrel mounting, and swing clear design.
- B. Mortise Locks: BHMA A156.13; Grade 2; stamped steel case with steel or brass parts; Series 1000. Provide function as indicated in door hardware schedule. Comply with requirements for labeled doors for length of bolts.
  1. Lock Trim: Provide design as indicated on Drawings Provide cast or forged levers, with solid construction.
- C. Lock Cylinders:
  1. BHMA A156.5; Grade 2 permanent cores; tumbler type; constructed from brass or bronze, stainless steel, or nickel silver; face finished to match lockset.
- D. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
- E. Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm, Grade 2, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force. Provide surface-mounted design.
- F. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer. Provide gasketing with maximum air leakage, when tested in accordance with ASTM E283 with tested pressure differential of 0.3 inch wg (75 Pa), as follows
  1. Gasketing on Single Doors: 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) of door opening.

### 2.4 ACCESSORIES

- A. Lite Openings: Manufacturer's standard lite opening frames formed of 0.048-inch- (1.2-mm-) thick, cold-rolled steel sheet; factory finished to match door finish; and approved for use in doors of fire-protection rating indicated.

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1. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
- B. Boxed Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosure; filtered and regulated; voltage rating and type matching requirements of door hardware served; listed and labeled for use with fire-alarm systems.

### 2.5 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 (610 mm) of frame height above 7 feet (2.1 m).
  3. Postinstalled Expansion Anchor: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

### 2.6 MATERIALS

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

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### 2.7 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. 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.
- B. Hardware Preparation: Prepare hollow-metal doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with SDI A250.6, door hardware schedule, 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.

### 2.8 FINISHES

- A. Door Faces and Frames: Manufacturer's standard factory finish, color as selected by Architect-Brown
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than that specified by referenced standards for the applicable units of hardware.
- C. Factory Finish for Steel: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.
  - 1. Color and Gloss: Brown
- D. Hardware Finishes: Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Hollow-Metal Frames: Comply with SDI A250.11 and NFPA 80.
  - 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.

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- 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. Floor Anchors: Secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  3. Solidly pack mineral-fiber insulation inside frames.
  4. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- B. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
1. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.

### 3.2 CLEANING AND TOUCHUP

- A. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish in accordance with manufacturer's written instructions.
- B. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081713

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## SECTION 083113 - ACCESS DOORS AND FRAMES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Access doors and frames for ceilings.
  - 2. Access doors and frames for exterior walls.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
- B. Shop Drawings:
  - 1. Include plans, elevations, sections, details, and attachments to other work.
  - 2. Detail fabrication and installation of access doors and frames for each type of substrate.
- C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
  - 1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
  - 2. NFPA 288 for fire-rated access door assemblies installed horizontally.

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### 2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Acudor Products, Inc.
  2. Babcock-Davis.
  3. JL Industries, Inc.; a division of the Activar Construction Products Group.
  4. Larsens Manufacturing Company.
  5. MIFAB, Inc.
  6. Nystrom, Inc.
  7. Williams Bros.
  8. Approved Equal.
- B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.
- C. Flush Access Doors with Exposed Flanges INTERIOR:
1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
  2. Locations: Ceiling, unless otherwise indicated.
  3. Door Size: 22 inch by 30 inch, unless otherwise indicated on Drawings.
  4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage.
    - a. Finish: Factory prime for field finish painting.
  5. Frame Material: Same material, thickness, and finish as door.
  6. Hinges: Manufacturer's standard.
  7. Hardware:
    - a. Mortise cylinder lock. Mortise lock to accept Owner-furnished, Owner-installed SFIC 7-pin core.
- D. Flush Access Doors with Concealed Flanges EXTERIOR:
1. Assembly Description: Fabricate door to fit flush to frame. With core of mineral -fiber insulation enclosed in sheet metal with exposed flange, self-closing door, and concealed hinge with gasketing, piano hinges, and masonry anchors.
  2. Locations: Exterior concrete wall.
  3. Door Size: 22 inches by 30 inches, unless otherwise indicated.
  4. Stainless Steel for Door Nominal 0.038 inch (.95mm) 20 gage, ASTM A480/A480M No.4 finish.
  5. Frame Material: Same material and thickness as door.
  6. Hinges: Manufacturer's standard.
  7. Hardware: Mortise cylinder lock. Mortise lock to accept Owner-furnished, Owner-installed SFIC 7-pin core.
- E. Hardware:
1. Lock: Mortise cylinder compatible with Owner's SFIC 7-pin core. Prepare door to receive mortise cylinder lock, and furnish access door with mortise cylinder lock. Mortise cylinder lock to received SFIC 7-pin core. Core and keys will be furnished and installed by Owner.



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### 2.3 MATERIALS

- A. Steel Plates, Shapes and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- D. Stainless Steel Plate, Sheet, and Strip: ASTM A240/A240M or ASTM A666, Type 316. Remove tool and die marks and stretch lines, or blend into finish.
- E. Stainless Flat Bars: ASTM A666, Type 316. Remove tool and die marks and stretch lines, or blend into finish.
- F. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.
- G. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.
- H. Aluminum Sheet: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15; with minimum sheet thickness according to ANSI H35.2.
- I. Frame Anchors: Same type as door face.
- J. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

### 2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
  - 1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
  - 2. Provide mounting holes in frames for attachment of units to metal or wood framing.
  - 3. Provide mounting holes in frame for attachment of masonry anchors.
- D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

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- E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
  - 1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.
- F. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

### 2.5 FINISHES

- A. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
  - 2. Factory Finished: Apply manufacturer's standard baked-enamel or powder-coat finish immediately after cleaning and pretreating, with minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.
    - a. Color: As selected by Architect from full range of industry colors.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.
- B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

### 3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.
- B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

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## SECTION 085414 - FIBERGLASS CLAD WOOD DOUBLE HUNG WINDOWS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Ultrex® clad wood double hung window complete with hardware, glazing, weather strip, insect screen, and standard or specified anchors, trim and attachments.

#### 1.2 RELATED SECTIONS

- A. Section 064023—Millwork: Wood trim other than furnished by window manufacturer
- B. Section 079200—Joint Sealants: Sill sealant and perimeter caulking
- C. Section 0990300—Wood Stains and Transparent finishes: Paint or stain other than factory applied finish

#### 1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
  - 1. E 283: Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors.
  - 2. E 330: Standard Test Method for Structural Performance of Exterior Windows, Curtains Walls, and Doors by Uniform Static Air Pressure Difference.
  - 3. E 547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential.
  - 4. E 774: Specification for Sealed Insulated Glass Units.
  - 5. E 1886: Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
  - 6. E 1996: Standard Specifications for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes
  - 7. C 1036: Standard Specification for Flat Glass.
- B. Window and Door Manufacturers Association (WDMA): I.S.4: Industry Standard for Water Repellent Preservative Treatment for Millwork.
- C. Sealed Insulating Glass Manufacturers Association / Insulating Glass Certification Council (SIGMA / IGCC).
- D. American Architectural Manufacturers Association / Window and Door Manufacturers Association (AAMA / WDMA):
  - 1. ANSI/AAMA/NWDA 101 / I.S.2-97: Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.
  - 2. 101/I.S. 2/NAFS-02: Voluntary Performance Specification for Windows, Skylights and Glass Doors.
  - 3. AAMA/WDMA/CSA 101/I.S.2/A440-05: Standard/ Specification for windows, doors, and unit skylights.
- E. Window and Door Manufacturers Association (WDMA): Hallmark Certification Program.

- F. American Architectural Manufacturers Association (AAMA): 613: Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles.
- G. National Fenestration Rating Council (NFRC): 101: Procedure for Determining Fenestration Product Thermal Properties.

#### 1.4 SYSTEM DESCRIPTION

##### A. Design and Performance Requirements:

1. Window Units shall be designed to comply with 101/I.S.2-97 and 101/I.S. 2/NAFS-02
  - a. Double Hung: H-LC40 rating
  - b. Double Hung HP: H-LC50 rating
  - c. Transom: F-LC40 rating
  - d. Transom HP: F-LC50 rating
  - e. Picture: F-LC40 rating
  - f. Picture HP: F-LC50 rating
2. Air leakage shall not exceed the following when tested at 1.57 psf according to ASTM E 283: 0.30 cfm per square foot of frame.
3. No water penetration shall occur when units are tested at the following pressure according to ASTM E 547:
  - a. Double Hung: 6.0 psf
  - b. Double Hung HP: 7.5 psf
  - c. Transom: 6.0 psf
  - d. Transom HP: 7.5 psf
  - e. Picture: 6.0 psf
  - f. Picture HP: 7.5 psf
4. Units shall be designed to comply with ASTM E330 for structural performance when tested at the following pressures:
  - a. Double Hung: +75/-75 psf
  - b. Transom: +75/-75 psf
  - c. Picture: +75/-75 psf
5. Thermal Unit "U" Value, .35 or less, complies with NFRC Certification.
6. Forced Entry Resistance, complies with ASTM F588-04.

##### B. Impact Zone 3 Certification Requirements:

1. Window Units shall be designed to comply with 101/I.S.2-97, 101/I.S. 2/NAFS-02, and 101/I.S.2/A440-05
  - a. Double Hung: H-LC +55/-65 rating
  - b. Transom: F-LC +55/-65 rating
  - c. Picture: F-LC +55/-65 rating
2. Air leakage shall not exceed the following when tested at 1.57 psf according to ASTM E 283: 0.30 cfm per square foot of frame.
3. No water penetration shall occur when units are tested at the following pressure according to ASTM E 547:
  - a. Double Hung: 8.25 psf
  - b. Transom: 8.25 psf
  - c. Picture: 8.25 psf
4. Units shall be designed to comply with ASTM E330 for structural performance when tested at the following pressures:
  - a. Double Hung: +82.5/-97.5 psf
  - b. Transom: +82.5/-97.5 psf
  - c. Picture: +82.5/-97.5 psf

5. Missile Impact at Missile Level D complies with ASTM E1886-05, ASTM E 1886-06, ASTM E1996-02, ASTM E1996-05, ASTM E1996-06.
6. Impact Pressure Cycling at +55/-65 psf, complies with ASTM E1886-02, ASTM E1886-05, ASTM E1886-06, ASTM E1996-02, ASTM E1996-05, ASTM E1996-06.
7. Thermal Unit "U" Value, .35 or less, complies with NFRC Certification.
8. Forced Entry Resistance, complies with ASTM F588-04.

## 1.5 SUBMITTALS

- A. Shop Drawings: Submit shop drawings showing elevations and installation details.
- B. Product Data: Submit catalog data
- C. Samples:
  1. Submit corner section under provisions of Section 01 33 23.
  2. Include glazing system, quality of construction, and specified finish.
- D. Quality Control Submittals: Submit manufacturer's certifications indicating compliance with specified performance.

## 1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Emergency Egress or Rescue: Comply with requirements for sleeping units of 2009 IBC International Building Code

## 1.7 DELIVERY

- A. Deliver in original packaging and protect from weather.

## 1.8 STORAGE AND HANDLING

- A. Prime or seal wood surfaces, including surface to be concealed by wall construction, if more than thirty (30) days will expire between delivery and installation.
- B. Store window units in an upright position in a clean and dry storage area above ground and protect from weather.

## 1.9 WARRANTY

- A. Windows shall be warranted to be free from defects in manufacturing, materials, and workmanship for a period of ten (10) years from purchase date.
- B. Window glass shall be warranted to be free from defects in manufacturing, materials and workmanship for period of twenty (20) years from the purchase date.

## PART 2 PRODUCTS

### 2.1 MANUFACTURED UNITS

- A. Description: Ultrex® Double Hung (and related stationary or picture units) as manufactured by Integrity Windows and Doors, Fargo, North Dakota. Operating sash tilt to interior for cleaning or removal.
- B. OR APPROVED EQUAL

## 2.2 FRAME DESCRIPTION

- A. Interior: Clear pine interior surfaces.
  - 1. Kiln dried to a moisture content no greater than twelve (12) percent at the time of fabrication.
  - 2. Water repellent preservative treated in accordance with ANSI / NWWDA I.S.4-94.
- B. Exterior: Fiberglass reinforced (Ultrex®), 0.075 inch (2 mm) thick.
- C. Frame width: 4-9/16 inches (116 mm).

## 2.3 SASH DESCRIPTION

- A. Clear pine interior surfaces.
  - 1. Kiln dried to a moisture content no greater than twelve (12) percent at the time of fabrication.
  - 2. Water repellent preservative treated in accordance with ANSI / NWWDA I.S.4-94.
- B. Exterior: Pultruded reinforced fiberglass (Ultrex®), 0.070 – 0.075 inch (2 mm) thick.
- C. Composite sash thickness: 1-9/16 inches (40 mm).

## 2.4 GLAZING

- A. Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E 774.
- B. Glazing method: 3/4 inch (19 mm) Insulated glass.
- C. Glass type: LoE<sup>2</sup> - 272<sup>®</sup> Argon gas + Tempered Obscure.
- D. Glazing seal: Silicone bedding at exterior and interior.
- E. Optional Impact glazing zone for winds up to 130 miles per hour. Glass is laminated insulated Low EII with Argon, consisting of annealed or tempered glass to the exterior and laminated glass to the interior. The laminated glass is made up of glass with either a SGP or PVB laminate layer between. The interior and exterior glazing compound is silicone, in a sandwich style glazing system.

## 2.5 Certified Mulling

- A. Directional mull limits 1H or 1W only. Maximum span for vertical mull is 75 3/4" (1924)
- B. Directional mull limits for 2H or 2W only. Maximum span for horizontal mull is 62" (1575)

## 2.6 FINISH

- A. Exterior: Factory baked on acrylic urethane. Color: Bronze.
- B. Interior: Treated bare wood; Field Finish

## 2.7 HARDWARE

- A. Balance System: Coil spring block and tackle with nylon cord and glass filled nylon shoe and steel locking clutch.

- B. Jamb Track: Pultruded extrusion.
- C. Lock: High pressure zinc die-cast cam lock and keeper. Finish: Phosphate coated and electrostatically painted.
  - 1. Color: Oil Rubbed Bronze
- D. Tilt latches: Spring loaded latches for release of sash located at checkrail.
  - 1. Color: Oil Rubbed Bronze

## 2.8 WEATHER STRIP

- A. Frame, sash stiles, and meeting rails, sealed with flexible bulb gasket. Bottom and top rails sealed with flexible leaf gasket.

## 2.9 JAMB EXTENSION

- A. Furnish jamb extension 6-9/16 (167 mm) factory installed (shipped loose) 5-5/16 (135 mm); 6-13/16 (160 mm); shipped loose.
- B. Finish: Bare wood; Field finish.

## 2.10 INSECT SCREENS

- A. Factory installed full screen. Screen mesh, 18 by 16: Charcoal fiberglass.
- B. Aluminum frame finish: ; Bronze

## 2.11 ACCESSORIES AND TRIM

- A. Installation Accessories:
  - 1. Factory installed vinyl nailing fin / drip cap at head and side jambs.
  - 2. Installation brackets: Brackets for 4-9/16 inch (116 mm); 6-9/16 inch (167 mm) jambs.
  - 3. Mullion kit: Standard mullion kit for field assembly of related units available in horizontal, vertical, round top over double hung and 2-wide and/or 2-high configurations. Kit includes: Instructions, aluminum pins, filler blocks, wood mullion tie, sealant foam tape, interior mullion trim, mull tee, related screws and nailing fin connectors.
  - 4. Structural mullion kit: Structural mullion kit for field assembly of related units available in horizontal, vertical, round top over double hung and 2-wide and/or 2-high configurations. Kit includes: Instructions, reinforcement member, aluminum pins, filler blocks, wood mullion tie, sealant foam tape, interior mullion trim, mull tee, related screws, nailing fin connectors and structural brackets.
  - 5. Installation clips standard with nailing fin on impact glazed windows.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Before Installation, verify openings are plumb, square, and of proper dimension as required in Section 01 71 00. Report frame defects or unsuitable conditions to the General Contractor before proceeding.
- B. Acceptance of Conditions: Beginning of installation confirms acceptance of existing conditions.

### 3.2 INSTALLATION

- A. Comply with Section 01 73 00.
- B. Assemble and install window unit according to manufacturer's instructions and reviewed shop drawings.
- C. Install sealant and related backing materials at perimeter of unit or assembly in accordance with Section 07 92 00 Joint Sealants. Do not use expansive foam sealant.
- D. Install accessory items as required.
- E. Use finish nails to apply wood trim and mouldings.

### 3.3 CLEANING

- A. Remove visible labels and adhesive residue according to manufacturer's instructions.
- B. Leave windows and glass in a clean condition.
- A. Protect windows from damage by chemicals, solvents, paint, or other construction operations that may cause damage.

END OF SECTION 085414



**SECTION 087100 – DOOR HARDWARE**

PART 1 - GENERAL

1.01 SUMMARY

Section includes:

1. Mechanical door hardware

Section excludes:

2. Windows
3. Cabinets (casework), including locks in cabinets
4. Access Doors
5. Toilet accessories

Related Sections:

6. Division 01 Section "Alternates" for alternates affecting this section.
7. Division 06 Section "Rough Carpentry"
8. Division 06 Section "Finish Carpentry"
9. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
10. Division 08 Sections for Doors and Frames.

1.02 REFERENCES

UL, LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

DHI - Door and Hardware Institute

5. Sequence and Format for the Hardware Schedule
6. Recommended Locations for Builders Hardware
7. Keying Systems and Nomenclature
8. Installation Guide for Doors and Hardware

NFPA – National Fire Protection Association

9. NFPA 70 – National Electric Code
10. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
11. NFPA 101 – Life Safety Code
12. NFPA 105 – Smoke and Draft Control Door Assemblies
13. NFPA 252 – Fire Tests of Door Assemblies

ANSI - American National Standards Institute

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14. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
  15. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
  16. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
  17. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
  18. ANSI/SDI A250.8 - Standard Steel Doors and Frames.
  19. ANSI/DHI A115.IG – Installation Guide for Doors and Hardware
- B. ICC – International Code Council, Inc
1. ICC/ANSI A117.1 – Accessible and Usable Buildings and Facilities.
  2. ICC IBC – International Building Code
- C. NFPA – National Fire Protection Agency
1. NFPA 101 - Life Safety Code
  2. NFPA 80 - Fire Doors and Windows
- D. Builders Hardware Manufacturing Association (BHMA)

### 1.03 SUBMITTALS

#### General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
  - a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.
  - b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
  - c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

#### Action Submittals:

3. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
4. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
  - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
5. Door Hardware Schedule:
  - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
  - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
  - c. Indicate complete designations of each item required for each opening, include:

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- 1) Door Index: door number, heading number, and Architect's hardware set number.
  - 2) Quantity, type, style, function, size, and finish of each hardware item.
  - 3) Name and manufacturer of each item.
  - 4) Fastenings and other pertinent information.
  - 5) Location of each hardware set cross-referenced to indications on Drawings.
  - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
  - 7) Mounting locations for hardware.
  - 8) Door and frame sizes and materials.
  - 9) Degree of door swing and handing.
  - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
6. Key Schedule:
- a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
  - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
  - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
  - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
  - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
  - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

### Informational Submittals:

7. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
8. Provide Product Data:
  - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
  - b. Include warranties for specified door hardware.

### Closeout Submittals:

9. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
  - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
  - b. Catalog pages for each product.
  - c. Final approved hardware schedule edited to reflect conditions as installed.
  - d. Final keying schedule
  - e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
  - f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

### Inspection and Testing:

10. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

- a. fire door assemblies, in compliance with NFPA 80.
- b. required egress door assemblies, in compliance with NFPA 101.

### 1.04 QUALITY ASSURANCE

#### Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
  - a. For door hardware: DHI certified AHC or DHC.
  - b. Can provide installation and technical data to Architect and other related subcontractors.
  - c. Can inspect and verify components are in working order upon completion of installation.
  - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

#### Certifications:

5. Accessibility Requirements:
  - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

#### Pre-Installation Meetings

6. Keying Conference
  - a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
    - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    - 2) Preliminary key system schematic diagram.
    - 3) Requirements for key control system.
    - 4) Requirements for access control.
    - 5) Address for delivery of keys.
7. Pre-installation Conference
  - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - b. Inspect and discuss preparatory work performed by other trades.

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- c. Inspect and discuss electrical roughing-in for electrified door hardware.
- d. Review sequence of operation for each type of electrified door hardware.
- e. Review required testing, inspecting, and certifying procedures.
- f. Review questions or concerns related to proper installation and adjustment of door hardware.

### 1.05 DELIVERY, STORAGE, AND HANDLING

Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

### 1.06 COORDINATION

Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

### 1.07 WARRANTY

Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Beginning from date of Substantial Completion, for durations indicated.
  - a. Locksets:
    - 1) Mechanical: 3 years
  - b. Key Blanks: Lifetime
2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.

Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

#### 2.02 MATERIALS

##### Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

4. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

#### 2.03 HINGES

##### Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Ives 5PB series
2. Acceptable Manufacturers and Products:
  - a. Hager 1191/1279 series
  - b. McKinney T series
  - c. Stanley F series

##### Requirements:

3. Provide hinges conforming to ANSI/BHMA A156.1.
4. Provide five knuckle, plain bearing hinges.

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5. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
  - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
  - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
6. Doors over 1-3/4 inch (44 mm) thick or over 36 inches (914 mm) wide:
  - a. Exterior: Bronze/stainless steel, 5 inches (127 mm) high
  - b. Interior: Steel, 5 inches (127 mm) high
7. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
8. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
9. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
10. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Steel Hinges: Steel pins
  - b. Non-Ferrous Hinges: Stainless steel pins
  - c. Out-Swinging Exterior Doors: Non-removable pins
  - d. Out-Swinging Interior Lockable Doors: Non-removable pins
  - e. Interior Non-lockable Doors: Non-rising pins

### 2.04 HINGES

#### Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Ives 5BB series
2. Acceptable Manufacturers and Products:
  - a. Hager BB1191/1279 series
  - b. McKinney TB series
  - c. Stanley FBB series

#### Requirements:

3. Provide hinges conforming to ANSI/BHMA A156.1.
4. Provide five knuckle, ball bearing hinges.
5. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
  - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
  - b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
6. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
  - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
7. 2 inches or thicker doors:
  - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
8. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.

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9. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
10. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
11. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Steel Hinges: Steel pins
  - b. Non-Ferrous Hinges: Stainless steel pins
  - c. Out-Swinging Exterior Doors: Non-removable pins
  - d. Out-Swinging Interior Lockable Doors: Non-removable pins
  - e. Interior Non-lockable Doors: Non-rising pins
12. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

### 2.05 CYLINDRICAL LOCKS – GRADE 2

#### Manufacturers and Products:

1. Scheduled Manufacturer and Product:
  - a. Schlage ALX series
2. Acceptable Manufacturers and Products:
  - a. Best 7KC series
  - b. Sargent 7-Line
  - c. Corbin-Russwin CL3800 series

#### Requirements

3. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 2, and UL Listed for 3-hour fire doors with a minimum cycle life of 1 million.
4. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide 3/4" latch throw for UL listing at pairs.
6. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
7. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
8. Provide a minimum of 5 points of lever engagement between the cassette spindle and lever shank to prevent lever sag.
9. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
10. Plug-n-Play – Provide modular lockset allowing lock functions to be created for 7 typical functions by inserting/installing parts into the exterior of a fully assembled chassis
11. Reconfigurable Chassis - Provide modular lockset that allows the function to be reconfigured by removing external components from the chassis
12. Lever Trim: Solid cast levers and wrought roses on both sides.

### 2.06 CYLINDERS

#### Manufacturers:



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1. Scheduled Manufacturer and Product:
  - a. Match Owner Standard
2. Acceptable Manufacturers and Products:
  - a. No Substitute

Requirements:

3. Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

### 2.07 KEYING

Scheduled System:

- a. Provide cylinders/cores keyed into Owner's existing keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

Requirements:

#### 2. Permanent Keying:

- a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
  - 1) Master Keying system as directed by the Owner.
- b. Forward biting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
- c. Provide keys with the following features:
  - 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
- d. Identification:
  - 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
  - 2) Identification stamping provisions must be approved by the Architect and Owner.
  - 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
  - 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
  - 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
- e. Quantity: Furnish in the following quantities.
  - 1) Change (Day) Keys: 3 per cylinder/core.
  - 2) Master Keys: 6.

### 2.08 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

Manufacturers:

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1. Scheduled Manufacturers:
  - a. Glynn-Johnson
2. Acceptable Manufacturers:
  - a. Rixson
  - b. Sargent
  - c. ABH

Requirements:

3. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
4. Provide friction type at doors without closer and positive type at doors with closer.

**2.09 DOOR STOPS AND HOLDERS**

Manufacturers:

1. Scheduled Manufacturer:
  - a. Ives
2. Acceptable Manufacturers:
  - a. Trimco
  - b. Burns
  - c. Rockwood

Provide door stops at each door leaf:

3. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
4. Where a wall stop cannot be used, provide universal floor stops.
5. Where wall or floor stop cannot be used, provide overhead stop.
6. Provide roller bumper where doors open into each other and overhead stop cannot be used.

**2.10 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING**

Manufacturers:

1. Scheduled Manufacturer:
  - a. Zero International
2. Acceptable Manufacturers:
  - a. National Guard
  - b. Reese
  - c. Legacy
  - d. Pemko

Requirements:

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3. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
4. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
5. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
6. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.02 INSTALLATION

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. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

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Closer/holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

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 may impede traffic or present tripping hazard.

Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

### 3.03 ADJUSTING

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.

Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

### 3.04 CLEANING AND PROTECTION

Clean adjacent surfaces soiled by door hardware installation.

Clean operating items per manufacturer's instructions to restore proper function and finish.

Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

### 3.05 DOOR HARDWARE SCHEDULE

The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

Hardware Sets:

- 1) The hardware sets listed below represent design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware

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schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process.

END OF SECTION

**JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)**

**Hardware Group No. 01 - ENTRY DOOR**

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	613	IVE
1	EA	KEYPAD HANDLESET	OWNER FURNISHED, CONTRACTOR INSTALLED		EMT
1	EA	OH STOP	450S	US10B	GLY
1	EA	GASKETING	488SBK PSA	BK	ZER
1	EA	DOOR SWEEP	8197D	D	ZER
1	EA	THRESHOLD	655D-223	D	ZER
	EA	SCREEN DOOR HARDWARE SET	BY MANUFACTURER		UNK

**Hardware Group No. 02 - BEDROOMS**

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5PB1 4.5 X 4.5	613	IVE
1	EA	PRIVACY LOCK	ALX40 OME	613	SCH
1	EA	WALL STOP	WS406/407CCV	US10B	IVE

**Hardware Group No. 03 - CLOSET**

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5PB1 4.5 X 4.5	613	IVE
1	EA	STOREROOM LOCK	ALX80P6 OME	613	SCH
1	EA	OH STOP	450S	US10B	GLY

**Hardware Group No. 04 - BATHROOM**

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5PB1 4.5 X 4.5	613	IVE
1	EA	PRIVACY LOCK	ALX40 OME	613	SCH
1	EA	WALL STOP	WS406/407CCV	US10B	IVE

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 089543 - INSULATED FLOOD VENTS

#### 1. GENERAL

##### 1.1 WORK INCLUDES

###### A. Base Bid:

1. General Contractor provides factory color finished formed insulated flood vents

##### 1.2 RELATED WORK

###### A. Specified Elsewhere:

1. GCC - General Conditions of the Contract for Construction.
- 2.. 033000- Concrete
3. 079200 - Sealants & Caulking.

##### 1.3 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to fabrication where possible to ensure proper fitting of work.
- B. Furnish inserts and anchorages which must be built into other work for installation of components.
- C. Single source responsibility: Obtain louver units and accessories through one source from a single manufacturer.

##### 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect materials during delivery, storage and handling.

##### 1.5 WARRANTY. Contractor shall provide the following minimum warranty.

- a. Contractor's: One year in accord with general conditions.
- b. Manufacturer's standard warranties.

##### 1.6 SUBMITTALS

- A. Submit in accord with Section GCC.

1. Product Data: Submit manufacturer's detailed technical data for materials, fabrication, and installation, including catalog cuts of anchors, hardware, fastenings, and accessories.
2. Shop Drawings: Submit shop drawings for fabrication and erection of Vent assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
3. Samples: Submit 2 samples for each type of unit required..

##### 1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

#### 2. PRODUCTS V

##### 2.1 MATERIALS

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### A. Metal materials:

1. SAE 316L Stainless Steel.

## 2.2 INSULATED FLOOD VENT MANUFACTURERS

### A. Acceptable Manufacturers:

1. Smart Vent- Insulated Flood Vent
2. Owner approved equal.

B. Flood door made of 316 L Marine Grade Stainless steel with a 2" insulated core that has an R value of 8.34 with felt weather stripping.

C. Mounting: All fasteners to be aluminum or galvanized steel.

## 2.3 FINISH

A. Finish all surfaces and accessories.

B. Comply with NAAIVIM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

## EXECUTION

### 3.1 INSTALLATION

A. Install level, plumb, rigid and recessed as indicated on drawings and in accordance with manufacturer's instructions.

B. Anchor louvers to walls at intervals recommended by manufacturer. Install anchors through backup reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.

C. Fit exposed connections of trim, fillers and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

D. Carefully coordinate with roof truss framing, sheet metal, and other work as required.

### 3.2 CLEANING AND PROTECTION

a. Clean all exposed surfaces.

b. Protect louvers from damage, abuse, dust, dirt, stain or paint.

c. Touch up marred finishes. Use only materials and procedures recommended or furnished by louver manufacturer.

END OF SECTION 089543



# JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

## SECTION 092216 - NON-STRUCTURAL METAL FRAMING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for ceiling furring.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of code-compliance certification for studs and tracks.
- B. Evaluation reports for embossed, high-strength steel studs and tracks.

#### 1.4 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Framing Industry Association or the Steel Stud Manufacturers Association.

### 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, according to 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, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

#### 2.2 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

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1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
  2. Protective Coating: Coating with equivalent corrosion resistance of ASTM A653/A653M, G40 (Z120)], hot-dip galvanized unless otherwise indicated.
- B. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Steel Thickness: 0.0296 inch (0.752 mm)
- C. Hat-Shaped, Rigid Furring Channels: ASTM C645.
1. Minimum Base-Steel Thickness: 0.0296 inch (0.752 m).
  2. Depth: As indicated on Drawings.
- D. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.
1. Depth: As indicated on Drawings
  2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch (0.8 mm).
  3. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

### 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
  2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
1. 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.

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- 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 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Install studs so flanges within framing system point in same direction.
- C. 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 (610 mm) o.c.
- D. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

### 3.3 INSTALLING CEILING 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.

END OF SECTION 092216

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## SECTION 092900 - GYPSUM BOARD

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

##### A. Section Includes:

1. Interior gypsum board.
2. Tile Backing Panels.
3. Trim and accessories.

##### B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood framing
2. Section 079219 "Acoustical Joint Sealants" for acoustical joint sealants.
3. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems and acoustical isolation hangers that support gypsum board panels.

#### 1.3 ACTION SUBMITTALS

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

- B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

#### 1.4 DELIVERY, STORAGE AND HANDLING

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

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### 1.5 FIELD CONDITIONS

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

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

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

### 2.2 GYPSUM BOARD, GENERAL

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

### 2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide basis of design product or comparable products by one of the following:
  - 1. CertainTeed Corporation.
  - 2. Georgia-Pacific Building Products.
  - 3. National Gypsum Company.
  - 4. Temple-Inland Building Products by Georgia-Pacific.
  - 5. United States Gypsum Company.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M, with moisture- and mold-resistant core and paper surfaces.
  - 1. Thickness: 5/8 inch.
  - 2. Long Edges: Tapered.

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### 2.4 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board Designation GB-2: ASTM C 1178/C 1178M, with manufacturer's standard edges.
  - 1. Basis of Design Product: Subject to compliance with requirements, provide DensShield Tile Backer as manufactured by Georgia Pacific.
  - 2. Core: 5/8 inch, Type X.
  - 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

### 2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
  - 2. Shapes:
    - a. Cornerbead.
    - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    - c. L-Bead: L-shaped; exposed long flange receives joint compound.
    - d. Expansion (control) joint.
- B. Aluminum Trim - Reveal: Extruded accessories of profiles and dimensions indicated.
  - 1. Basis of Design Product: Subject to compliance with requirements, provide "SWU-R Series Wall Reveals" as manufactured by Pittcon Industries, or comparable products by one of the following:
    - a. Fry Reglet Corporation.
    - b. Gordon, Inc.
    - c. Pittcon Industries.
    - d. Approved Equal.
  - 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 Alloy 6063-T5.
  - 3. Finish: Clear anodized.

### 2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
  - 2. Tile Backing Panels: As recommended by panel manufacturer.

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- 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 and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
  - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.

### 2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
  - 2. For fastening glass-mat, water-resistant backing board units, use screws of type and size recommended by panel manufacturer.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
  - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
  - 2. Thickness: 3-1/2 inches unless otherwise indicated.
  - 3. Surface Burning Characteristics: Flame Spread 0, Smoke Spread 0
  - 4. UL Formaldehyde Free.
- D. Acoustical Joint Sealant: As specified in Section 079219 "Acoustical Joint Sealant".

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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### 3.2 APPLYING AND FINISHING PANELS, GENERAL

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

### 3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Type X: Vertical surfaces, unless otherwise indicated.



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2. Glass-Mat, Water-Resistant Backing Board: Vertical surfaces to receive tile wall finishes.

### B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
  - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

### C. Multilayer Application:

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

## 3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings.
- C. Interior Trim: Install in the following locations:
  1. Cornerbead: Use at outside corners unless otherwise indicated.
  2. LC-Bead: Use at exposed panel edges.
  3. L-Bead: Use where indicated.

## 3.5 FINISHING GYPSUM BOARD

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

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- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  - 2. Level 2: Panels that are substrate for tile.
  - 3. Level 3: Where indicated on Drawings.
  - 4. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

### 3.6 PROTECTION

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

END OF SECTION 092900

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## SECTION 093013 - CERAMIC TILING

### 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. Porcelain tile.
2. Glazed wall tile.
3. Waterproofing membrane.
4. Crack isolation membrane.
5. Metal edge strips.

- B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
2. Section 092900 "Gypsum Board" for cementitious backer units.

#### 1.3 DEFINITIONS

- A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

- B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in its "Specifications for Installation of Ceramic Tile."

- C. Module Size: Actual tile size plus joint width indicated.

- D. Face Size: Actual tile size, excluding spacer lugs.

#### 1.4 PREINSTALLATION MEETINGS

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

1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

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### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Samples for Verification:
  - 1. Full-size units of each type and composition of tile and for each color and finish required.
  - 2. Full-size units of each type of trim and accessory for each color and finish required.
  - 3. Metal edge strips in 6-inch lengths.

### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product.
- D. Product Test Reports: For tile-setting and -grouting products.

### 1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated. Furnish a minimum of 2 full boxes of tile and 2 full boxes of base. Label all boxes with location of installation. Verify that each box has manufacturer name, product style, color name and number readily visible.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

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- D. Store liquid materials in unopened containers and protected from freezing.

### 1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
  - 1. Obtain setting and grouting materials, except for unmodified Portland cement and aggregate, from single manufacturer.
  - 2. Obtain waterproof membrane and crack isolation membrane, except for sheet products, from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
  - 1. Waterproof membrane.
  - 2. Crack isolation membrane.
  - 3. Cementitious backer units.
  - 4. Metal edge strips.

### 2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements unless otherwise indicated.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

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- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

### 2.3 TILE PRODUCTS

- A. Products and Colors: As indicated by manufacture's designations in the Interior Finish Material Schedule.
- B. Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing where applicable. Provide coved base and cap angles pieces designed to fit with stretcher shapes.

### 2.4 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Waterproof Membrane, Polyethylene Sheet: Polyethylene faced on both sides with fleece webbing; 0.008-inch (0.2-mm) nominal thickness. Bonded waterproofing and vapor retardant membrane.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Kerdi- Schluter Systems
    - b. Kobau Flex SD60
    - c. Trugard Systems LLC .
    - d. Approved Equal.

### 2.5 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product, that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Crack Isolation Membrane, Fluid-Applied Membrane: Fluid-applied liquid-latex rubber or elastomeric polymer, or corrugated polyethylene membrane.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Kerdi- Schluter Systems
    - b. Kobau Flex SD60
    - c. Trugard Systems LLC .
    - d. Approved Equal.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### 2.6 SETTING MATERIALS

- A. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. C-Cure.
    - b. Custom Building Products.
    - c. Laticrete International, Inc.
    - d. MAPEI Corporation.
    - e. Southern Grouts & Mortars, Inc.
    - f. TEC; H.B. Fuller Construction Products Inc.
    - g. Approved Equal.
  2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
  3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- B. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3, with a VOC content of 65 g/L or less.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. C-Cure.
    - b. Custom Building Products.
    - c. Laticrete International, Inc.
    - d. MAPEI Corporation.
    - e. Southern Grouts & Mortars, Inc.
    - f. TEC; H.B. Fuller Construction Products Inc.
    - g. Approved Equal.
  2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.

### 2.7 GROUT MATERIALS

- A. High-Performance Tile Grout: ANSI A118.7.
1. Basis-of-Design Product: Subject to compliance with requirements, TEC AccuColor Premium Sanded Grout with TEC Acrylic Grout Additive as manufactured by TEC, or comparable products by one of the following:
    - a. ARDEX GmbH.
    - b. Boiardi Products Corporation; a QEP company.
    - c. Bonsal American, an Oldcastle company.

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- d. Bostik, Inc.
  - e. C-Cure.
  - f. Custom Building Products.
  - g. Jamo Inc.
  - h. Laticrete International, Inc.
  - i. MAPEI Corporation.
  - j. Southern Grouts & Mortars, Inc.
  - k. Summitville Tiles, Inc.
  - l. TEC; H.B. Fuller Construction Products Inc.
  - m. Approved Equal.
2. Locations: As Indicated on Drawings.
- B. High-Performance Tile Grout: ANSI A118.7, formulated to resist stains without sealers.
- 1. Basis-of-Design Product: Subject to compliance with requirements, TEC AccuColor XT, as manufactured by TEC, or comparable products by one of the following:
    - a. ARDEX GmbH.
    - b. Boiardi Products Corporation; a QEP company.
    - c. Bonsal American, an Oldcastle company.
    - d. Bostik, Inc.
    - e. C-Cure.
    - f. Custom Building Products.
    - g. Jamo Inc.
    - h. Laticrete International, Inc.
    - i. MAPEI Corporation.
    - j. Southern Grouts & Mortars, Inc.
    - k. Summitville Tiles, Inc.
    - l. TEC; H.B. Fuller Construction Products Inc.
    - m. Approved Equal.
    - n. Locations: As Indicated on Drawings.
  - 2. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.
- C. Polymer Tape: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepacked with other dry ingredients.
- D. Provide unsanded grout mixture for wall joints and floor joints 1/8 inch and less. Provide sanded grout mixture for joint wider than 1/8 inch.
- E. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.
- 1. Manufacturers: Subject to compliance with requirements, provide AccuColor EFX Epoxy Special Effects Grout, or comparable products by one of the following:
    - a. Atlas Minerals & Chemicals, Inc.
    - b. Boiardi Products Corporation; a QEP company.
    - c. Bonsal American, an Oldcastle company.
    - d. Bostik, Inc.



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- e. C-Cure.
  - f. Custom Building Products.
  - g. Jamo Inc.
  - h. Laticrete International, Inc.
  - i. MAPEI Corporation.
  - j. Merkrete by Parex USA, Inc.
  - k. Sauereisen.
  - l. Southern Grouts & Mortars, Inc.
  - m. Summitville Tiles, Inc.
  - n. TEC; H.B. Fuller Construction Products Inc.
  - o. Approved Equal.
2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 140 and 212 deg F, respectively, and certified by manufacturer for intended use.
  3. Locations: As Indicated on Drawings.

### 2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips and Transition Strips and Corners: Metal strips with integral perforated anchoring leg for anchorage to mortar bed or substrate; height to math tile and setting bed thickness.
  1. Basis of Design Product: Subject to compliance with requirements, provide products by Schluter Systems L.P., or comparable product by one of the following:
    - a. Blanke Corporation.
    - b. Ceramic Tool Company, Inc.
    - c. Schluter Systems L.P.
    - d. Approved Equal.
  2. Refer to Drawings for products. Finish for all metal edge strips, transition strips and corners to be selected by Architect from manufacturer's full range of available finishes.
- C. Shower Shelves: Metal shelves set in tiled walls.
  1. Basis of Design Product: Subject to compliance with requirements, provide SHELF-E corner shelf for tiled walls by Schluter Systems L.P., or approved equal.
    - a. Material: Aluminum
    - b. Finish: Matte White
    - c. Type / Size: Pentagonal (7-11/16" x 7-11/16")
    - d. Perforation Pattern: Square

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- D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

### 2.9 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
    - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
  - 3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
  - 4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A

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- B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

### 3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
  - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
    - a. Tile floors in wet area.
    - b. Tile floors consisting of tiles 8 by 8 inches or larger.
    - c. Tile floors consisting of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush, including glass tiles.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
  - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
  - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. Glazed Wall Tile: 1/16 inch.
  - 2. Porcelain Tile: 1/4 inch.

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- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- J. Metal Floor Edge Transition and Edge Strips: Install at locations indicated and where exposed edge of tile flooring meets carpet, resilient flooring, concrete finish, or other flooring that finishes flush with or below top of tile.

### 3.4 WATERPROOFING INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing to cure and verify by testing that it is watertight before installing tile or setting materials over it.

### 3.5 CRACK ISOLATION MEMBRANE INSTALLATION

- A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
- B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

### 3.6 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

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### 3.7 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

### 3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

#### A. Interior Floor Installations, Concrete Subfloor:

- 1. Ceramic Tile Installation 2: TCNA F125A; thinset mortar on crack isolation membrane.
  - a. Ceramic Tile Type: CTF1 and CTF2.
  - b. Thinset Mortar: Medium-bed, latex-portland cement mortar for large format tile, minimum 80 percent tile coverage on back of tile.
  - c. Grout: High-performance sanded grout.
- 2. Ceramic Tile Installation 3: TCNA F131; water-cleanable, tile-setting epoxy; epoxy grout on waterproofing membrane.
  - a. Ceramic Tile Type: CTF16.
  - b. Grout: Water-cleanable epoxy grout.

#### B. Interior Wall Installations, Metal Studs or Furring:

- 1. Ceramic Tile Installation 4 TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units.
  - a. Ceramic Tile Type: Refer to Drawings.
  - b. Thinset Mortar: Latex- portland cement mortar.
  - c. Grout: High-performance unsanded grout or sanded grout.

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### SECTION 096516 - RESILIENT SHEET 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. Section includes vinyl sheet flooring.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
- C. Samples for Verification: In manufacturer's standard size, but not less than 6-by-9-inch sections of each different color and pattern of resilient sheet flooring required.
  - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- D. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch. Sample applied to a rigid backing and prepared by Installer for this Project.
- E. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

##### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

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### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Resilient Sheet Flooring: Furnish 2 full rolls.

### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Refer to Section 1.E Special Conditions for mockup requirements.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### 1.8 DELIVERY, STORAGE, AND HANDLING

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

### 1.9 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 85 deg F, in spaces to receive resilient sheet flooring during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during resilient sheet flooring installation.
- D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.

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- E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet 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. FloorScore Compliance: Resilient sheet flooring shall comply with requirements of FloorScore certification.

#### 2.2 VINYL SHEET FLOORING – NO WAX FLOOR

- A. Basis-of-Design Products and Colors: Subject to compliance with requirements, provide basis-of-design product indicated by manufacturer's designations in the Interior Finish Material Schedule, or, provide comparable approved product by the following:
  - 1. Altro Group.
  - 2. Armstrong World Industries, Inc.
  - 3. Congoleum Corporation.
  - 4. Forbo Industries, Inc.
  - 5. Gerflor.
  - 6. IVC US.
  - 7. Lonseal, Inc.
  - 8. Mannington Mills, Inc.
  - 9. Patcraft; a division of Shaw Industries, Inc.
  - 10. Philadelphia Commercial; a division of Shaw Industries, Inc.
  - 11. Polyflor, Ltd.; distributed by Gerbert Limited.
  - 12. Shaw Contract Group; a Berkshire Hathaway company.
  - 13. TOLI International.
- B. Product Standard: Vinyl sheet floor covering with backing, ASTM F 1303.
  - 1. Type (Binder Content): Type I, minimum binder content of 90 percent. Type II, minimum binder content of 34 percent.
  - 2. Wear-Layer Thickness: 0.20 inch.
  - 3. Overall Thickness: As standard with manufacturer.
  - 4. Interlayer Material: None.
  - 5. Backing Class: Class A (fibrous) Class B (nonfoamed plastic).
- C. Wearing Surface: Embossed PVC layer, type I, Grade 1 per ASTM 1303.
- D. Sheet Width: As standard with manufacturer 6 feet.
- E. Seamless-Installation Method: Heat welded.



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- F. Colors and Patterns: As indicated by manufacturer's designations.
- G. Refer to Drawings Finish Schedule for Color

### 2.3 MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
  - 1. Adhesives shall have a VOC content of 50 g/L or less.
  - 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Seamless-Installation Accessories:
  - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
    - a. Color: Match flooring.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

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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 resilient sheet flooring manufacturer. Do not use solvents.
3. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient sheet flooring manufacturer's written recommendations, but not less stringent than the following:
  - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
  - b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient sheet flooring until it is the same temperature as the space where it is to be installed.
  1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

### 3.3 RESILIENT SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
  1. Maintain uniformity of flooring direction.
  2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
  3. Match edges of flooring for color shading at seams.
  4. Avoid cross seams.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

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- G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
  - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Perform the following operations immediately after completing resilient sheet flooring installation:
  - 1. Remove adhesive and other blemishes from surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 096516

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 096519 - RESILIENT TILE 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. Section Includes:

- 1. High performance luxury vinyl floor tile.

###### B. Related Sections:

- 1. Section 012200 "Unit Prices" for floor patching.
- 2. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with resilient tile flooring.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. For adhesives, documentation including printed statement of VOC content.
- B. Samples: Full-size units of each color and pattern of floor tile required.

##### 1.4 CLOSEOUT SUBMITTALS

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

##### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish one full unopened box.

##### 1.6 QUALITY ASSURANCE

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

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1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

### 1.7 DELIVERY, STORAGE, AND HANDLING

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

### 1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
  1. 48 hours before installation.
  2. During installation.
  3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

## 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. FloorScore Compliance: Resilient tile flooring shall comply with requirements of FloorScore certification.

### 2.2 HIGH PERFORMANCE LUXURY VINYL FLOOR TILE

- A. Location: As shown on drawings.
- B. Size: As indicated on drawings.
- C. Pattern and Color: As indicated on drawings.

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### 2.3 VINYL COMPOSITION TILE

- A. Location: As shown on drawings.
- B. Size: As indicated on drawings.
- C. Pattern and Color: As indicated on drawings.

### 2.4 INSTALLATION MATERIALS

- A. For patching, smoothing, and leveling monolithic subfloors concrete provide Flooring Manufacturer's recommended cement based self-leveling compound up to 1/4 inch thick per square foot. For material and labor beyond this thickness and square footage, refer to Unit Pricing Requirements.
- B. For priming porous and non-porous substrates to aid in adhesive bond strength and reducing subfloor porosity, Manufacturer's recommended primers.
- C. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.
- D. Provide transition/reducing strips tapered to meet abutting materials.
- E. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
- F. Provide threshold of thickness and width as required.
- G. Provide resilient edge strips of width at material transitions, of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.
- H. For Initial Maintenance and Sealing provide Flooring Manufacturer's recommended Commercial Floor Sealer, Wax and or Polish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

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

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### 3.2 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products. Thoroughly clean and prepare existing floors to receive new vinyl floor tile.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
  - 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

### 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles square with room axis in pattern indicated.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles with grain direction as indicated on Drawings.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between

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pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover floor tile until Substantial Completion.

END OF SECTION 096519



# JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

## SECTION 099113 - EXTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

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

#### 1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

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B. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
3. VOC content.

### 1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1. Paint: 1 gal. of each material and color applied in unopened can.

### 1.6 QUALITY ASSURANCE

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

1. Refer to Section 1.E Special Conditions for mockup requirements. Final approval of color selections will be based on mockups.
  - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner. Architect will select up to three colors for mockup painting.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### 1.7 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.

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### 1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures 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. Benjamin Moore & Co.
  - 2. PPG/ Pittsburgh Paints.
  - 3. Sherwin-William Company
  - 4. Approved equal.

### 2.2 SUPPLIER (DEALER)

- A. Supplier shall be located within a 30-mile radius of the University of Missouri- Columbia campus.

### 2.3 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: As indicated in Interior Finish Material Schedule.

### 2.4 METAL PRIMERS

- A. Primer, Alkyd, Anti-Corrosive for Metal: MPI #79.

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- B. Primer, Galvanized, Water Based: MPI #134.
- C. Primer, Quick Dry, for Aluminum: MPI #95.

### 2.5 WATER-BASED PAINTS

- A. Latex, Exterior Flat (Gloss Level 1): MPI #10.
- B. Latex, Exterior Semi-Gloss (Gloss Level 5): MPI #11.

### 2.6 SOLVENT-BASED PAINTS

- A. Alkyd, Exterior, Semi-Gloss (Gloss Level 5): MPI #94.

### 2.7 SOURCE QUALITY CONTROL

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

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- 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.

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### 3.2 PREPARATION

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

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
  - 1. Use applicators and techniques suited for paint and substrate indicated.
  - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
  - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
  - 4. Paint entire exposed surface of window frames and sashes.
  - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

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6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
  1. Paint the following work where exposed to view:
    - a. Equipment, including rooftop-mounted fans and hoods
    - b. Uninsulated metal piping.
    - c. Pipe hangers and supports.
    - d. Metal conduit.

### 3.4 FIELD QUALITY CONTROL

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

### 3.5 CLEANING AND PROTECTION

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

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### 3.6 EXTERIOR PAINTING SCHEDULE

#### A. Steel Substrates:

##### 1. Alkyd System:

- a. Prime Coat: Primer, alkyd, anticorrosive for metal, MPI #79.
- b. Prime Coat: Shop primer specified in Section where substrate is specified.
- c. Intermediate Coat: Exterior alkyd enamel matching topcoat.
- d. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.

#### B. Galvanized-Metal Substrates:

##### 1. Alkyd System:

- a. Prime Coat: Primer, galvanized metal, as recommended in writing by topcoat manufacturer for exterior use on galvanized-metal substrates with topcoat indicated.
- b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
- c. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5), MPI #94.

#### C. Aluminum Substrates:

##### 1. Latex System:

- a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior flat (Gloss Level 1), MPI #10.

END OF SECTION 099113

# JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

## SECTION 099123 - INTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exposed interior new and existing substrates including, but not limited to:
  - 1. Concrete.
  - 2. Steel.
  - 3. Galvanized metal.
  - 4. Wood.
  - 5. Gypsum board.
- B. Related Requirements:
  - 1. Section 099113 Exterior Painting
  - 2. Section 099300 Wood Stains and Transparent Finishes

#### 1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.



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### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Step coats on Samples to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
  - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
  - 3. VOC content.

### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: 1 gallon of each material and color applied in unopened can.
  - 2. Label each can with the specific location used in the building.

### 1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each coating system specified in Part 3.
    - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft..
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner. Architect will select up to two (2) paint colors for verifying each paint color.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. 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.

### 1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures 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. Benjamin Moore & Co.
  2. PPG/ Pittsburgh Paint
  3. Sherwin-William Company (The)

### 2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
  1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.

D. Colors: As indicated in a color schedule on Interior Finish Material Schedule.

### 2.3 PRIMERS/SEALERS

A. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.

### 2.4 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based: MPI #107.
- B. Primer, Alkyd, Anti-Corrosive, for Metal: MPI #79.
- C. Primer, Alkyd, Quick Dry, for Metal: MPI #76.
- D. Primer, Galvanized, Water Based: MPI #134.
- E. Primer, Latex, for Interior Wood: MPI #39.

### 2.5 WATER-BASED PAINTS

- A. Latex, Interior, Institutional Low Odor/VOC, Flat (Gloss Level 1): MPI #143, premium-grade and 100 percent acrylic.
- B. Latex, Interior, Institutional Low Odor/VOC, Eggshell (Gloss Level 3): MPI #145, premium-grade and 100 percent acrylic.
- C. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5): MPI #147, premium-grade and 100 percent acrylic.

### 2.6 SOLVENT-BASED PAINTS

- A. Alkyd, Water-Borne, Interior Semi-Gloss (Gloss Level 5): Subject to compliance with requirements provide one of the following:
  1. Benjamin Moore & Company; Advance Waterborne Interior Alkyd Paint
  2. PPG; Speedhide 6-1510 Series
  3. Approved Equal by Sherwin Williams.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### 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. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Wood: 15 percent.
  - 3. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. 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 in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
  - 2. Thoroughly clean all existing wall surfaces to receive new paint finishes.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:

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1. SSPC-SP 3, "Power Tool Cleaning."
- F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Prepare galvanized-metal substrates in strict accordance with paint manufacturers recommendations for specified paint system.
- H. Wood Substrates:
  1. Sand surfaces that will be exposed to view, and dust off.
  2. Prime edges, ends, faces, undersides, and backsides of wood.
  3. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
  1. Use applicators and techniques suited for paint and substrate indicated.
  2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
  5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
  6. For plywood backing in IT Rooms, any "Fire Rating Stencil" and Underwriters Laboratory seal on the plywood shall be taped over and the tape removed after painting, so that these are clearly displayed on the plywood.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

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1. Paint the following work where exposed in rooms:
  - a. Uninsulated metal piping.
  - b. Uninsulated plastic piping.
  - c. Pipe hangers and supports.
  - d. Metal conduit.
  - e. Plastic conduit.
  - f. Ducts.
  - g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces. Paint to extend into duct for a distance of 2 feet from the outlet.

### 3.4 FIELD QUALITY CONTROL

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

### 3.5 CLEANING AND PROTECTION

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

### 3.6 INTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
  1. Alkyd System:

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- a. Prime Coat: Primer as recommended by paint manufacturer for specified intermediate and topcoat system.
- b. Intermediate Coat: Alkyd, water-borne, interior, matching topcoat.
- c. Topcoat: Alkyd, water-borne, interior, semi-gloss (Gloss Level 5).

**B. Galvanized-Metal Substrates:**

**1. Alkyd System:**

- a. Prime Coat: Primer as recommended by paint manufacturer for specified intermediate and topcoat system.
- b. Intermediate Coat: Alkyd, water-borne, interior, matching topcoat.
- c. Topcoat: Alkyd, water-borne, interior, semi-gloss (Gloss Level 5).

**C. Gypsum Board Substrates:**

**1. Institutional Low-Odor/VOC Latex System:**

- a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, eggshell (Gloss Level 3), MPI #145.

**D. Wood Substrate: Including wood-based panel products:**

**1. Institutional Low-Odor/VOC Latex System:**

- a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
- b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
- c. Topcoat: Latex, interior, eggshell (Gloss Level 3), MPI #145.

END OF SECTION 099123

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 099300 – STAINING AND TRANSPARENT FINISHES

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. This Section includes surface preparation and the application of wood finishes on the following substrates:
  - 1. Exterior Substrates:
    - a. Exposed Heavy Timber beams and columns.
    - b. Dressed lumber (finish carpentry).
    - c. Exposed wood panel products.
  - 2. Interior Substrates:
    - a. Exposed Heavy Timber beams and columns.
    - b. Dressed lumber (finish carpentry).
    - c. Exposed wood panel products.

##### 1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each finish and for each color and texture required.
- C. Product List: Printout of MPI's current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.

##### 1.3 QUALITY ASSURANCE

- A. MPI Standards:
  - 1. Products: Complying with MPI standards indicated and listed in its "MPI Approved Products List."
  - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and finish systems indicated.
- B. Mockups: Apply benchmark samples of each finish system indicated and each color selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).



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- b. Other Items: Architect will designate items or areas required.
2. Final approval of stain color selections will be based on benchmark samples.
  - a. If preliminary stain color selections are not approved, apply additional benchmark samples of additional stain colors selected by Architect at no added cost to Owner.

### 1.4 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  1. Quantity: Furnish an additional 5 percent, but not less than 5 gal. of each material and color applied.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

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

### 2.2 WOOD FILLERS

- A. Wood Filler Paste: MPI #91. Filler to match color of wood.
  1. VOC Content: E Range of E.

### 2.3 PRIMERS AND SEALERS:

#### A. Exterior:ClearFinish(BaseBid)

- 1.Exterior Varnish (Semi Gloss). MPI # 30, gloss level 5, 3 coats on Primary surfaces,3 coats of TWP (CEDAR COLOR) -4 coats on end conditions. 3

#### B. Interior - Clear Finish (Base Bid)

1. Minwax; Helmsman Spar Urethane Semi Gloss.3 Coats.

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### 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 work.
  - 1. Maximum Moisture Content of Wood Substrates: 15 percent when measured with an electronic moisture meter.
  - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes.
  - 3. Begin finish application only after unsatisfactory conditions have been corrected and surfaces are dry.
  - 4. Beginning application of finish system constitutes Contractor's acceptance of substrate and conditions.

#### 3.2 PREPARATION AND APPLICATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
- C. Protect work of other trades against damage from finish application. Correct damage 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 finished wood surfaces.

END OF SECTION 099300

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 102800 - TOILET AND BATH ACCESSORIES

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 SUMMARY

- A. Section Includes:

- 1. Toilet accessories.
- 2. Underlavatory guards.

- B. Owner-Furnished, Contractor-Installed Material: Accessories listed below will be furnished by Owner and installed by Contractor:

- 1. Paper Towel Dispensers
- 2. Soap Dispensers
- 3. Roll paper holders (toilet tissue roll paper)

- C. Owner-Furnished, Owner-Installed Material: Accessories listed below will be furnished and installed by Owner:

- 1. Trash and waste receptacles.

- D. Related Sections:

- 1. Section 093013 "Ceramic Tiling" for shower shelves.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:

- 1. Construction details and dimensions.
- 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- 3. Material and finish descriptions.
- 4. Features that will be included for Project.
- 5. Manufacturer's warranty.

- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

- 1. Identify products using room designations indicated.

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### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

### 1.5 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

### 1.6 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed. Brass, steel, and cast-zinc alloy (zamac) are available with chrome finish.

### 2.2 TOILET ACCESSORIES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide basis-of-design products in on the Toilet Accessory Schedule or comparable product by one of the following:
  - 1. American Specialties, Inc.
  - 2. Bobrick Washroom Equipment, Inc.

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3. Bradley Corporation.
- B. Extra Heavy Duty Surface Mounted Towel Bar TA-1:
1. Basis-of-Design Product: Bobrick B-530x24.
  2. Outside Diameter: 1 inch.
  3. Material: 18-gauge, type 304 stainless steel, satin finish.
  4. Length: 24 inches.
- C. Toilet Tissue Dispenser TA-2:
1. Basis-of-Design Product: Owner-furnished, Owner-installed.
- D. Paper Towel Dispenser TA-3:
1. Basis-of-Design Product: Owner-furnished, Contractor-installed.
- E. Soap Dispenser TA-4:
1. Basis-of-Design Product: Owner-furnished, Contractor-installed.
- F. Grab Bar TA-5:
1. Basis-of-Design Product: American Specialties, Inc., Series 3800 Type 01.
  2. Mounting: Flanges with concealed fasteners.
  3. Material: Stainless steel, 0.05 inch thick.
    - a. Finish: Smooth, No. 4 finish (satin).
  4. Outside Diameter: 1-1/2 inches.
  5. Configuration and Length: Straight, 42 inches.
  6. Configuration and Length: Straight, 36 inches.
  7. Configuration and Length: Straight, 18 inches.
- G. Mirror TA-6:
1. Basis-of-Design Product: Bobrick B-165 Channel Frame Mirror.
  2. Description: One-piece, channel frame mirror with mitred corners, theft-resistant concealed wall mount. Type 430 stainless steel, with 1/4" glass mirror.
  3. Size: 24" x 30".
- H. Shower Curtain Rod and Curtain Hooks TA-7:
1. Basis-of-Design Product (Shower Curtain Rod): Bobrick B-6107.
  2. Basis-of-Design Product (Shower Curtain Hook): 204-1.
  3. Description: 1" diameter heavy-duty shower curtain, Type 304 satin stainless steel finish with concealed mounting flanges. Provide compatible shower curtain hooks; provide quantity required for shower curtain.
  4. Size: Varies – field verify (coordinate with shower enclosure dimensions).
  5. Contractor furnished, Contractor installed.
- I. Shower Curtain TA-8:

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1. Basis-of-Design Product: Subject to compliance with the requirements listed, provide vinyl shower curtain by CS Cubicle Curtains, a Division of Construction Specialties, Inc., or approved equal.
  2. Description: Vinyl fabric shower curtain, intrinsically fire retardant, and antimicrobial.
    - a. Basis-of-Design: CS Sure-Check Linen vinyl fabric curtain by CS Cubicle Curtains, a Division of Construction Specialties, Inc.
    - b. Width: Equal to track (or shower curtain rod) length from which curtain is hung plus 10 percent, but not less than 12" (300 mm).
    - c. Length: Equal to floor-to-ceiling (or shower rod-to-floor) height minus 2" from finished ceiling at top and 1" above finished floor.
    - d. Top Hem: Not less than 1" (26 mm) and not more than 1 ½" (40 mm) wide, triple thickness, reinforced with integral web and double stitched.
      - 1) Grommets: 2 piece, rolled-edge, rustproof, nickel-plated brass and spaced not more than 6" (150 mm) o.c.
      - 2) Bottom and Side Hems: Not less than 1" (25 mm) wide, reinforced, triple thickness and single stitched.
      - 3) Seams: Not less than ½" (13 mm) wide, double turned and double stitched.
    - e. Color: As selected by Architect from manufacturer's full range.
  3. Contractor furnished, Contractor installed.
- J. Surface-Mounted Robe Hook TA-9
1. Basis-of-Design Product: Bobrick B-7671.
  2. Description: Surface-mounted robe hook shall be type-304 stainless steel with satin finish. Flange and support arm shall be 22 gauge (0.8mm) and equipped with a concealed, 18-gauge (1.2mm) mounting bracket secured to a concealed, 19-gauge wall plate with stainless steel setscrew. Cap shall be 14 gauge (2.0mm), welded to support arm.
  3. Mounting Height: 54" AFF at standard units; 40" AFF at designated ADA units.
  4. Contractor furnished, Contractor installed.
- K. Folding Shower Seat TA-10
1. Basis-of-Design Product: Bobrick B-5181.
  2. Description: Reversible folding shower seat with frame constructed of Type-304, satin-finish stainless steel. One-piece, 1/2" thick solid phenolic seat with matte finish, reversible for left- or right-hand installation.
  3. Mounting Height: 19" AFF to seat or as recommended by manufacturer.
  4. Special Notes: Folding shower seat shall be included in Alternate Bid No. 1 and installed at designated ADA cabin units.
- L. Two-Wall Shower Grab Bar TA-11
1. Basis-of-Design Product: Bobrick B-6861.
  2. Description: 1 1/2" diameter Type-304 stainless steel grab bar with satin finish, slip-resistant surface.
  3. Size: Concealed mounting with snap flanges.
  4. Contractor furnished, Contractor installed.
  5. Special Notes: Folding shower seat shall be included in Alternate Bid No. 1 and installed at designated ADA cabin units.
- M. Shower Shelf TA-12
1. Refer to specification section, "Ceramic Tiling" for requirements.

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### 2.3 UNDERLAVATORY GUARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Plumberex Specialty Products, Inc.
  - 2. Truebro by IPS Corporation.
  - 3. Approved Equal.
- B. Underlavatory Guard:
  - 1. Basis-of-Design Product: Plumberex Specialty Products, Inc., Handy-Shield Maxx.
  - 2. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
  - 3. Material and Finish: Antimicrobial, molded plastic, white.

### 2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. 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 according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 104416 - FIRE EXTINGUISHERS

#### 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 portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting bracket.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

##### 1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

##### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

##### 1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

##### 1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.



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1. Failures include, but are not limited to, the following:
  - a. Failure of hydrostatic test according to NFPA 10.
  - b. Faulty operation of valves or release levers.
2. Warranty Period: Five years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

#### 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide Larsen's Fire Extinguisher, Model MP10, as manufactured by Contractor to verify required model number with Owner as manufactured by Larsen's Manufacturing Company.
- B. Multipurpose Dry-Chemical Type: UL-rated 4-A:80-B:C, 10-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container. Size: 5 inch cylinder diameter, 20 inches overall height, 7-3/4" overall width.

#### 2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated.
  1. Basis-of-Design Project: Subject to compliance with requirements, provide Larsen's Fire Extinguisher Standard Bracket, Model 546, as manufactured by Larsen's Manufacturing Company.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
  1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

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**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 INSTALLATION**

- A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

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## SECTION 123661 - SIMULATED STONE COUNTERTOPS

### 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. Solid-surface-material countertops and backsplashes.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For countertop and adhesive materials.
- B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
- C. Samples for Verification: For the following products:
  - 1. Countertop material, 6 inches square.

#### 1.4 PROJECT CONDITIONS

- A. Field Measurements: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete.

#### 1.5 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

### PART 2 - PRODUCTS

#### 2.1 SOLID-SURFACE-MATERIAL COUNTERTOPS

- A. Configuration: Provide countertops with the following front and backsplash style:
  - 1. Front: Straight, slightly eased at top.
  - 2. Backsplash: Straight, slightly eased at corner.

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3. Endsplash: Matching backsplash.
- B. Countertops: 1/2-inch-thick, solid surface material with front edge built up with same material to 1 1/2-inch thickness at face. Or 3 cm thick quartz
- C. Backsplashes: 1/2-inch-thick solid surface material. Or 2 cm quartz
- D. Endsplash: 1/2-inch-thick solid surface material. Or 2 cm quartz
- E. Fabrication: Fabricate tops in one piece with shop-applied edge unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
  1. Fabricate with loose backsplashes for field assembly.
  2. Coordinate cut-outs for plumbing fixtures.

### 2.2 COUNTERTOP MATERIALS

- A. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- B. Adhesives: Adhesives shall not contain urea formaldehyde.
- C. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
  1. Basis-of-Design Products: See Finish Schedule.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
  2. Seal edges of cutouts in plywood subtops by saturating with varnish.

END OF SECTION 123661

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 211313 – FIRE SPRINKLER SYSTEM

#### 1.0 GENERAL 1.1 General Requirements

- A. The Automatic Fire Sprinkler System Installation Contractor (herein referred to as the Contractor) shall design, furnish and install all necessary equipment to provide a limited area fire sprinkler system in the mechanical rooms of the new cabins at Johnson's Shut-Ins State Park as indicated and described on the contract drawings and in this specification.
- B. At the time of bid, all exceptions taken to these Specifications, variances from these Specifications and all substitutions of equipment specified shall be listed in writing and forwarded to the State of Missouri (hereafter, referred to as the Owner). Any such exceptions, variances, or substitutions, which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment.
- C. Any equipment proposed as equal to that specified herein shall conform to the standards herein, and the manufacturer shall supply proof of having produced similar equipment, now giving satisfactory service. In addition, the Contractor shall obtain the approval of the Owner in writing ten (10) working days prior to bidding equipment other than that which is specified. The manufacturer's name, model numbers, and number of copies of all equipment drawings and engineering data sheets necessary for a complete review shall be submitted for approval, in accordance with this specification. Included in the submittal shall be a written statement indicating compliance with the features, functions, and performance of the specified equipment and the applicable codes.

#### 1.2 Quality Assurance

- A. This specification identifies the essential functional requirements of the limited area fire sprinkler system for installation at the cabins at Johnson's Shut-Ins State Park. The manufacturer's equipment and system configuration shall comply with or exceed the functional intent of this specification.
- B. Installation Contractor Qualifications: The Contractor shall be licensed (as required) in the State of Missouri, shall be experienced in the installation of fire sprinkler systems, and shall have obtained design approval and inspection approval for similar projects from authorities having jurisdiction.
- C. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in Missouri and is experienced in providing fire protection engineering services. Engineering services are defined as those performed for installations of fire suppression piping that are similar to those indicated for this Project in material, design, and extent.
- D. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" and FM's "Approval Guide" and that comply with other requirements indicated shall be acceptable.
- E. Sprinkler System Components: Listing and labeled by a testing agency for the intended use and acceptable to the Owner.

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- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction. G. All materials and equipment shall be new and unused.
- H. All equipment supplied shall be first quality and the manufacturer's best type and latest model capable of complying with all requirements of this specification and shall have been in continuous production and in continuous service in commercial applications for at least one year. Obsolete equipment shall not be used.
- I. Any case of error, omission, discrepancy or lack of clarity shall be promptly identified to the Owner.

### 1.3 Scope of Work

- A. The limited area fire sprinkler system shall be a wet pipe automatic sprinkler system. The project includes the design, fabrication and installation of a complete, ready and operational, sprinkler system in the mechanical rooms of the cabins, as specified herein and indicated on the drawings including, but not limited to the following: piping, fittings, hangers, sprinklers, check valves, control valves, drain valves, water pressure gauges, alarm and supervisory devices.
- B. The work described in this specification shall consist of all labor, materials, services, tools, transportation, and temporary construction necessary to design, fabricate, install, test and flush the operational fire sprinkler system.

### 1.4 Contractor's Responsibilities

- A. The Contractor's responsibilities include the following:

- 1. The installation of a complete, ready and operational limited area fire sprinkler system in the cabins at Johnson's Shut-Ins State Park. The system installation shall include, but not be limited to:
  - a. Installation of the fire sprinkler system from the point of connection to the domestic water system inside the building.
  - b. Installation and location of all sprinkler system risers, mains and branch line piping. Sprinkler piping in equipment rooms and storage rooms shall be permitted to be exposed if no ceiling is installed within the room. The locations of any necessary core drilling through walls or floors shall be coordinated and approved by Owner prior to drilling.
  - c. Installation and location of all control valve assemblies.
  - d. Installation and location of all waterflow and supervisory devices. Valve supervisory devices shall be provided for all valves controlling any portion of the fire sprinkler system. Contractor shall be responsible to coordinate with the fire alarm contractor for the connection of the waterflow and supervisory devices to the building fire alarm system.

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- e. Installation and location of all required drain valves, drain lines, inspector's test connections, pressure gauges and signs to identify all valves.
  - f. Installation and location of all sprinklers. Contractor shall coordinate the exact location of sprinklers within the mechanical rooms with the Owner prior to the installation.
3. The development of working drawings (as defined by NFPA 13) for the limited area fire sprinkler system in accordance with applicable codes, cited in this specification. The Contractor shall submit working drawings for:
    - a. Review and approval by the Owner (Note: Drawings shall not be submitted to the authority having jurisdiction until approved in writing by the Owner.)
    - b. Submission to the authority having jurisdiction for review, permit issuance, and approval for installation.
    - c. Field installation of the limited area fire sprinkler standpipe system, after the Owner and the authorities having jurisdiction have reviewed and approved the drawings and submittals, and the permit for the installation of the fire sprinkler system has been issued.
  4. The preparation of a minimum of six complete submittal packages identifying the quantities and technical information for all materials and equipment to be provided. Complete manufacturer's technical specifications shall be provided for all substitute components to those identified in these specifications. Substitutions must be approved in writing by Owner prior to installation or purchase.
  5. Payment of all permit fees required for the installation of the fire sprinkler system and obtaining all permits from the authorities having jurisdiction.
  6. Coordinating the installation of the limited area fire sprinkler system and testing of associated equipment and appurtenances with all related trades, contractors, equipment maintenance and testing representatives, the Owner and the authorities having jurisdiction. Where applicable, work and/or equipment provided in other sections and related to the fire sprinkler system shall include, but not be limited to:
    - a. Sprinkler waterflow and supervisory devices. The Contractor shall be responsible for installing the devices. The Contractor shall coordinate and verify the quantity and location of all devices with the fire alarm contractor and electrical contractor.
    - b. Power. The Contractor shall coordinate and verify the location and power requirements of all equipment with the installing electrical contractor.
  7. Recording of all field changes to working plans and preparation of as-built CAD drawings, showing all field changes to the working drawings.
  8. Training of Owner's personnel as described herein.

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### 1.5 Sprinkler System Design Criteria

- A. The fire sprinkler shall be designed in accordance with the following:
  - 1. Ordinary Hazard Group 1 Occupancy Areas (Mechanical Rooms): Wet pipe sprinkler system serving ordinary hazard shall be designed in accordance with the Density / Area method referenced in NFPA 13. The sprinklers in these areas shall be designed for 130 square feet maximum sprinkler spacing (unless listed ordinary hazard extended coverage sprinklers are utilized). The Contractor shall utilize the minimum flow requirements and minimum sprinkler operating pressure in hydraulic calculations for the sprinklers. Sprinklers shall be nominal 200°F temperature rated sprinklers. In areas with finished ceiling, sprinklers shall be recessed pendent. In areas without finished ceilings, sprinklers shall have a brass finish.
- B. Pipe sizing shall be determined by hydraulic calculations in accordance with NFPA 13 requirements, and shall be based upon a waterflow test performed by the Contractor at the site. Any sizing indicated on contract drawings is for reference only.
- C. Sprinkler systems shall be designed according to the following:
  - 1. Minimum density for fire sprinkler piping design:
    - a. Ordinary Hazard, Group 1 Occupancy: 0.15 gpm over 1,500 square foot area.
    - b. Design areas shall be modified as necessary to comply with the requirements for specific building features identified in NFPA 13. This includes increases and reductions in design area, if applicable.
    - c. Sprinklers shall utilize the minimum required discharge pressure and flow as indicated in the UL listing of the sprinkler for the specific spacing.
  - 2. Maximum Protection Area per Sprinkler:
    - a. Ordinary Hazard Areas: 130 square foot (unless ordinary hazard extended coverage sprinklers are utilized).
  - 3. The Contractor is required to calculate pressure losses due to elevation and friction losses through all fittings, piping, and valves in accordance with NFPA 13.
  - 4. Hose Allowance:
    - a. Ordinary Hazard Areas: 250 gpm combined inside and outside hose allowance.
  - 5. Safety Factor: The hydraulic calculations shall incorporate a margin of safety of 5 psi with respect to the residual pressure. This shall be above the required sprinkler system demand pressure at the calculated system design flow including hose allowances.
  - 6. Calculations shall demonstrate that the maximum velocity in piping does not exceed 32 feet per second in building piping and 20 feet per second in underground piping.
- D. Components and Installation: Capable of producing piping systems with 175-psig minimum working-pressure rating, unless otherwise indicated.



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### 1.6 Qualification of Bidders

- A. Sprinkler system contractor shall provide proof of competence of their company, designer and lead installer that will be assigned to this project. The Contractor shall have been in the business of installing fire sprinkler / standpipe systems and fire pump systems for at least ten (10) years, acceptable to the Owner. Once assigned, the Contractor's designer and lead installer shall not be changed without the approval of the Owner.
- B. The Contractor shall be licensed (as required) in the State of Missouri and experienced in the installation of fire sprinkler systems in buildings similar to this project and has obtained design and inspection approvals for similar projects from authorities having jurisdiction.
- C. The Contractor shall have on-staff a professional engineer (or minimum NICET Level III certified technician) who is legally qualified to practice in the State of Missouri and is experienced in providing fire protection engineering services. The professional engineer (or minimum NICET Level III certified technician) shall perform and be responsible for the design of the fire sprinkler system. Engineering services are defined as those performed for installations of fire sprinkler systems that are similar to those indicated for this project in material, design, and extent.
- D. Each proposed bid shall be professionally presented, be bound and shall include a title page and index.
- E. As a minimum, all bidding contractors shall include the following in the fire sprinkler system bid:
  1. The names and qualifications of the Contractor's lead installer and the equipment supplier's lead installer, project manager and project engineer who shall be in responsible charge during the entire project installation. Contractor's qualifications and supplier's qualifications shall include years in business, service policies, warranty definitions and prior experience with installations that include the type of equipment that is to be supplied.
  2. A list of at least three (3) similar installations with addresses of properties, contact names and types of system equipment installed.
  3. The price for the systems as specified, the prices for required and recommended alternatives for equipment, service work not included in the warranty and prices for a service contract. The prices for engineering, fabrication and on-site installation of each system shall include all subcontractor's and manufacturer's on-site representative labor costs. The Contractor shall list all deviations and/or exceptions to these specifications as proposed alternatives.
  4. Completed pricing shall be accompanied by equipment manufacturer's product data sheets for the major components of the proposed system (fire pump, sprinklers, piping, fitting, valves, etc.).
  5. Nonconformance to the Qualification of Bidders requirements outlined in this specification shall be cause for immediate dismissal of the Bid Response Documents without comment.
  6. The award of the contract shall be based on the submitted information and all considerations in the best interests of the Owner. Once the contract is awarded, no requested changes for equipment, suppliers or subcontractors shall be accepted unless justification is made in writing. Once assigned, the Contractor's designer, lead installer and the technicians shall not

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be changed without the approval of the Owner. Upon written request from the Contractor, the Owner may authorize changes, but at their sole choice and discretion. The Contractor shall be at risk for any attempt to substitute the equipment suppliers or subcontractors accepted. All cost for removal, relocation, or replacement of a substituted item shall be at the risk of the Contractor.

### 1.7 Codes and Standards

- A. The fire sprinkler system shall comply with all applicable state and local codes, including the International Building Code (latest applicable edition) and the *National Fire Codes* as referenced and modified by the applicable building and fire codes.
- B. All equipment and devices shall be labeled and listed for the intended use in Underwriters Laboratories, Inc. (UL), UL FPED *Fire Protection Equipment Directory*.
- C. If a UL listing for a specific device is unavailable, approval by FM Global (FM) or other nationally recognized testing laboratory (NTRL) acceptable to the Owner shall be acceptable.
- D. Installation shall be made in accordance with applicable provisions of the latest applicable edition of the following:
  - 1. International Building Code, 2018 edition
  - 2. NFPA 13R, *Installation of Sprinkler Systems in Low-Rise Residential Occupancies*.
  - 3. NFPA 13, *Installation of Sprinkler Systems*.
  - 4. NFPA 25, *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*.
  - 5. NFPA 70, *National Electrical Code*.
  - 6. NFPA 72, *National Fire Alarm and Signaling Code*.
  - 7. Underwriters Laboratories, Inc. (UL), UL FPED, *Fire Protection Equipment Directory*.
  - 8. The latest published edition of the equipment manufacturers' product datasheets, technical specifications, and installation instructions and guidelines.
- E. The systems shall be tested in accordance with the latest applicable edition of the following:
  - 1. NFPA 13, *Installation of Sprinkler Systems*.
  - 2. NFPA 13R, *Installation of Sprinkler Systems in Low-Rise Residential Occupancies*.
  - 3. NFPA 25, *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*.
  - 4. NFPA 70, *National Electrical Code*.
  - 5. NFPA 72, *National Fire Alarm and Signaling Code*.
  - 6. The latest published edition of the equipment manufacturers' testing procedures and guidelines.

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### 1.8 Related Documents

- A. Drawings and general provisions of the Contract, including General and Supplementary, apply to this Section.
- B. Drawings supplied with this specification shall be used by the Contractor as a reference for the requirement and location of system components. It shall be the responsibility of the Contractor to visit the site, observe the existing conditions, and confirm the required quantities of devices and specific options for locations of the same.
- C. Documents, including shop drawings, hydraulic calculations, and material specifications prepared according to NFPA 13 shall be required for obtaining approval by the Owner and the authorities having jurisdiction.
- D. The requirement of building permits and authorization to proceed shall become part of this specification. The building permits and authorization to proceed shall be obtained and paid for by the Contractor, where applicable.
- E. Prior to commencement and after completion of work, the Contractor shall provide written notification to the authorities having jurisdiction.
- F. The Contractor shall notify the Owner, in writing, when the system is ready for the Demonstration Test and the Acceptance Test. Notification shall be a minimum of one (1) week in advance of the planned tests. The system shall be considered ready for the Demonstration Test, only after all preliminary tests have been made by the Contractor, and all deficiencies have been found and corrected. In addition, two (2) copies of the Contractor's Materials and Test Certificate shall be submitted to the Owner before Owner shall agree to the scheduling of the Demonstration Test.

### 1.9 Order of Precedence

- A. Should conflicts arise out of discrepancies between documents referenced in this specification, the most stringent requirement shall apply; however, should a level of stringency be indeterminable, the discrepancies shall be resolved as follows:
  - 1. State and local codes shall take precedence over this specification.
  - 2. The National Fire Protection Association Standards shall take precedence over this specification.
  - 3. This specification shall take precedence over the drawings.

### 1.10 Submittals

- A. By submitting a proposal to conduct the work as described in these specifications and the accompanied design documents, the Contractor agrees that he has reviewed the documentation to verify dimensions, quantities, installation techniques, and good workmanship and safety precautions and that he understands said documents relative to this project including the applicable referenced local, state and national Codes, Standards and Regulations. Further, the Contractor agrees that he is familiar with the building layout and understands that the fire sprinkler system shall be installed in accordance with the herein referenced documents.

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- B. The Contractor shall certify in writing that the submittal documentation is in conformance with all of the requirements of this specification and the applicable referenced local, state and national Codes, Standards and Regulations.
- C. The Contractor is responsible to prepare and submit a minimum of six copies of submittals for approval. Each submittal package shall be prepared and presented in a professional manner, be bound and shall include a title page and index. Each section of the submittal shall be numbered. Submittal packages shall be complete and contain all information required herein. Partial submittal packages will be returned without review. System working plans (as defined in NFPA 13) and calculations must be prepared and submitted for approval, by a registered professional engineer or a minimum NICET Level III certified technician who is legally qualified to practice in State of Missouri.
- D. The Contractor shall not order any equipment and shall not begin any work until the submittals have been approved in writing by the Owner and the authorities having jurisdiction. The Contractor shall not perform any installation prior to the receipt of a written authority to proceed from the Owner and receipt of a written permits by all applicable authorities having jurisdiction.
- E. The Owner shall review these documents for the limited purposes of checking for general conformance with the design and not to determine accuracy or completeness of other details such as dimensions and quantities. The Owner shall not approve means, methods or procedures of construction or installation; nor shall they review for safety precautions.
- F. If submittals are found not to conform to all of the requirements of this specification and the applicable referenced Codes, Standards and Regulations, the Contractor shall be required to revise and resubmit the package with modifications.
- G. In the event that the Contractor's submittal package is required to be revised and resubmitted due to nonconformance with this specification, illegibility of the submittal, incomplete submittals, noncompliance with the referenced Codes, Standards and Regulations or nonconformance with pertinent documentation relative to the project, the Contractor shall pay all fees associated with the additional submittal review. Payment of the fee shall be solely the Contractor's responsibility.
- H. Prior to performing any work, the Contractor responsible for the fire sprinkler system installation shall include the following documentation in addition to those documents required elsewhere in this specification:
  - 1. Sufficient information to describe their qualifications, the work efforts to be performed, and the materials to be provided, including the names and qualifications of the Contractor's lead installer and the equipment supplier's project manager and project engineer who shall be in responsible charge during the entire project installation. Contractor's qualifications shall include years in business and prior experience with installations that include the type of equipment that is to be supplied.
  - 2. The manufacturer's technical representative's name and qualifications. Once approved, the representative shall not be changed without approval in writing by the Owner.
  - 3. A schedule indicating the delivery dates of the equipment to be supplied; installation sequence; time frame and the total amount of on-site technical assistance time (in manhours)

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per phase) that the supplier of the equipment has included in their bid to comply with the requirements of this specification and the Owner's requirements; and demonstration test and final test/acceptance dates to meet the Owner's scheduled project completion dates.

4. Written confirmation of how the manufacturer/supplier plans to comply with the performance operational design of the system and all pertinent information regarding the reliability and operation of the equipment to be supplied.
  5. A letter from the equipment manufacturer stating that the equipment to be supplied is not at or near the end of its life cycle and that replacement components for all control equipment shall be available from the manufacturer for a minimum of 15 years from the date of installation.
  6. A preliminary Equipment List identifying the type, quantity, make and model number of each piece of equipment to be provided under this submittal. The Equipment List shall include the type, quantity, make and model of spare equipment, as specified in this specification. Types and quantities of equipment submitted shall coincide with the types and quantities of equipment used in the calculations and those shown on the shop drawings. A final Equipment List shall be submitted with the Operating and Maintenance (O&M) Manual, as specified in this specification.
  7. Manufacturer's original product datasheets, specifications, installation instruction sheets and descriptive information for all major components of the system. Copies shall not be acceptable. All equipment and devices to be furnished under this contract shall be clearly marked (highlighted) on the product datasheets.
  8. Appropriately scaled Working Plans (in accordance with NFPA 13) shall be submitted including a riser diagram of the complete fire sprinkler / standpipe system and complete details as necessary.
  9. Complete hydraulic calculations for all areas of the buildings to justify pipe sizing and routing.
  10. Proof of insurance consistent with the Owner's requirements.
- I. Equipment other than specified shall be considered for approval. It shall be the Contractor's obligation to submit data and information to allow the Owner time to consider the equality of the substituted items to that specified. It is the Contractor's responsibility to meet the entire intent of the specifications. Deviations from the specified items shall be at the risk of the Contractor until the date of substantial completion of the project and acceptance by the Owner. Accepted submittals on substitute equipment shall only allow the Contractor to proceed with proposing a substituted item and shall not be considered equal until such time as the Owner has completely accepted the substitute item as installed. The Contractor shall provide the following in writing to the Owner a minimum of ten (10) days before the submittal date:
1. Complete lists, descriptions, and drawings of materials to be used.
  2. A complete riser diagram of the fire sprinkler system.

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3. All pertinent information regarding the reliability and operation of the equipment to be supplied.
4. Manufacturer's original product datasheets, specifications, installation instruction sheets and descriptive information for all major components of the system. J. The Owner may request a demonstration of the proposed equipment.
- K. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."
- L. Maintenance Data: Contractor shall provide owner with a complete maintenance manual for each system. The maintenance manual shall describe in detail the purpose and function of all system devices and valves and inspection, testing and maintenance forms. Contractor shall provide owner with one (1) copy of the latest edition of NFPA 25, *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*, in addition to the maintenance manual.

### 1.11 Scheduling

- A. The Contractor shall provide a schedule to the Owner indicating the installation sequence and time frame prior to beginning work. The Contractor shall provide weekly updates to the Owner. It is the Contractor's responsibility to have all installation and testing completed in time for the equipment supplier to make all final connections and conduct all tests as outlined in these specifications.
- B. The Contractor shall be responsible for coordinating the Demonstration Test for the fire sprinkler / standpipe system with the Owner.
- C. The Contractor shall be responsible for coordinating the Acceptance Test for the fire sprinkler system with the Owner and the authorities having jurisdiction.

### 1.12 Spare Parts

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Sprinkler Cabinets: Finished, wall-mounting steel cabinets and hinged covers, with space for a minimum of ten spare sprinklers plus sprinkler wrench. Include the number of cabinets and number of spare sprinklers required by NFPA 13 and wrench for each type of spare sprinkler.
- B. The Contractor shall provide a suggested spare parts list with firm unit prices maintained for the duration of the manufacturer's warranty period as specified herein.
- C. All spare parts shall be neatly and protectively packed in one or more cartons. The quantity, manufacturer, and model of each unit in the carton shall be identified on the outside of the carton. In addition, the name, address, and telephone number of the Contractor and of the manufacturer's local representative, plus the date of delivery, shall be neatly identified on the cover of each carton.

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- D. Per unit costs for additional devices shall be supplied to the Owner and shall be firm prices maintained for one year beyond the duration of the manufacturers warranty period as specified herein.

### 1.13 As-Built Drawings

- A. During the course of the project, the Contractor shall develop electronic versions of the as-built drawings in AutoCAD format. The Contractor shall be required to show the following on these floor plans for as-built drawings:
  - 1. The exact locations and installation details of all equipment installed including the piping, hangers, sprinklers, valves, etc.
- B. The Contractor shall show the equipment and devices on a separate layer and provide copies of only this layer shown on the floor plans as part of the set of as-built drawings.
- C. During the fire sprinkler installation, the draft as-built drawing shall be updated every 24 hours. The on-site as-built drawings shall be available for inspection and review on request by the Owner.
- D. Upon completion of the installation of the system and a minimum of one (1) week prior to the Demonstration Test, the Contractor shall deliver two (2) complete sets of reproducible, fullsize, appropriately scaled, as-built drawings to the Owner. These drawings shall be produced in AutoCAD.
- E. The as-built drawings shall be in a final form for submission for final approvals. Once the asbuilt drawings are approved, the Contractor shall submit six copies and the updated AutoCAD format disk to the Owner for distribution.

### 1.14 Test Plan

- A. Upon completion of the installation of the system and a minimum of one (1) week prior to the Demonstration Test, the Contractor shall deliver two (2) complete sets of the Test Plan, which shall describe how the system shall be tested. This shall include a step-by-step description of all tests and shall indicate type and location of test apparatus to be employed. All tests shall be conducted in the presence of the Owner and shall not be conducted until the "Test Plan" is approved.

### 1.15 Operating and Maintenance Manual

- A. The Contractor shall provide three complete indexed bound sets of the Operating and Maintenance (O&M) Manual a minimum of one week prior to the Demonstration Test of the system. These O&M Manuals shall include the following:
  - 1. The final Equipment List identifying the quantities and types of equipment listed by manufacturer's part number.
  - 2. A detailed narrative description of the system ancillary functions, intended sequence of operations, application considerations, and limitations.
  - 3. An equipment datasheet (or specification sheet) on every piece of equipment installed.

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4. Operator instructions for basic system operations.
5. A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contract, including testing and maintenance instructions for each type of device installed.
  - a. This information shall include manuals that outline inspection, testing and maintenance procedures for all equipment, as well as any other special maintenance procedures for any other pieces of fire sprinkler / standpipe equipment installed in the building.
6. Detailed drawings showing the location of all control valves and the areas served by those control valves.
7. A service directory, including a list of names and telephone numbers of those who provide service for the system.

### 1.16 Warranty

- A. The Contractor shall guarantee all new equipment installed from defects in workmanship and inherent mechanical and electrical defects for a period of one (1) years from the date of substantial completion of the project and acceptance by the Owner.
- B. The Manufacturer or the authorized representative shall guarantee all new system equipment for a period of one (1) year from the date of substantial completion of the project and acceptance by the Owner.
- C. Upon completion of the installation of the fire sprinkler system equipment, the Contractor shall provide the Owner with a signed written statement indicating that the fire sprinkler system was installed in accordance with all applicable codes, standards, and manufacturer's instruction and recommendations.
- D. The warranty period shall begin on the date of substantial completion of the project and acceptance in writing by the Owner.

### 2.0 PRODUCTS 2.1 General

- A. All components shall be used in accordance with the manufacturer's recommendations and its UL listing and/or FM approval.
- B. The naming of manufacturers in the specifications shall not be construed as eliminating the materials, products or services of other manufacturers and suppliers providing approved equivalent items.
- C. The substitutions of materials or products other than those named in the specifications are subject to prior approval by the Owner granted in writing.

### 2.2 Piping Materials

- A. Refer to Section 3.2, *Piping Applications*, for applications of pipe, tube, fitting, and joining materials.



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- B. Pipe shall be new, designed for maximum 175 psi working pressure, conforming to ASTM specifications, and have the manufacturer's name and brand along with the applicable ASTM standard marked on each length of pipe.
- C. Copper:
  - 1. Pipe:
    - a. Overhead pipe used shall be Type K, L or M copper required by NFPA 13.
  - 2. Fittings:
    - a. Changes of direction, unless otherwise noted, shall be accomplished by the use of copper fittings suitable for use in sprinkler systems and defined in NFPA 13. Bushings shall not be used unless written approval is obtained from the Owner. Additional fittings, pipe and hangers required by site conditions shall be provided at no additional cost to Owner.

### 2.3 Sprinklers

- A. Areas with finished ceilings: Semi-recessed, quick response, standard coverage, pendent sprinklers, with white finish. Some areas will require concealed pendants. Refer to drawings for location.
- B. Areas without ceiling: Sprinklers which are on exposed piping shall be listed and approved brass upright type, in upright position, except listed and approved brass pendent type in pendent position may be used where necessary due to clear height requirements, duct interferences, etc.
- C. Install intermediate and high temperature sprinklers of proper degree rating wherever necessary to meet the requirements of NFPA 13.
- D. Sprinkler Escutcheons: Match finish of sprinklers.
- E. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler and white or red finish.

### 2.4 Fire Protection Service Valves

- A. General: UL listed and/or FM approved, with minimum 175 psig non-shock working-pressure rating. Valves for grooved-end piping may be furnished with grooved ends instead of flanged ends.
- B. Gate Valves, NPS 2 and Smaller: UL 262; cast-bronze, threaded ends; solid wedge; OS&Y; and rising stem.
- C. Indicating Valves, NPS 2-1/2 and Smaller: UL 1091; butterfly or ball-type, bronze body with threaded ends; and integral indicating device.
  - 1. Indicator: Visual.
  - 2. Indicator: Electrical 115-V ac, pre-wired, single-circuit, supervisory switch.

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- D. Gate Valves, NPS 2-1/2 and Larger: UL 262, iron body, bronze mounted, taper wedge, OS&Y, and rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.
- E. Swing Check Valves, NPS 2 and Smaller: UL 312 or MSS SP-80, Class 150; bronze body with bronze disc and threaded ends.
- F. Swing Check Valves, NPS 2-1/2 and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends.

### 2.5 Alarm Devices

- A. General: Types matching piping and equipment connections.
- B. Water-Flow Indicators: UL 346; electrical-supervision, vane-type water-flow detector; with minimum 175 psig pressure rating; and designed for horizontal or vertical installation. Include two single-pole, double-throw, circuit switches for isolated alarm and auxiliary contacts, complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
- C. Valve Supervisory Switches: UL 753; electrical; single-pole, double throw; with normally closed contacts. Include design that signals controlled valve is in other than normal position. **2.9**

#### Pressure Gauges

- A. Pressure Gauges: UL 393, 3-1/2- to 4-1/2-inch diameter dial with dial range of 0 to 300 psig.

### 3.0 EXECUTION 3.1 Examination

- A. Examine and verify actual locations of risers, mains and branch line piping before installation.
- B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing and other conditions where pipes, risers and cross-mains are to be installed. C. All examinations shall be coordinated with the Owner.
- D. All locations shall be approved by the Owner before installation.

### 3.2 Piping Applications

- A. Sprinkler / Standpipe Feed Mains and Risers:
  - 1. Copper pipe with approved copper fittings.
- B. Sprinkler System Cross Mains and Branch line Piping:
  - 1. Cross mains shall be copper.
  - 2. Branch line piping shall be copper.

### 3.3 Valve Applications

- A. The following requirements apply:

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1. Fire-Protection-Service Valves: UL listed and/or FM approved for applications where required by NFPA 13.
  - a. Shutoff Duty: Use gate valves.
2. General-Duty Valves: For applications where UL-listed and/or FM-approved valves are not required by NFPA 13.
  - a. Shutoff Duty: Use gate, ball, or butterfly valves.
  - b. Throttling Duty: Use globe, ball, or butterfly valves.

### 3.4 Piping Installation

- A. Refer to manufacturer's specifications and NFPA 13 for basic piping installation.
- B. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on drawings, as far as practical.
- C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- E. Install Inspector's Test Connections in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13, as shown on drawings.
- F. Install piping with drains for complete system drainage.
- G. Install alarm devices in piping systems.
- H. Hangers and Supports: Install according to NFPA 13 for sprinkler piping.
- I. Install pressure gauges on riser or feed main, at each sprinkler test connection. Include pressure gauges with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they will not be subject to freezing.

### 3.6 Valve Installation

- A. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13, manufacturer's written instructions, and authorities having jurisdiction.
- B. Gate Valves: Install fire-protection-service valves supervised open or closed (as appropriate), located to control sources of water supply except from fire department connections. Provide permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection.

### 3.7 Sprinkler Installation

- A. Install sprinklers in patterns indicated on working drawings.

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### 3.8 Connections

- A. Connect water-supply piping to incoming water supply.
- B. Connect piping to specialty valves, hose valves, specialties, fire department connections, and accessories.
- C. Electrical Connections: Power wiring is specified in Division 16.
- D. Connect alarm devices to fire alarm.

### 3.9 Labeling and Identification

- A. Install labeling and pipe markers on valves, equipment and piping according to requirements in NFPA 13.

### 3.10 Field Quality Control

- A. Flush entire system, perform hydrostatic test, and inspect piping according to NFPA 13. Coordinate hydrostatic test date and time of test with the Owner.
- B. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
- C. Report test results promptly and in writing to the Owner and authorities having jurisdiction.

### 3.11 Cleaning

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers having paint other than factory finish or have been damaged during the construction.

### 3.12 Protection

- A. Protect sprinklers from damage until Substantial Completion.

### 3.13 Commissioning

- A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.
- B. Verify that specified tests of piping are complete.
- C. Verify that damaged sprinklers and sprinklers with paint or coating not specified are replaced with new, correct type.
- D. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.
- E. Fill piping with water.
- F. Energize circuits to electrical equipment and devices.

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G. Coordinate with fire alarm tests. Operate as required.

**3.14 Demonstration**

- A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.
- B. Schedule demonstration with the Owner with at least seven days advance notice.
- C. Schedule final Acceptance Test with Owner and Authority Having Jurisdiction with at least seven days advance notice.

**END OF SECTION 211313**

## SECTION 220005 - PLUMBING GENERAL PROVISIONS

### PART 1 - GENERAL

The drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications, apply to work of this section.

#### 1.1. CODES, REGULATIONS, AND STANDARDS:

- A. All work under this Section shall be done in strict accordance with the latest adopted edition of the following:
1. Plumbing and Building, as well as Fire Protection and Electrical Codes that have been adapted and specifically applicable to the project type and location.
  2. N.F.P.A. and N.B.F.U. requirements as well as applicable state fire codes.
  3. All local, state and federal regulations, laws and ordinances, as well as the regulations and special requirements of the State and Local Fire Marshal.
  4. Latest State adopted Energy Codes, rules, and regulations.
  5. Owner's corporate fire, and insurance related, rules and regulations.
  6. Life Safety Code.
  7. Occupational Safety and Health Act (OSHA)
  8. Americans with Disabilities Act (ADA)
- B. All equipment, apparatus and systems shall be fabricated and installed in complete accordance with the latest edition or revision of the following applicable regulations, standards, and codes:

CISPI	Cast Iron Soil Pipe Institute
AIA	American Institute of Architects
ACI	American Society for Testing Materials
NEC	National Electrical Code
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
UL	Underwriters Laboratories, Inc.
IPCEA	Insulated Power Cable Engineers Association
IBC	International Building Code
IEEE	Institute of Electrical Electronic Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
AWWA	American Water Works Association
NSF	National Safety Foundation

1.2. GENERAL REQUIREMENTS

- A. The Architectural General Conditions, Supplementary General Conditions, Special Conditions and Instructions to Bidders are hereby made a part of this Plumbing Trade Contractor and systems section of the Specifications, and are to be consulted for instructions pertaining to this work.
- B. Work covered by the Section of Specifications shall consist of providing all materials, labor, equipment and services necessary for a complete plumbing system (as well as applicable special systems) installation as specified herein or shown on the Drawings. The term or word "Provide" shall be held to mean "Furnish, Install and Connect," in order to made a complete and operable system.
- C. Where the standards differ among the various authorities, the most rigid shall apply. Where the requirements shown on the Drawings or called for in the Specifications are in excess of code requirements, these Drawings and Specifications shall take precedence. Where the requirements within the Division 22 Plumbing Specifications for any section of work and the Drawings are in conflict with the herein before referenced code documents, the documents having the excess, or more rigid and higher cost requirements shall apply.
- D. All work shall be done under the supervision of the Contractor who shall provide foremen to lay out all work. All work shall be laid out with due regard for the space requirements of the other contractors.
- E. All equipment and fixtures shall be installed as recommended by the manufacturer to meet the intent of the application.
- F. Equipment of a type to require servicing shall be located to allow easy access with required clearances. Nameplates of all equipment shall be readily accessible for reading. Metal access panels of required size and type shall be provided and installed to meet the requirements for access to equipment located in walls, above ceilings or furred-in spaces.

PART 2 - PRODUCTS

2.1. ACCESS PANELS:

- A. Unless otherwise indicated, furnish access panels of adequate size for all concealed equipment, valves and other concealed devices requiring service, including access to blind spaces in which specialty items are installed and to which there is no normally available access.
- B. Access panels shall be turned over to the General Contractor for installation during initial construction, together with specific instructions as to their location and use. Failure to deliver and instruct on schedule shall obligate this Contractor to install the panels later at his own expense.

2.2. ASBESTOS CONTAINING MATERIALS:

- A. No products or materials containing asbestos shall be used.

PART 3 - EXECUTION

3.1. PERMITS AND FEES:

- A. This Contractor shall obtain all permits and pay all fees required for the work under this Section.
- B. This Contractor shall give all required notices so as to comply with, and meet, all inspections that are required by Federal as well as State or Local authorities.

3.2. SHOP DRAWINGS:

- A. Shop drawings shall be submitted in accordance with Division 1 requirements of the specifications. Shop drawings will be reviewed for basic design, type and manufacturer. It shall be the responsibility of Contractor to furnish the correct number of units of the proper size and capacity to meet the requirements of the Drawings and Specifications. All shop drawings shall be identified with symbols and numbers as indicated in the Drawings, or within the Specifications unless other specifically designated by the Engineer.
- B. Shop drawings showing name and address of the manufacturer giving all details, dimensions, construction details and performance characteristics shall be submitted.
- C. Shop drawing procedure: Submit shop drawings in accordance with Division 1 of the specifications.
- D. Approval of samples, certificates, manufacturers' literature and data, and shop drawings, will be subject to contract requirements and shall not relieve the Contractor nor his subcontractors or suppliers from responsibility for errors of any sort in such submittals, or from any unauthorized deviations from the contract requirements. An authorized deviation is a written deviation that has been requested by the Contractor, or the Owner, and then given written approval by the Architect and Engineer.
- E. Any deviation from the contract requirements must be stated along with justifications in a letter of transmittal from the Contractor and properly submitted for consideration.

3.3. SUBSTITUTIONS AND ALTERNATE MANUFACTURERS

- A. All bids shall be based on the manufactures materials and products shown on the plans and in these specifications. Substitutions of manufacturers, products or materials, other than those listed on the plans or in these specifications, must be submitted for approval at least 10 working days before the date of the bid opening. Any products not approved prior to the bid date are subject to rejection without any reason. All submittals of products or materials for approval must show that the submitted equipment, product or material is in complete conformance with the plans and specifications.
- B. Alternate manufactures listed on the plans and in these specifications are to indicate an acceptable level of quality only. The listing of alternate manufactures does not necessarily indicate that the manufacturer meets the intent of the plans and specifications. All equipment, products and materials must meet the requirements shown on the plans and listed in these specifications.

3.4. PRESENT JOBSITE INSPECTION:

- A. This Contractor shall visit the project site before presenting his Bid and made a careful inspection of the existing conditions.
- B. He shall determine, at the time of the visit, any existing conditions and responsibilities which are not clearly defined by the Drawings and Specifications. If any such conditions exist, he shall bring same to the attention of the Architect and the Engineer in writing who together will make the required clarification. The absence of questions before the opening of bids indicates a clear understanding of the scope of work and the Contractor's responsibility. All indicated utility data shall be coordinated and reviewed with the local utility companies, by this Contractor.

3.5. MINOR DEVIATIONS:

- A. The Drawings accompanying these Specifications indicate, generally, the design and arrangement of



equipment, ductwork, piping, apparatus, fixtures, and accessories necessary to complete the installation of the system. The exact location or arrangement of all system components, apparatus, and equipment, even if dimensioned, is subject to minor changes necessitated by field conditions and shall be made as required without additional cost to the Owner. Measurements shall be verified by actual observation at the construction site. Each Trade Contractor shall be responsible for all of his work fitting into place in a satisfactory and workmanlike manner to the approval of the Owner, Architect, and Engineer.

3.6. PROTECTION DURING CONSTRUCTION:

- A. Equipment and trim shall be protected against damage or injury due to building materials, acid, tools and equipment or any causes incidental to construction. All equipment damaged by any cause shall be replaced at no cost to the Owner.
- B. The equipment protection, and equipment trim protection, shall be removed at the completion of construction.
- C. Where materials to be installed are being stored at or near the project during construction, this Contractor shall arrange such materials so as to minimize the possibility of contamination, corrosion and damage. All open ends of pipe, ductwork, equipment, and specialties, shall be kept properly closed during construction and installation so as to avoid the possibility of any miscellaneous materials being placed in the openings. Building and appurtenances shall be protected from damage during construction.

3.7. PROTECTION OF NEW AND EXISTING SERVICE LINES:

- A. The new and existing service lines and utility structures as may be shown or reasonably indicated on the Drawings, the location of which is reasonably known to the Contractor prior to beginning excavation or construction shall be protected and safeguarded from damage and, if damaged, shall be repaired by the Contractor at his expense. The above provisions are applicable to all service lines or utilities structures, all or any portion of which protrudes above the original ground surface or lies beneath the ground surface within any areas.

3.8. CUTTING AND PATCHING IN BUILDING:

- A. This Contractor shall do all necessary cutting and patching as the result of the installation of mechanical systems or as required for the installation of his work in a building, unless otherwise indicated on the Drawings. He shall cut as required and patch to leave the premises and finishes in a complete and neat condition comparable to the original. All painting of patched surfaces will be by the painting subcontractor of the General Contractor, unless otherwise specifically indicated or noted. However, the fire and waterproof integrity of all walls, floors, roof, ceilings, and partitions shall be maintained.

3.9. HOISTING:

- A. This Contractor shall be responsible for hoisting all materials and equipment furnished under this Section of the Specifications, except as may be specifically otherwise indicated within special instructions issued by the Architect.
- B. All hoisting shall be done in strict accordance with all city, state and federal rules and regulations as well as the Owner's Insurance Company regulations.

3.10. ERECTION OF EQUIPMENT:

- A. Equipment of a type to require servicing, adjusting or maintenance shall be located to allow easy access and space for the removal of internal assemblies. Nameplates of all equipment shall be readily accessible for reading. Metal access panels shall be provided and installed to meet the requirements for access to equipment located in walls, above ceilings or furred-in spaces.
- B. Where crowded locations exist and where there is a possibility of conflict between the trades, this Contractor shall make composite drawings showing the exact locations of pipes, ducts, conduits and equipment. Drawings shall be based on field measurements and where possible, after consultation and agreement between the trades, and shall be approved by the Engineer before installation of the work.
- C. Do not install any liquid carrying piping over any electrical equipment.

3.11. MATERIALS FURNISHED BY OTHERS:

- A. Wherever it may be specified that this Contractor shall install or erect materials furnished by others, it shall be understood that this Contractor shall receive, check and help unload at the project site such materials and that he assumes the entire responsibility from the time of delivery to the project site.

3.12. EXCAVATION AND BACKFILL:

- A. Each Trade Contractor shall provide all excavating, trenching, sheeting, bracing, pumping, and back-filling as required for the installation of his division or section of work and shall maintain all trenching free of standing water.
- B. Unless otherwise specifically noted, the depth of cover over all exterior to building piping shall not be less than that indicated on the Drawings or as required from a frost free installation.
- C. Trenches shall not back-filled until all tests have been completed and approved.
- D. Unless otherwise noted, separate trenches shall be provided for all underground piping, sewer, and water systems. Provide a minimum of ten (10) feet of undistributed earth between all trenches.
- E. All trenches shall be of sufficient width for the proper installation of all services and various trade work as required.
- F. As soon as practicable after the pipes or conduits are constructed tested and inspected, the trench shall be back-filled. At the sides and top from the sub-grade to a level at least one foot above the top of the pipe, selected granular material shall be deposited and carefully compacted by hand and machine tamping in layers not to exceed six inches in depth with remaining backfill as previously specified.
- G. Wherever gas mains, water mains, sewers, etc. cross the trench of each other or electrical conduit trench, 3000 psi design strength concrete shall be used for backfill beneath them. This backfill shall extend from the bottom of the trench up to spring line of the pipe crossing the trench. A rough wooden form shall be used to hold the concrete in place. The thickness of the backfill shall be 6 inches greater than the diameter of the crossing pipe.

3.13. REPAIRING PAVED SURFACES:

- A. This work shall include the replacement of all paved surfaces damaged or removed due to the construction of the underground lines or sewers. No permanent surface repair shall be made until the backfill in the trench and around manholes has settled and the Engineer has given his approval to make

such repairs. The maintenance of temporary paved surfaces during the period of settlement is the responsibility of the individual Trade Contractor for his part of the work. All repairs shall be same type and at least equal to existing pavements. Edges of existing pavement parallel to trench shall be cut to a neat line prior to making a repair.

- B. All the work necessary to make repairs to paved surfaces will be included as part of the applicable Trade Contractor's bid proposal for the system served.

3.14 CLEANING:

- A. At the completion of the installation, Contractor shall clear and clean all piping system lines and equipment and shall remove all rubbish, crating, unused fixtures, devices, material or any other debris occasioned by this installation. This Contractor shall leave all work in a finished, clean and satisfactory working condition, subject to review and approval of the Architect, Owner, and Engineer.

3.15 RECORD DRAWINGS:

- A. The Contractor shall maintain at the site one copy of all Drawings in good order and marked to record all changes made during construction.
- B. The Contractor shall pay for and obtain a set of the complete Record Drawings and all other drawings relating to any changes required.
- c. The Contractor shall employ competent draftsmen to update the drawings, incorporating all changes, and deliver as-built drawings to Owner via the engineer upon completion of the Work.

3.16. GUARANTEE:

- A. All work shall be guaranteed in accordance with the Division 1 specifications.

END OF SECTION 220005

SECTION 220700 - PLUMBING INSULATION

PART 1 - GENERAL

- 1.1 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, smoke-developed index of 50 or less and a fuel contribution of 0 (zero), as tested by ASTM E 84 (NFPA 255) method.
  - A. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.
  - B. Exception: Industrial mechanical insulation that will not affect life safety egress of building may have flame spread index of 75 and smoke developed index of 150.
- 1.2 Asbestos Containing Materials: No asbestos containing materials shall be used for insulation or related materials.
- 1.3 Submittals: Submit manufacturer's technical product data, installation instructions, and maintenance data for each type of mechanical insulation.
- 1.4 Manufacturer: Armstrong World Industries; CertainTeed, Knauf Fiber Glass; Manville Products; Owens-Corning Fiberglass.

PART 2 - PRODUCTS

- 2.1 Piping Insulation Materials:
  - A. Flexible Elastomeric Piping Insulation: ASTM C 534, Type I.
- 2.2 Equipment Insulation Materials:
  - A. Rigid Fiberglass Equipment Insulation: ASTM C 612 Class 2.
  - B. Flexible Fiberglass Equipment Insulation: ASTM C 553, Type I, Class B-4.
  - C. Flexible Elastomeric Equipment Insulation: ASTM C 534, Type II.
- 2.3 Plumbing Piping System Insulation:
  - A. Insulation Omitted: Omit insulation on chrome-plate exposed piping (except for handicapped fixtures), air chambers, unions, strainers, check valves, balance cocks, flow regulators, drain lines from water coolers, fire protection piping, and pre-insulated equipment.
  - B. Cold Piping: Insulate the following cold plumbing piping systems:
    - Potable cold water piping.
    - Condensate drain piping.
    - Plumbing vents within 6 lineal feet of roof outlet.

1. Insulate each piping system specified above with one of the following types and thickness' of insulation:

Flexible Elastomeric: 1/2" thickness.

- C. Hot Piping: Insulate the following hot plumbing piping systems:

Potable hot water piping.

1. Insulate each piping system specified above with one of the following types and thickness' of insulation:
2. Flexible Elastomeric: 1/2" thick for pipe sizes up to and including 2" (largest size permitted).

### PART 3 - EXECUTION

#### 3.1 Installation:

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purposes.
- B. Installation insulation on plumbing systems subsequent to testing and acceptance of tests.
- C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- D. Clean and dry surfaces prior to insulating. But insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- E. Maintain integrity of vapor-barrier jackets on insulation, and protect to prevent puncture or other damage.
- F. Cover valves, fittings and similar items in each plumbing system with equivalent thickness and composition of insulation as applied to adjoining run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.
- G. Extend insulation without interruption through walls, floors and similar penetrations, except where otherwise indicated.
- H. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet cot of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.
- I. Apply insulation using staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.
- J. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; including metal vessel covers, fasteners, frames and accessories.

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- L. Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.
- M. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- N. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 220700

SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

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 water-distribution piping and related components outside the building for water service
- B. Utility companies usually provide water meters and bill charges directly or through Contractor to Owner. Contact utility company serving the site for information. Delete paragraph below if water meters are provided by utility company or Contractor. If utility company furnishes water meters, identify the company here and specify what it will do; then edit text to suit Project.
- C. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.3 DEFINITIONS

- A. EPDM: Ethylene propylene diene terpolymer rubber.
- B. LLDPE: Linear, low-density polyethylene plastic.
- C. PA: Polyamide (nylon) plastic.
- D. PE: Polyethylene plastic.
- E. PP: Polypropylene plastic.
- F. PVC: Polyvinyl chloride plastic.
- G. RTRF: Reinforced thermosetting resin (fiberglass) fittings.
- H. RTRP: Reinforced thermosetting resin (fiberglass) pipe.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

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1. Wiring Diagrams: Power, signal, and control wiring for alarms.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.
- B. Field quality-control test reports.

### 1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

### 1.7 QUALITY ASSURANCE

- A. Regulatory Requirements:
  1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
  2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
  3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
- B. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.
- E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.
- F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
  1. Ensure that valves are dry and internally protected against rust and corrosion.
  2. Protect valves against damage to threaded ends and flange faces.
  3. Set valves in best position for handling. Set valves closed to prevent rattling.



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- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
  - 1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
  - 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.
- C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

### 1.9 PROJECT CONDITIONS

- A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
  - 1. Notify Owner no fewer than 5 days in advance of proposed interruption of service.

### 1.10 COORDINATION

- A. Coordinate connection to water main with utility company.

## PART 2 - PRODUCTS

### 2.1 COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
  - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
  - 2. Copper, Pressure-Seal Fittings:
    - a. NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.

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- b. NPS 2-1/2 to NPS 4 Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.
- B. Hard Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, drawn temper.
  - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
  - 2. Copper, Pressure-Seal Fittings:
    - a. NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.
    - b. NPS 2-1/2 to NPS 4: Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.
- C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
- D. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

**2.2 PVC PIPE AND FITTINGS**

- A. PVC, Schedule 40 Pipe: ASTM D 1785.
  - 1. PVC, Schedule 40 Socket Fittings: ASTM D 2466.
- B. PVC, Schedule 80 Pipe: ASTM D 1785.
  - 1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.
  - 2. PVC, Schedule 80 Threaded Fittings: ASTM D 2464.
- C. PVC, AWWA Pipe: AWWA C900, Class 150 and Class 200, with bell end with gasket, and with spigot end.
  - 1. Comply with UL 1285 for fire-service mains if indicated.
  - 2. PVC Fabricated Fittings: AWWA C900, Class 150 and [Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
  - 3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
  - 4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
    - a. Gaskets: AWWA C111, rubber.
  - 5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
    - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

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### 2.3 JOINING MATERIALS

- A. Brazing Filler Metals: AWS A5.8, BCuP Series.
- B. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

### 2.4 PIPING SPECIALTIES

- A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
- B. Dielectric Fittings:

### 2.5 JOINT CONSTRUCTION

- A. Make pipe joints according to the following:
  - 1. Copper-Tubing, Pressure-Sealed Joints: Use proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer.
  - 2. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.

### 2.6 FIELD QUALITY CONTROL

- A. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

### 2.7 CLEANING

- A. Clean and disinfect water-distribution piping as follows:
  - 1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
  - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
    - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
    - c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

END OF SECTION 221113

## SECTION 221116 – DOMESTIC WATER PIPING

### 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 work of this section.
- B. Division-22 Basic Materials and Methods sections apply to work of this section.

#### 1.2 DESCRIPTION OF WORK

- A. Extent of domestic water piping systems work, is indicated on drawings and schedules, and by requirements of this section.
- B. Applications for domestic water piping systems include the following:
  - 1. Domestic cold-water piping.
  - 2. Domestic hot-water piping.
- C. Insulation for domestic water piping is specified in applicable Division 22 sections, and is included as work of this section.
- D. Refer to appropriate Division 22 sections for insulation required in connection with domestic water piping.
- E. Trenching and backfill required in conjunction with domestic water piping inside of building foundations is specified in applicable Division 2 sections, and is included as work of this section.

#### 1.3 QUALITY ASSURANCE

- A. Plumbing Code Compliance: Comply with applicable portions of local plumbing codes pertaining to plumbing materials, construction and installation of products.
- B. ANSI Compliance: Comply with applicable American National standards pertaining to products and installation of domestic water piping systems.

#### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data for domestic water piping systems, materials and products.

### PART 2 - PRODUCTS

#### 2.1 DOMESTIC WATER PIPING MATERIALS AND PRODUCTS

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capabilities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide fittings of materials which match pipe materials used in domestic water piping systems. Where more than 1

type of materials or products are indicated, selection is Installer's option.

2.2 BASIC PIPE, TUBE, AND FITTINGS

A. General: Provide pipe, tube, and fittings in accordance with the following listing:

B. Interior Domestic Water Piping:

1. Pipe size 2" and Smaller: Copper tube.
  - a. Wall Thickness: Type L, hard-drawn temper.
  - b. Fittings: Wrought-copper, solder-joints.

2.3 BASIC PIPING SPECIALTIES:

A. General: Provide piping specialties complying with Division-22 Basic Materials and Methods section "Piping Specialties", in accordance with the following listing:

1. Pipe escutcheons
2. Low-pressure Y-type pipeline strainers
3. Dielectric unions
4. Pipe sleeves
5. Sleeve seals

B. Special Piping Specialties:

1. Water Hammer Arresters: Provide bellows or piston type water hammer arresters, stainless steel casting and bellows or piston, pressure rated for 150 psi, tested and certified in accordance with PDI Standard WH-201.
2. Manufacturer: Subject to compliance with requirements, provide water hammer arresters of one of the following:
  - a. Amtrol, Inc.
  - b. Smith (Jay R.) Mfg. Co.
  - c. Wade Div., Tyler Pipe
  - d. Zurn Industries, Inc., Hydromechanics Div.
  - e. Sioux Chief Manufacturing Company

2.4 BASIC SUPPORTS AND SEALS:

A. General: Provide supports and seals in accordance with the following listing:

1. Adjustable steel clevises for horizontal piping hangers and supports.
2. Two-Bolt riser clamps for vertical piping supports.
3. C-clamps and steel brackets for building attachments.
4. Protection shields for insulated piping supports in hangers.

5. Copper flashing for piping penetrations.

## 2.5 BASIC VALVES

- A. General: Provide valves in accordance with the following listing:
- B. Interior Section Valves:
  1. 2" and Smaller: Ball Valves, top entry, bronze body.
- C. Interior Shutoff Valves:
  1. 2" and Smaller: Ball Valves, top entry, bronze body.
- D. Interior Drain Valves:
  1. 2" and Smaller: Gate Valves, bronze body.
  2. 2" and Smaller: Ball Valves, top entry, bronze body.
- E. Interior Check Valves:
  1. All sizes: Swing Check Valves, bronze body.
- F. Interior Stop Valves:
  1. 3/4" and Smaller: Chrome plated brass, angle or straight, threaded, sweat, or compression fittings with wheel handle, stuffing box reducer and escutcheon.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF DOMESTIC WATER DISTRIBUTION PIPING

- A. General: Install water distribution piping accordance with Division 22 Basic Materials and Methods section "Pipe, Tube, and Fittings".
- B. Interior domestic water piping shall extend to a point 5 feet outside of building. Beyond 5 feet, piping shall be exterior domestic water piping.

### 3.2 INSTALLATION OF PIPING SPECIALTIES:

- A. Install piping specialties in accordance with Division-22 Basic Materials and Methods section "Piping Specialties".
- B. Water Hammer Arresters: Install in upright position, in locations and of sizes in accordance with manufacturers recommendation, and elsewhere as indicated.

### 3.3 INSTALLATION OF SUPPORTS, ANCHORS, AND SEALS:

- A. Install supports, anchors, and seals, in accordance with Division 22 Basic Materials and Methods

section "Piping Specialties".

- B. Install supports as shown on plans and on required by code for proper support.

#### 3.4 INSTALLATION OF VALVES

- A. Install valves in accordance with Division 22 Basic Materials and Methods section "Valves".
- B. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections, and elsewhere as indicated.
- C. Shutoff Valves: Install on inlet of each plumbing equipment item, and in inlet of each plumbing fixture, and elsewhere as indicated.
- D. Drain Valves: Install at low points in the domestic water system such that it is completely drainable for freeze protection and on each plumbing equipment item located to completely drain equipment for service or repair. Install where required to completely drain domestic water piping service.
- E. Stop Valves: Provide a stop valve on hot and cold water supplies for each fixture.

#### 3.5 EQUIPMENT CONNECTIONS

- A. Piping Run-outs to Fixtures: Provide hot and cold water piping run-outs to fixtures of sizes indicated, but in no case smaller than required by local plumbing codes.

END OF SECTION 221116

SECTION 221313 - FACILITY SANITARY SEWERS

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. Pipe and fittings.
  - 2. Nonpressure and pressure couplings.
  - 3. Expansion joints and deflection fittings.
  - 4. Cleanouts.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

- A. PVC Piping and Fittings
  - 1. Pipe: ASTM D 1785, Schedule 40 PVC, with plain ends for solvent-cemented joints.
  - 2. Fittings: ASTM D 2466, Schedule 40 PVC, socket type.

2.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves,



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and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

- C. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

### 2.3 FIELD QUALITY CONTROL

- A. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
  - 1. Do not enclose, cover, or put into service before inspection and approval.
  - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
  - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  - 4. Submit separate report for each test.
  - 5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
    - a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
    - b. Close openings in system and fill with water.
    - c. Purge air and refill with water.
    - d. Disconnect water supply.
    - e. Test and inspect joints for leaks.
  - 6. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
    - a. Option: Test plastic gravity sewer piping according to ASTM F 1417.
    - b. Option: Test concrete gravity sewer piping according to ASTM C 924
- B. Leaks and loss in test pressure constitute defects that must be repaired.
- C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

### 2.4 CLEANING

- A. Clean dirt and superfluous material from interior of piping.

END OF SECTION 221313

## SECTION 221316 - DRAIN, WASTE, VENT PIPING

### 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 work of this section.
- B. Division 22 Basic Materials and Methods sections apply to work of this section.

#### 1.2 DESCRIPTION OF WORK

- A. Extent of drain, waste, vent (DWV) piping system work, is indicated on drawings and schedules, and by requirements of this section.
- B. Applications for drain, waste, vent piping systems include the following:
  - 1. Sanitary sewer drain and waste piping.
  - 2. Vent piping for drain and waste piping.
- C. Trenching and backfill required in conjunction with drain, waste, vent piping inside of building foundations is specified in applicable Division - 2 sections, and is included as work of this section.

#### 1.3 QUALITY ASSURANCE

- A. Plumbing Code Compliance: Comply with applicable portions of local plumbing codes pertaining to plumbing materials, construction and installation of products.
- B. ANSI Compliance: Comply with applicable American National standards pertaining to products and installation of drain, waste, vent piping systems.

#### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's data for drain, waste, vent piping systems, materials and products.

### PART 2 - PRODUCTS

#### 2.1 Drain, Waste, Vent Piping Materials and Products

- A. Piping materials and products required for work of this section are specified here-in. Provide products of types, sizes, ratings, and characteristics indicated which comply with manufacture's standard materials, design, and construction in accordance with published product information; provide proper quantity of piping and equipment as required for completion installation.

#### 2.2 PIPE, TUBE, AND FITTINGS

- A. Above Ground Soil, Waste and Vent Piping:
  - 1. Cast-iron Hub-and-Spigot Soil Pipe: Service weight; cast-iron hub-and-spigot soil pipe fittings.

- a. Joints: Caulked, lead and oakum.
      - b. Joints: Compression gaskets.
    - 2. Cast-iron Hubless Soil Pipe: Service weight; cast-iron hubless soil pipe fittings; hubless joints.
    - 3. Polyvinyl Chloride (PVC) and Chlorinated Polyvinyl Chloride (CPVC): Where allowed by local codes, conforming to ASTM D 1785.
      - a. Fittings: Conforming to ASTM D 2564.
  - B. Underground Building Drain Piping:
    - 1. Cast-iron Hub-and-Spigot Soil Pipe: Service weight; cast-iron hub-and-spigot soil pipe fittings.
      - a. Joints: Caulked, lead and oakum.
    - 2. Cast-iron Hubless Soil Pipe: Service weight; cast-iron soil pipe fittings; hubless joints.
    - 3. Polyvinyl Chloride (PVC) and Chlorinated Polyvinyl Chloride (CPVC): Where allowed by local codes, conforming to ASTM D 1785.
      - a. Fittings: Conforming to ASTM D 25 64.
- 2.3 SUPPORTS AND ANCHORS
  - A. General: Provide factory-fabricated hangers, supports, and anchors complying with MSS SP-69. Install in compliance with MSS SP-89.
- 2.4 DRAINAGE PIPING PRODUCTS
  - A. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1, countersunk head. Install in cleanouts as indicated, and as required by Plumbing Code.
  - B. Floor Cleanouts: Cast-iron body and frame; adjustable round top as follows:
    - 1. Nickel-Bronze Top: Pattern to suit adjacent floor finish. Install in occupied areas.
  - C. Wall Cleanouts: Cast-iron body adaptable to pipe with cleanout plug, stainless steel round cover and screw.
- 2.5 VENT PIPING
  - A. Vent Thru Roof: Plumbing Contractor shall provide and install all vents thru roof including making openings and patching roof.
  - B. Vent Flashings: 4 pound seamless lead roof flashing, minimum of 30" round with conical steel reinforcing boot. Deliver to Roofing Installer for installation.
- 2.6 DRAINAGE PIPING PRODUCTS

- A. Drainage Piping Products Manufacturer: Ancon; Josam; Smith; Wade; or Zurn.
- B. Floor Drains:
  - 1. General: Provide floor drains of sized as indicated on drawings.
  - 2. Floor Drain Type "FD": Cast-iron body, cast-iron grate, with the following features:
    - a. Round or square top; bottom outlet, inside caulk.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF DRAIN WASTE VENT PIPING

- A. General: Install building drains and vents s indicated and in accordance with local plumbing code. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.
- B. Install soil and vent piping pitched to drain at minimum slope of 1/4" per ft. (2%) for piping 3" and smaller, an 1/8" per ft. (1%) for piping 4" and larger.
- C. All horizontal drain piping and traps shall be installed on the "warm side" of insulation. Coordinate with GC and Insulation Contractor.

#### 3.2 INSTALLATION OF PIPING SPECIALTIES

- A. Pipe Escutcheons: Install on each pipe penetration exposed to view in occupied spaces.
- B. Sheet-Metal Pipe Sleeves: Install on each pipe penetration through interior partitions and ceilings.
- C. Steel Pipe Sleeves: Install on each pipe penetration except as otherwise indicated.
- D. Sleeve Seals: Install in each cast-iron pipe sleeve.

#### 3.3 INSTALLATION OF DRAINS

- A. Coordinate with soil and waste piping as necessary to interface floor drains with drainage piping systems.
- B. Coordinate flashing work with work of waterproofing and adjoining substrate work.
- C. Install floor drains in accordance with manufacturer's written instructions, at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
- D. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated.

- E. Position drains so that they are accessible and easy to maintain.

3.4 EQUIPMENT CONNECTIONS

- A. Piping Run-outs to Fixtures: Provide soil and waste piping run-outs of plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by local plumbing code.
- B. Locate piping run-outs as close as possible to bottom of floor supporting fixtures or drains.

3.5 PIPING TESTS

- A. Test soil and waste piping system in accordance with requirements of local plumbing code.

END OF SECTION 221316

## SECTION 223330 - DOMESTIC WATER HEATERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 DESCRIPTION OF WORK

- A. Extent of water heater work is indicated on drawings and provision of this section, including schedules and equipment lists associated with either drawings or this section.
- B. Types of water heaters required for project include the following:

Residential Electric Water Heater

#### 1.3 QUALITY ASSURANCE

- A. Codes and Standards: Comply with the following codes and standards.
  - 1. ASME Pressure Vessel Code
  - 2. National Electrical Manufacturers Association
  - 3. Underwriters Laboratory
  - 4. National Standard Plumbing Code
  - 5. National Fire Protection Association Codes
  - 6. ASHRAE/IES 90.1 Energy Efficient Design of New Buildings Except Low Risk Residential Buildings.
  - 7. National Electrical Code

#### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's water heater specifications installation and start-up instructions, and capacity and ratings, with selection points clearly indicated.
- B. Shop Drawings: Submit assembly type shop drawings indicated dimensions, weights, required clearances, and methods of assembly of all components.

### PART 2 - PRODUCTS

#### 2.1 RESIDENTIAL ELECTRIC WATER HEATER

- A. General:
  - 1. Water heater shall be electric tankless type. Heater shall be completely factory assembled including flow switch, thermostatic control, over temp protection and replaceable cartridge element.
  - 2. Water heater shall have capacities as scheduled on the plans.
- B. Element: Nickel Chrome.
- C. Controls: Microprocessor

- D. Heater shall be to the compliance with the requirements of the plans and these specifications, provide residential electric water heaters of one of the following:
  - Eemax
  - Navien
  - State

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF WATER HEATERS

- A. General: Install storage water heater as indicated, in accordance with manufacturer's installation instructions, and in compliance with applicable codes.
- B. Temperature and pressure relief valves shall be piped to the nearest floor or funnel drain.
- C. Provide electrical disconnect for water heater.
- D. Piping: Connect hot and cold water to unit with shutoff valves and unions. Provide dielectric unions if water piping is copper.
- E. Start-Up: Start-up and test water heaters in accordance with manufacturer's start-up instructions.

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END OF SECTION 223330

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 224100 - RESIDENTIAL PLUMBING FIXTURES

#### 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. Bathtubs.
2. Faucets.
3. Lavatories.
4. Showers.
5. Kitchen sinks.
6. Water closets.
7. Toilet seats.
8. Supply fittings.
9. Waste fittings.

##### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
  2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: Include diagrams for power, signal, and control wiring.



## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### PART 2 - PRODUCTS

- 2.1 Refer to Plumbing Schedule on drawings.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing-fixture installation.
- B. Examine walls, floors, cabinets, and counters for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install plumbing fixtures level and plumb according to roughing-in drawings.
- B. Install floor-mounted water closets on closet flange attachments to drainage piping.
- C. Install counter-mounting fixtures in and attached to casework.
- D. Install pedestal lavatories on pedestals and secured to wood blocking in wall.
- E. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
  - 1. Exception: Use ball or gate valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 220523.12 "Ball Valves for Plumbing Piping" and Section 220523.15 "Gate Valves for Plumbing Piping."
- F. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- G. Install toilet seats on water closets.
- H. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- I. Install shower flow-control fittings with specified maximum flow rates in shower arms.
- J. Install traps on fixture outlets.
  - 1. Exception: Omit trap on fixtures with integral traps.
  - 2. Exception: Omit trap on indirect wastes unless otherwise indicated.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

- K. Install disposer in outlet of each sink indicated to have a disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
- L. Set bathtubs and shower receptors in leveling bed of cement grout.
- M. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories and sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."
- N. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- O. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

### 3.3 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

### 3.4 ADJUSTING

- A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

### 3.5 CLEANING AND PROTECTION

- A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.
- B. Clean plumbing fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed plumbing fixtures and fittings.
- D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224100

SECTION 230005 - HVAC GENERAL PROVISIONS

PART 1 - GENERAL

The drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specifications, apply to work of this section.

1.1. CODES, REGULATIONS, AND STANDARDS:

- A. All work under this Section shall be done in strict accordance with the latest adopted edition of the following:
1. Mechanical and Building, as well as Fire Protection and Electrical Codes that have been adapted and specifically applicable to the project type and location.
  2. N.F.P.A. and N.B.F.U. requirements as well as applicable state fire codes.
  3. All local, state and federal regulations, laws and ordinances, as well as the regulations and special requirements of the State and Local Fire Marshal.
  4. Latest State adopted Energy Codes, rules, and regulations.
  5. Owner's corporate fire, and insurance related, rules and regulations.
  6. Life Safety Code.
  7. Occupational Safety and Health Act (OSHA)
  8. Americans with Disabilities Act (ADA)
- B. All equipment, apparatus and systems shall be fabricated and installed in complete accordance with the latest edition or revision of the following applicable regulations, standards, and codes:

AIA	American Institute of Architects
ACI	American Society for Testing Materials
NEC	National Electrical Code
NEMA	National Electric Manufacturers Association
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
UL	Underwriters Laboratories, Inc.
IPCEA	Insulated Power Cable Engineers Association
IBC	International Building Code
IEEE	Institute of Electrical Electronic Engineers
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
AMCA	Air Moving and Conditioning Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
MCAA	Mechanical Contractors Association of America, Inc.
NSF	National Safety Foundation

1.2. GENERAL REQUIREMENTS

- A. The Architectural General Conditions, Supplementary General Conditions, Special Conditions and Instructions to Bidders are hereby made a part of this Mechanical Trade Contractor and systems section of the Specifications, and are to be consulted for instructions pertaining to this work.
- B. Work covered by the Section of Specifications shall consist of providing all materials, labor, equipment and services necessary for a complete heating, ventilating, air conditioning system (as well as applicable special systems) installation as specified herein or shown on the Drawings. The term or word "Provide" shall be held to mean "Furnish, Install and Connect," in order to made a complete and operable system.
- C. Where the standards differ among the various authorities, the most rigid shall apply. Where the requirements shown on the Drawings or called for in the Specifications are in excess of code requirements, these Drawings and Specifications shall take precedence. Where the requirements within the Division 23 Mechanical Specifications for any section of work and the Drawings are in conflict with the herein before referenced code documents, the documents having the excess, or more rigid and higher cost requirements shall apply.
- D. All work shall be done under the supervision of the Contractor who shall provide foremen to lay out all work. All work shall be laid out with due regard for the space requirements of the other contractors.
- E. All equipment and fixtures shall be installed as recommended by the manufacturer to meet the intent of the application.
- F. Equipment of a type to require servicing shall be located to allow easy access with required clearances. Nameplates of all equipment shall be readily accessible for reading. Metal access panels of required size and type shall be provided and installed to meet the requirements for access to equipment located in walls, above ceilings or furred-in spaces.

PART 2 - PRODUCTS

2.1. ACCESS PANELS:

- A. Unless otherwise indicated, furnish access panels of adequate size for all concealed equipment, dampers, valves and other concealed devices requiring service, including access to blind spaces in which specialty items are installed and to which there is no normally available access.
- B. Access panels shall be turned over to the General Contractor for installation during initial construction, together with specific instructions as to their location and use. Failure to deliver and instruct on schedule shall obligate this Contractor to install the panels later at his own expense.

2.2. ASBESTOS CONTAINING MATERIALS:

- A. No products or materials containing asbestos shall be used.

PART 3 - EXECUTION

3.1. PERMITS AND FEES:

- A. This Contractor shall obtain all permits and pay all fees required for the work under this Section.
- B. This Contractor shall give all required notices so as to comply with, and meet, all inspections that are

required by Federal as well as State or Local authorities.

3.2. SHOP DRAWINGS:

- A. Shop drawings shall be submitted in accordance with Division 1 requirements of the specifications. Shop drawings will be reviewed for basic design, type and manufacturer. It shall be the responsibility of Contractor to furnish the correct number of units of the proper size and capacity to meet the requirements of the Drawings and Specifications. All shop drawings shall be identified with symbols and numbers as indicated in the Drawings, or within the Specifications unless other specifically designated by the Engineer.
- B. Shop drawings showing name and address of the manufacturer giving all details, dimensions, construction details and performance characteristics shall be submitted for items listed below:
- C. Shop drawing procedure: Submit shop drawings in accordance with Division 1 of the specifications.
- D. Approval of samples, certificates, manufacturers' literature and data, and shop drawings, will be subject to contract requirements and shall not relieve the Contractor nor his subcontractors or suppliers from responsibility for errors of any sort in such submittals, or from any unauthorized deviations from the contract requirements. An authorized deviation is a written deviation that has been requested by the Contractor, or the Owner, and then given written approval by the Architect and Engineer.
- E. Any deviation from the contract requirements must be stated along with justifications in a letter of transmittal from the Contractor and properly submitted for consideration.

3.3. SUBSTITUTIONS AND ALTERNATE MANUFACTURERS

- A. All bids shall be based on the manufactures materials and products shown on the plans and in these specifications. Substitutions of manufacturers, products or materials, other than those listed on the plans or in these specifications, must be submitted for approval at least 10 working days before the date of the bid opening. Any products not approved prior to the bid date are subject to rejection without any reason. All submittals of products or materials for approval must show that the submitted equipment, product or material is in complete conformance with the plans and specifications.
- B. Alternate manufactures listed on the plans and in these specifications are to indicate an acceptable level of quality only. The listing of alternate manufactures does not necessarily indicate that the manufacturer meets the intent of the plans and specifications. All equipment, products and materials must meet the requirements shown on the plans and listed in these specifications.

3.4. PRESENT JOBSITE INSPECTION:

- A. This Contractor shall visit the project site before presenting his Bid and made a careful inspection of the existing conditions.
- B. He shall determine, at the time of the visit, any existing conditions and responsibilities which are not clearly defined by the Drawings and Specifications. If any such conditions exist, he shall bring same to the attention of the Architect and the Engineer in writing who together will make the required clarification. The absence of questions before the opening of bids indicates a clear understanding of the scope of work and the Contractor's responsibility. All indicated utility data shall be coordinated and reviewed with the local utility companies, by this Contractor.

3.5. MINOR DEVIATIONS:

- A. The Drawings accompanying these Specifications indicate, generally, the design and arrangement of equipment, ductwork, piping, apparatus, fixtures, and accessories necessary to complete the installation of the system. The exact location or arrangement of all system components, apparatus, and equipment, even if dimensioned, is subject to minor changes necessitated by field conditions and shall be made as required without additional cost to the Owner. Measurements shall be verified by actual observation at the construction site. Each Trade Contractor shall be responsible for all of his work fitting into place in a satisfactory and workmanlike manner to the approval of the Owner, Architect, and Engineer.

3.6. PROTECTION DURING CONSTRUCTION:

- A. Equipment and trim shall be protected against damage or injury due to building materials, acid, tools and equipment or any causes incidental to construction. All equipment damaged by any cause shall be replaced at no cost to the Owner.
- B. The equipment protection, and equipment trim protection, shall be removed at the completion of construction.
- C. Where materials to be installed are being stored at or near the project during construction, this Contractor shall arrange such materials so as to minimize the possibility of contamination, corrosion and damage. All open ends of pipe, ductwork, equipment, and specialties, shall be kept properly closed during construction and installation so as to avoid the possibility of any miscellaneous materials being placed in the openings. Building and appurtenances shall be protected from damage during construction.

3.7. PROTECTION OF NEW AND EXISTING SERVICE LINES:

- A. The new and existing service lines and utility structures as may be shown or reasonably indicated on the Drawings, the location of which is reasonably known to the Contractor prior to beginning excavation or construction shall be protected and safeguarded from damage and, if damaged, shall be repaired by the Contractor at his expense. The above provisions are applicable to all service lines or utilities structures, all or any portion of which protrudes above the original ground surface or lies beneath the ground surface within any areas.

3.8. CUTTING AND PATCHING IN BUILDING:

- A. This Contractor shall do all necessary cutting and patching as the result of the installation of mechanical systems or as required for the installation of his work in a building, unless otherwise indicated on the Drawings. He shall cut as required and patch to leave the premises and finishes in a complete and neat condition comparable to the original. All painting of patched surfaces will be by the painting subcontractor of the General Contractor, unless otherwise specifically indicated or noted. However, the fire and waterproof integrity of all walls, floors, roof, ceilings, and partitions shall be maintained.

3.9. HOISTING:

- A. This Contractor shall be responsible for hoisting all materials and equipment furnished under this Section of the Specifications, except as may be specifically otherwise indicated within special instructions issued by the Architect.
- B. All hoisting shall be done in strict accordance with all city, state and federal rules and regulations as well as the Owner's Insurance Company regulations.

3.10. ERECTION OF EQUIPMENT:

- A. Equipment of a type to require servicing, adjusting or maintenance shall be located to allow easy access and space for the removal of internal assemblies. Nameplates of all equipment shall be readily accessible for reading. Metal access panels shall be provided and installed to meet the requirements for access to equipment located in walls, above ceilings or furred-in spaces.
- B. Where crowded locations exist and where there is a possibility of conflict between the trades, this Contractor shall make composite drawings showing the exact locations of pipes, ducts, conduits and equipment. Drawings shall be based on field measurements and where possible, after consultation and agreement between the trades, and shall be approved by the Engineer before installation of the work.
- C. Do not install any liquid carrying piping over any electrical equipment.

3.11. MATERIALS FURNISHED BY OTHERS:

- A. Wherever it may be specified that this Contractor shall install or erect materials furnished by others, it shall be understood that this Contractor shall receive, check and help unload at the project site such materials and that he assumes the entire responsibility from the time of delivery to the project site.

3.12. CLEANING:

- A. At the completion of the installation, Contractor shall clear and clean all piping system lines and equipment and shall remove all rubbish, crating, unused fixtures, devices, material or any other debris occasioned by this installation. This Contractor shall leave all work in a finished, clean and satisfactory working condition, subject to review and approval of the Architect, Owner, and Engineer.

3.13. RECORD DRAWINGS:

- A. The Contractor shall maintain at the site one copy of all Drawings in good order and marked to record all changes made during construction.
- B. The Contractor shall pay for and obtain a set of the complete Record Drawings and all other drawings relating to any changes required.
- c. The Contractor shall employ competent draftsmen to update the drawings, incorporating all changes, and deliver as-built drawings to Owner via the engineer upon completion of the Work.

3.14. GUARANTEE:

- A. All work shall be guaranteed in accordance with the Division 1 specifications.

END OF SECTION 230005

SECTION 230593 - TESTING, ADJUSTING AND BALANCING

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 work of this section.
- B. Division-23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of testing, adjusting, and balancing work required by this section is indicated on drawings and schedules, and by requirements of this section; and is defined to include, but is not necessarily limited to, air distribution systems, heating/cooling equipment and associated equipment and apparatus of mechanical work. The work consists of setting speed and volume (flow) adjusting facilities provided for systems, conducting tests, preparing and submitting reports, and recommending modifications to work as required by contract documents. Follow manufacturer's written instructions for installation and start-up of equipment.
- B. Component types of testing, adjusting, and balancing specified in this section includes the following as applied to mechanical equipment.
  - 1. Fans
  - 2. Heat pump units
  - 3. Ductwork systems
  - 4. Coils and heat exchangers
- C. Refer to Division-26 sections for electrical hook-ups and wiring of equipment to be tested, adjusted, and balances; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Codes and Standards:
  - 1. NEBB Compliance: Comply with NEBB's "Procedural Standards for Testing, adjusting, and Balancing of Environmental Systems" as applicable to mechanical air and hydronic distribution systems, and associated equipment and apparatus.
  - 2. Industry Standards: Comply with ASHRAE recommendations pertaining to measurements, instruments and testing, adjusting, and balancing, except as otherwise indicated.

1.4 JOB CONDITIONS

- A. Do not proceed with testing, adjusting, and balancing work until work has been completed and is operable. Ensure that there is not latent residual work still to be completed.
- B. Do not proceed until work scheduled for testing, adjusting, and balancing is clean and free from debris, dirt and discarded building materials.

1.5 QUALIFICATIONS



- A. All testing and balancing work shall be performed by an independent testing and balancing agency who is Associated Air Balance and Control (AABC) and/or National Environmental Balancing Bureau (NEBB) certified.

1.6 SUBMITTALS

- A. Submit Data Sheet on each item of testing equipment for Architect/Engineer approval. Include name of device, manufacturer's name, model number, latest date of calibration, and correction factors.
- B. Submit a report containing all test data and other related information recorded during testing and balancing, placed on appropriate forms for Architect/Engineer review and approval. Reports shall certify that the methods used and results achieved are as specified.

PART 2 - PRODUCTS

2.1 PATCHING MATERIALS

- A. Except as otherwise indicated, use same products as used by original installer for patching holes in insulation, ductwork and housings which have been cut or drilled for test purposes, including access for test instruments, attaching jigs, and similar purposes.
  - 1. At Tester's option, plastic plugs with retainers may be used to patch drilled holes in ductwork and housing.

2.2 TEST INSTRUMENTS:

- A. Utilize test instruments and equipment for TAB work required, of type, precision, and capacity as recommended in the following TAB standards:
  - 1. NEBB'S Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.

PART 3 - EXECUTION

3.1 AIR SYSTEMS. Test, adjust and balance systems within  $\pm 10\%$  of design values in accord with the following:

- A. Preliminary:
  - 1. Identify and list size, type and manufacturer of all equipment to be tested, including air terminals. Inspect all system components for proper installation and operation.
  - 2. Use manufacturer's ratings for all equipment to make calculations except where field test shows rating to be impractical.
  - 3. Verify that all instruments are accurately calibrated and maintained.
  - 4. Install clean filters.
- B. Furnaces:
  - 1. Test, adjust and record supply and return fan RPM to design requirements within the limits of

mechanical equipment provided.

2. Test and record motor voltage and running amperes including motor nameplate data and starter heater ratings.
  3. Make pitot tube traverse of main supply, exhaust and return ducts, determine and record cfm at fans and adjust fans to design cfm.
  4. Test and record system static pressure, inlet and discharge.
  7. Test and record heating apparatus entering air temperatures, dry bulb.
  8. Test and record cooling apparatus entering air temperatures, dry bulb and wet bulb.
  9. Test and record heating apparatus leaving air temperatures, dry bulb.
  10. Test and record cooling apparatus leaving air temperatures, dry bulb and wet bulb.
- C. Air Distribution System: Adjust zones or branch ducts to proper design, cfm, supply and return.
- D. Air Terminals:
1. Identify each air terminal from reports as to location and determine required flow reading.
  2. Test and adjust each air terminal to within 10% of design requirements.
  3. Test procedure on air terminals shall include comparison of specified fpm velocity and observed velocity, adjustment of terminal and comparison of specified cfm and observed cfm after adjustment.
  4. Adjust flow patterns from air terminal units to minimize drafts to extent design and equipment permits.
- E. Heat Pumps
1. Test and report refrigerant suction temperature
  2. Test and report heat pump current draw in amps.

### 3.3 SYSTEM PERFORMANCE REPORT

- A. After the conclusion of balancing operations, make temporary installation of portable recorders and simultaneously record temperatures and humidity during summer and winter conditions at representative locations in each system outside of building.
- B. Make recordings during summer and winter for a seven-day period, continuous over a weekend and including at least one period of operation at outside conditions within 5°F wet bulb temperature of minimum winter design condition.
- C. Report of test results shall include original recording and two reproductions.

### 3.4 REPORT SUBMITTAL

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- A. Fill in test results on appropriate forms.
- B. Submit three certified copies of test reports to the Architect/Engineer for approval.
- C. Include in report a list of instruments used and last date of calibration.

END OF SECTION 230593

SECTION 230713 - HVAC INSULATION

PART 1 - GENERAL

- 1.1 Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, smoke-developed index of 50 or less and a fuel contribution of 0 (zero), as tested by ASTM E 84 (NFPA 255) method.
  - A. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.
  - B. Exception: Industrial mechanical insulation that will not affect life safety egress of building may have flame spread index of 75 and smoke developed index of 150.
- 1.2 Asbestos Containing Materials: No asbestos containing materials shall be used for insulation or related materials.
- 1.3 Submittals: Submit manufacturer's technical product data, installation instructions, and maintenance data for each type of mechanical insulation.
- 1.4 Manufacturer: Armstrong World Industries; CertainTeed, Knauf Fiber Glass; Manville Products; Owens-Corning Fiberglass.

PART 2 - PRODUCTS

- 2.1 Piping Insulation Materials:
  - A. Flexible Elastomeric Piping Insulation: ASTM C 534, Type I.
- 2.2 Ductwork Insulation Materials:
  - A. Flexible Fiberglass Ductwork Insulation: ASTM C 553, Type I, Class B-4.
  - B. Ductwork Exposed to Weather: Provide outdoor protective foil facing or jacketing as recommended by manufacturer.
  - C. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.
  - D. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.
- 2.3 Equipment Insulation Materials:
  - A. Rigid Fiberglass Equipment Insulation: ASTM C 612 Class 2.
  - B. Flexible Fiberglass Equipment Insulation: ASTM C 553, Type I, Class B-4.

- C. Flexible Elastomeric Equipment Insulation: ASTM C 534, Type II.

2.4 HVAC Piping System Insulation:

- A. Sub-Freezing Piping (0 to 39 degrees F (-18 to 4 deg. C)): Insulate the following sub-freezing HVAC piping systems:
  - 1. Refrigerant piping: See Section 15175 of these specifications.
  - 2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
    - a. Flexible Elastomeric: 1/2" thickness.

2.5 Ductwork System Insulation:

- A. Dual Temperature Ductwork: Insulate the following dual temperature ductwork:
  - 1. Hot/cold supply and return ductwork between fan discharge or HVAC unit discharge and room terminal outlets.
  - 2. Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:
    - Rigid Fiberglass: 2" thick.
    - Flexible Fiberglass: 2" thick, application limited to concealed locations.

PART 3 - EXECUTION

3.1 Installation:

- A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purposes.
- B. Installation insulation on mechanical systems subsequent to testing and acceptance of tests.
- C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping or ductwork with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
- D. Clean and dry surfaces prior to insulating. But insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
- E. Maintain integrity of vapor-barrier jackets on insulation, and protect to prevent puncture or other damage.
- F. Cover valves, fittings and similar items in each mechanical system with equivalent thickness and

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composition of insulation as applied to adjoining run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.

- G. Extend insulation without interruption through walls, floors and similar penetrations, except where otherwise indicated.
- H. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet cot of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.
- I. Corner Angles: Install corner angels on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.
- J. Apply insulation using staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.
- K. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; including metal vessel covers, fasteners, frames and accessories.
- L. Repair damaged sections of existing mechanical insulation, both previously damaged or damaged during this construction period. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.
- M. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
- N. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 230713

## SECTION 232300 - REFRIGERANT PIPING SYSTEMS

### 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 work of this section.
- B. This section is Division 23 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to piping specialties specified herein.

#### 1.2 DESCRIPTION OF WORK

- A. Extent of refrigerant piping specialties work required by this section is indicated on drawings and schedules and by requirements of this section.

#### 1.3 QUALITY ASSURANCE

##### A. Codes and Standards:

- 1. Code Compliance: Comply with the following codes and standards:
  - a. Safety Code for Mechanical Refrigeration ANSI/ASHRAE 15.
  - b. Pressure Vessel Code for Refrigeration Piping ANSI B31.5.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. The Contractor shall provide and install refrigeration piping between direct expansion coils and split system heat pump units. Piping system shall be complete including piping, fittings, expansion valves, filter/dryers, solenoid valves, hot gas bypass valves, service valves, pipe insulation and pipe supports.

#### 2.2 Refrigerant Piping, Fittings and Accessories

- A. Refrigerant piping shall be hard drawn copper tubing, Type L with wrought copper fittings suitable for silver soldering.

- B. Service (shut-off) valves shall be pack-less angle or gate valves suitable for use in refrigeration system.
- C. Pipe Size: Refrigerant piping shall be sized in accordance with the heat pump unit manufactures instruction and recommendations.

Part 3 - EXECUTION

3.1 INSTALLATION OF REFRIGERANT PIPING

- A. General: Refrigerant piping shall be installed in accordance with the heat pump unit manufactures instructions and recommendations.
- B. Piping shall be sloped in the direction of refrigerant flow, except at risers. The minimum slope shall be on quarter inch per 10 feet.
- C. Refrigerant piping system shall be pressure tested at 300 psi on the high pressure side and 150 psi on the low pressure side. Dry nitrogen shall be used as a testing medium. Air shall not be used.
- D. Pressure shall be maintained for a minimum of 12 hours at an ambient temperature of 60 degrees F. Prior to testing, system shall be evacuated with a vacuum pump and then refilled with dry nitrogen for testing. After the system is filled with refrigerant, an electronic detector shall be used to check for leaks.
- E. Provide a strainer upstream of each solenoid valve and expansion valve.
- F. Insulation shall be provided on liquid lines running outdoors and any place where condensation could occur. Insulation shall be installed on suction lines where condensation could occur.

END OF SECTION 232300



SECTION 233100 - DUCTWORK

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 work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of low pressure ductwork is indicated on drawings and in schedules, and by requirements of this section.
- B. Types of ductwork required for project include the following:
  - 1. Heating and Air-conditioning supply and return air systems.
  - 2. Mechanical exhaust system.
- C. External Insulation for low pressure ductwork is specified in Division 23 insulation sections, and is included as work of this section.

1.3 QUALITY ASSURANCE

- A. SMACNA Standards: Comply with SMACNA "HVAC Duct Construction Standards Metal and Flexible" (SMACNA Standards) fabrication and installation of low pressure ductwork.
- B. NFPA Compliance: Comply with ANSI/NFPA 90A "Standard for the Installation of Air Conditioning and Ventilation Systems: and ANSI/NFPA 90B "standard for the Installation of Warm Air Heating and Air Conditioning Systems."

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications on manufactured products and factory-fabricated ductwork, used for work of this section.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Protect shop fabricated and factory-fabricated ductwork, accessories and purchase products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.

- B. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclosure with waterproof wrapping.

## PART 2 - PRODUCTS

### 2.1 DUCTWORK MATERIALS

- A. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains and discolorations, and other imperfections, including those which would impair painting.
- B. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ANSI/ASTM A 527, lock-forming quality, with ANSI/ASTM A 525, G90 zinc coating; mill phosphorized for exposed locations.

### 2.2 MISCELLANEOUS DUCTWORK MATERIALS:

- A. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant (type applicable for fabrication/installation detail) as compounded and recommended by manufacturer specifically for sealing points and seams in ductwork.
- B. Duct Cement: Non-hardening migrating mastic or liquid neoprene based cement (type applicable for fabrication/Installation detail) as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.
- C. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

### 2.3 FABRICATION:

- A. Duct dimensions indicated on the plans are inside clear dimensions unless otherwise noted.
- B. Verify space available for ductwork prior to fabricating ductwork. Shop fabricate ductwork in 4, 8, 10, or 12-foot lengths, unless otherwise indicated or required by complete runs. Pre-assemble work in shop to greatest extent possible, so necessary for shipping and handling. Match-mark sections for reassembly with coordinated installation.

- C. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to associated duct width; and fabricate to include turning vanes in elbows where shorter radius is necessary. Limit angular tapers to 30 degrees for contracting tapes and 20 degrees for expanding tapes. Provide turning vanes at all mitered elbows and tees.
- D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Division-15 section "Duct Accessories" for accessory requirements.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION OF DUCTWORK:

- A. General: Assemble and install ductwork in accordance SMACNA 2 inch wc. pressure which will achieve air tight (5% leakage) and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling.
- B. Seal ductwork, after installation, to seal class recommended, and method prescribed in SMACNA Standards.
- C. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent - enclosure elements of building. Limit clearance to 1/2" where furring is shown for enclosure or concealment of duct, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above ceilings. Coordinate layout with ceiling and lighting layouts and similar finished work.
- D. Where ducts pass through interior partitions and exterior walls, conceal space between construction opening and duct or duct-plus-insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1-1/2".

- E. Support ductwork in manner complying with SMACNA Standards. Do not suspend ductwork from piping or electrical conduit. Ductwork shall be independently supported.
- F. Seal duct penetrations in all walls, floors, ceilings, and other rated surfaces.

3.2 BALANCING:

- A. Refer to Division-23 section "Testing, Adjusting, and Balancing" for air distribution balancing of low pressure ductwork; not work of this section. Seal any leaks in ductwork that becomes apparent in balancing process.

END OF SECTION 233100

SECTION 233300 - DUCTWORK ACCESSORIES

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 work of this section.
- B. Division 23 – General Provisions sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of ductwork accessories work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of ductwork accessories specified in this section include the following:
  - 1. Control Dampers
  - 2. Turning Vanes
  - 3. Duct Hardware
  - 4. Flexible Connections
- C. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for balancing of ductwork accessories not work of this section.

1.3 QUALITY ASSURANCE:

- A. Codes and Standards:
  - 1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards - Metal and Flexible".
  - 2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
  - 3. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data, show drawings, and maintenance data for each type of ductwork accessory.

PART 2-PRODUCTS

- 2.1 Control Dampers: Provide low leakage dampers with parallel blades for 2-position control, or opposed blades for modulating control. Construction blades of 16-gauge steel, provide heavy-duty molded self-lubricating nylon bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" and 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1 1/4" x 16-gauge channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up.

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- 2.2 Fabricated Turning Vanes: Provide fabricated turning vanes and van runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".
- 2.3 Manufactured Turning Vanes: Provide turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c., and set into side strips suitable for mounting in ductwork.
- 2.5 Duct Hardware: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
  - A. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
  - B. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and extended bearing plates for externally insulated ductwork.
- 2.6 Flexible Connections: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.
- 2.9 Manufacturers: Subject to the compliance with the requirements of the plans and these specifications, provide ductwork accessories of one of the following:
  - 1. Arrow
  - 2. Air Balance
  - 3. American Warming
  - 4. Cesco
  - 5. NCA Manufacturing
  - 6. Nailor
  - 7. Ruskin
  - 8. Ventfabrics

### PART 3- EXECUTION

#### 3.1 GENERAL

- A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until satisfactory conditions have been corrected.
- B. Install ductwork accessories in accordance with manufacturer's installation instructions, and in accordance with recognized industry practices to ensure that products serve intended function.
- C. Install turning vanes in non-radius turn square of rectangular 90 degree elbows in supply, return, and exhaust air systems, and elsewhere as indicated.
- D. Install flexible connection at each duct connection to a fan.
- E. Install control dampers where shown on the plans and where required fan air system balancing.
- F. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

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- I. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leak-proof performance.
- H. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 233300

## SECTION 233423 - POWER VENTILATORS

### 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 work of this section.
- B. Division 23 Basic Materials and Methods sections apply to work of this section.

#### 1.2 DESCRIPTION OF WORK

- A. Extent of power ventilator work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of power ventilators specified in this section include the following:
  - 1. Ceiling Cabinet Fan
- C. Refer to Division 23 section "Testing, Adjusting, and Balancing" for balancing of power ventilators; not work of this section.
- D. Refer to Division 26 sections for the following work; not work of this section.
  - 1. Power supply wiring from power source to power connection on ventilators. Include starters, disconnects, and required electrical devices, except where specified, or factory-installed, by manufacturer.

#### 1.3 QUALITY ASSURANCE

- A. Codes and Standards:
  - 1. AMCA Compliance: Provide power ventilators which have been tested and rated in accordance with AMCA standards, and bear the AMCA Certified Ratings Seal.
  - 2. UL Compliance: Provide power ventilators which are listed by UL and have label affixed.
  - 3. NEMA Compliance: Provide motors and electrical accessories complying with NEMA standards.

#### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for power ventilators, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions.
- B. Shop Drawings: Submit assembly type show drawings showing unit dimensions, construction details, methods of assembly of components, and field connection details.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to power ventilators. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring.



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Clearly differentiate between portions of wiring that are factory-installed and portions to be field installed.

- D. Maintenance Data: Submit maintenance data and parts list for each type of power ventilator, accessory, and control. Include this data, product data, show drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 1.

### PART 2 - PRODUCTS

#### 2.1 CEILING CABINET FAN

##### A. General

- 1. Fan shall be completely factory assembled including housing, fan, motor and all accessories necessary for a complete inline cabinet fan.
- 2. Fan shall have the capacities as scheduled in the schedules on the plans.

##### B. Fan Housing

- 1. Housing shall be at least 20 gauge galvanized steel.
- 2. Housing shall be acoustically insulated.

##### C. Fan and Drive

- 1. Fan shall be centrifugal, direct drive, forward curved.
- 2. Fan shall be constructed of galvanized steel and balanced in accordance with AMCA 204.
- 3. Motor shall be open drip proof type with sealed permanently lubricated bearings. Motor shall have thermal overload protection.

##### D. Accessories

- 1. Inline cabinet fan shall include the following accessories:

- a. disconnect
- b. back-draft damper
- c. vibration isolation
- d. supports or suspension hangers
- e. 1 hour wall mounted time switch
- f. roof jack

##### E. Manufacturers

- 1. Subject to the compliance with the plans and specifications, provide inline cabinet fans of one of the following:

Acme  
Carnes  
Cook  
Greenheck  
Penn Ventilator

### PART 3 -EXECUTION

#### 3.1 INSPECTION

- A. General: Examine areas and conditions under which power ventilators are to be installed. Do not proceed with work until satisfactory conditions have been corrected.

#### 3.2 INSTALLATION OF POWER VENTILATORS

- A. General: Except as otherwise indicated or specified, install ventilators in accordance with manufacturer's installation instructions and recognized industry practices to insure that ventilators serve their intended function.
- B. Coordinate ventilator work with work of other trades as necessary for proper interfacing.
- C. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submitted to Electrical Installer.
  - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Verify proper rotation direction of fan wheels. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- D. Remove shipping bolts and temporary supports within ventilators. Adjust dampers for free operation.
- E. Provide flexible duct connections on fan inlet and discharge.

#### 3.3 FIELD QUALITY CONTROL

- A. Testing: After installation of ventilators has been completed, test each ventilator to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

#### 3.4 ADJUSTING AND CLEANING

- A. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 233423

SECTION 233700 - AIR OUTLETS AND INLETS

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 work of this section.
- B. Division 23 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK

- A. Extent of air outlet and inlet work required by this section is indicated on drawings and schedules, and by requirement of this section.
- B. Types of air outlet and inlet specified in this section include the following:
  - 1. Grilles and registers.
- C. Refer to Division 23 section "Testing, Adjusting, and Balancing" for balancing of air outlets and inlets of this section.

1.3 QUALITY ASSURANCE

- A. Codes and Standards
  - 1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards - Metal and Flexible".
  - 2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of air outlets and inlets, except as otherwise indicated. Air outlets and inlets shall comply with ASHRAE/ANSI 70 "Method of Testing for Rating the Performance of Air Outlets and Inlets".
  - 3. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.
- B. Submittals: Submit manufacturer's technical product data, show drawings, and maintenance data for each type of ductwork accessory.

PART 2 -PRODUCTS

2.1 GRILLES AND REGISTERS

- A. General: Grilles and registers shall have capacities, flow patterns, blade spacing, air deflection and be of the sizes as indicated on the plans and in the schedules.
- B. Construction: Extruded aluminum or corrosion resistant steel.
- C. Deflection blades: Include deflection blades to provide the deflection angle indicated in the schedules.

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- D. Volume Dampers: Provide opposed blade volume dampers for registers. Damper shall be adjustable from the face of the register.
- E. Finish: Baked on enamel, color as directed by Architect.
- F. Manufacturer: Subject to the requirements of the plans and these specifications, provide grilles and registers of one of the following:
  - 1. Carnes
  - 2. Kreuger
  - 3. Metal Aire
  - 4. Nailor Hart
  - 5. Titus
  - 6. Tuttle and Bailey

PART 3 - EXECUTION

3.1 GENERAL

- A. Examine areas and conditions under which air outlets and inlets will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Contractor shall be responsible for selecting air device frame styles which are suitable for the surface in which they are to be installed.
- C. Install accessories in accordance with manufacturer's installation instructions, and in accordance with recognized industry practices to ensure that products serve intended function.
- D. Install flexible duct run-out as shown on plans. Limit flexible duct length to a maximum of 5 feet.
- E. Install control dampers where shown on the plans and where required for air system balancing.
- F. Coordinate with other work, including ductwork as necessary to interface installation of air outlets and inlets properly with other work.
- G. Adjusting: Adjust air outlets and inlets for proper setting.
  - 1. Final adjustment of air outlets and inlets is specified in Division 15 section "Testing, Adjusting, and Balancing".
- H. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 233700

SECTION 235413 - ELECTRIC FURNANCES

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 work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extent of the electric heater work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of electric heaters specified in this section include the following:
  - 1. Electric Furnaces
- C. Refer to Division-26 sections for the following work; not work of this section.
  - 1. Power supply wiring from power source to power connection on the heaters. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.
- D. Provide the following electrical work as work of this section.
  - 1. Control wiring between field installed controls, indicating devices and heater control panels.

1.3 QUALITY ASSURANCE:

- A. American National Standards Institute
  - 1. ANSI/NFPA 70 National Electric Code.
  - 2. ANSI/UL 499 Electric Heating Appliances.
  - 3. ANSI/UL 1025 Electric Air Heaters
- B. National Electrical Manufacturers Association.
  - 1. NEMA 250 Enclosures for Electric Equipment.
- C. Canadian Standards Association.
  - 1. CSA22.2 No. 46-M Electric Air Heaters
  - 2. CSA22.2 No. 72-M Heater Elements
  - 3. CSA22.2 No. 155-M Electric Duct Heaters
- D. Underwriters Laboratory.
  - 1. UL 250 Enclosures for Electrical Equipment.

2. UL 2021 Fixed and Location Dedicated Electric Room Heaters.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights, furnished specialties and accessories; and installation and start-up instructions.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating capacities, dimensions, weight loadings, required clearances, and methods of assembly of components.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring for furnaces. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Maintenance Data: Submit maintenance data and parts list for each heater, and accessory; including "trouble-shooting" maintenance manual; in accordance with requirements of Division

1.5 PRODUCT DELIVER, STORAGE AND HANDLING:

- A. Handle heaters and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged heaters or components; replace with new.
- B. Store heaters and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- C. Comply with manufacturer's installation instructions for unloading heaters and moving them to final location.

PART 2-PRODUCTS

2.1 ELECTRIC FURNACE

- A. General:
  - 1. Furnace shall be completely factory assembled including casing, fan, filters, electric heating coil, heat pump heat/cool coil, coil plenum and controls.
  - 2. Furnace shall be suitable for vertical installations.
  - 3. Furnace shall be UL listed.
  - 4. Furnace shall have capacities as indicated on the plans and in the equipment schedules.
- B. Casing
  - 1. Casing shall be steel sheet metal and steel frame construction.
  - 2. Casing shall be factory insulated.
  - 3. Casing shall have all knock-outs required for power and control wiring.

C. Fan

1. Fan shall be forward curved centrifugal type, multi-speed, direct drive.
2. Fan shall be statically and dynamically balanced.

CI. Controls

1. Furnace shall include all temperature and safety controls.
2. Controls shall be low voltage and include all required transformers.

CII. Electric Heating Coil

1. Coil shall be a 2 stage open, slip in type.
2. Coil shall include temperature controls, thermal cut-outs and over-current protection.

CIII. Heat Pump Heat/Cool Coil

1. Coil shall be direct expansion type suitable for heat pump heating and cooling operation.
2. Coil shall use R-410a refrigerant.
3. Coil shall have copper tubes with aluminum fins mechanically bonded to the tubes, tested and rated at 400 psig working pressure.

CIV. Filters

1. Filters shall be one inch, low velocity, throw away type.
2. Filters shall be fully accessible for servicing.

CV. Manufacturers

1. Subject to the requirement of the plans and these specifications, provide electric furnaces of on the following:
  - a. Carrier
  - b. Lenox
  - c. Trane
  - d. Daikin

PART 3-EXECUTION

3.1 INSPECTION:

- A. Examine areas and conditions under which heaters are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRIC FURNACES:

- A. General: Install furnaces in accordance with manufacturer's installation instructions. Install plumb and level, firmly supported in locations indicated.

Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment Installer.

- B. Service Connections: Make all electrical, refrigeration piping, and control system connections to furnaces.
- C. Clearance: Provide adequate clearance around unit for access and for servicing and for adequate air flow.
- D. Route drain piping from heat/cool coil to floor drain.
- D. Coordination: Coordinate the work of Mechanical, Electrical and Controls Contractors as well as other trades.
- F. Start-up and Testing: electric furnace manufacturer shall provide start-up, testing and operator training by factory trained service personnel

END OF SECTION 235413



SECTION 238143 - AIR SOURCE HEAT PUMPS

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 work of this section.

1.2 DESCRIPTION OF WORK:

- A. Extend of air source unit work required by this section is indicated on drawings and schedules, and by requirements of this section.

- B. Types of air source heat pump units specified in this section include the following:

Air source heat pump units, 1 to 5 tons.

- C. Refer to Division-16 sections for the following work; not work of this section.

- 1. Power supply wiring from power source to power connection on the units. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.
- 2. Interlocking wiring between electronically-operated equipment units; and between equipment and field-installed control devices.
- 3. Interlock wiring specified as factory-installed is work of this section.

- D. Provide the following electrical work as work of this section.

- 1. Control wiring between field-installed controls, indicating devices, and unit control panels.

1.3 QUALITY ASSURANCE

- A. Comply with the following standards:

- 1. AHRI Standard 210/240-2003 Unitary Air-Conditioning and Air Source Heat Pump Equipment.
- 2. ASHRAE Standard 37-2009 Methods for Testing Electrically Driven Unitary Air-Conditioning and Heat Pump Equipment
- 3. ASHRAE Standard 90.2-2010 Design of Low-Rise Residential Buildings.
- 4. ASHRAE Standard 116-2010 Methods for Rating Seasonal Efficiency of Unitary Air-Conditioners and Heat Pumps.
- 5. UL 1995 Heating and Cooling Equipment.

1.4 SUBMITTALS

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- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights, furnished specialties and accessories; and installation and start-up instructions.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating capacities, dimensions, weight loadings, required clearances, and methods of assembly of components.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring for units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Maintenance Data: Submit maintenance data and parts list for each unit controls, and accessory; including "trouble-shooting" maintenance manual; in accordance with requirements of Division 1.

### 1.5 PRODUCT DELIVER, STORAGE AND HANDLING:

- A. Handle units and components carefully to prevent damage, breaking, denting and scoring. Do not install damaged units or components; replace with new.
- B. Store units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
- C. Comply with Manufacturer's rigging and installation instructions for unloading units and moving them to final location.

## PART 2- PRODUCTS

### 2.1 AIR SOURCE HEAT PUMP UNITS, 1 TO 5 TONS

- A. General
  - 1. Condensing units shall be completely factory assembled and tested as a unit including compressor(s), condensing coil(s), condenser fan(s), motors, vibration isolation, cabinet, controls and an R-410a refrigerant charge.
  - 2. Unit shall be factory assembled on steel mounting/lifting rails.
  - 3. Unit shall have capacities as indicated on the plans and in these specifications. Unit shall have rated heating capacities at 47°F and cooling capacities at 95°F.
- B. Casing: Casing shall be at least 18 gauge zinc coated galvanized steel with a weather resistant baked enamel finish suitable for outdoor installation. Casing shall have removable access panels which allow easy access to all major components and controls.
- C. Compressors and Refrigeration System: Compressors shall be serviceable hermetic reciprocating, scroll or screw type with vibration isolation, over-temperature protection, over-pressure protection, capacity controls and noise control.
- D. Condenser Coil: Coil shall have aluminum fins mechanically bonded to copper tubes. Coil shall be factory tested to 425 psig air pressure. The coil shall be protected on all four sides by louvered panels.

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- E. Condenser Fans and Motors: Fans shall be direct drive propeller type with aluminum blades, steel hubs, statically and dynamically balanced. Fans shall be vertical discharge with steel wire safety guard.
- F. Motors shall be high efficiency permanently lubricated, totally enclosed resiliently mounted. Motors shall have built-in current and thermal overload protection with either ball or sleeve type bearings.
- G. Controls: Unit controls shall be factory wired with 24 volt controls transformer and control circuit fuses. Unit shall include starters and disconnects. Safety controls shall include high and low pressure switches, compressor overload devices and anti-short cycle timers and controls, electronic expansion valve, reverse cycle defrost and reversing valve.
- H. Accessories: Unit shall include the following accessories:
  - Refrigerant receiver
  - Programmable heat/cool setback thermostat with sub-base. Thermostat shall have a programmable maximum heating set-point temperature, programmable minimum cooling set-point temperature and an adjustable dead band.
  - - Refrigerant piping
  - Anti-short cycle timer
  - Snow stand
- I. Manufacturers: Subject to the requirements of the plans and these specifications, provide condensing units to one of the following:
  - Carrier
  - Lennox
  - Daikin
  - Trane

PART 3- EXECUTION

3.1 INSPECTION

- A. Examine areas and conditions under which heat pump units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF HEAT PUMP UNITS:

- A. General: Install heat pump units in accordance with manufacturer's installation instructions. Install on snow stand, plumb and level, firmly supported.
- B. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment Installer.
- C. Service Connections: Make all electrical, piping and control system connections to heat pump unit.
- D. Clearance: Provide adequate clearance around condensing unit for access and for servicing and for adequate air flow.

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- E. Coordination: Coordinate the work of Mechanical, Electrical and Controls Contractors as well as other trades.
  
- F. Start-up and Testing: Heat pump unit manufacturer shall provide start-up, testing and operator training by factory trained service personnel.

END OF SECTION 238143

**SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL**

**PART 1 - GENERAL**

A. RELATED DOCUMENTS

1. Applicable provisions of the General Conditions, Supplementary General Conditions and Special Conditions shall govern work performed under this section.

B. SCOPE OF WORK

1. This section supplements all sections of this Division and shall apply to all phases of work hereinafter specified, shown on the drawings, or required to provide a complete installation of electrical systems.

C. QUALITY ASSURANCE

1. Electrical work including, but not limited to, installation, materials, equipment and wiring methods, shall comply with the latest edition of the National Electrical Code, NFPA 70.
2. Equipment and materials shall comply with the applicable requirements of the following:
  - a. National Electrical Manufacturer Association (NEMA).
  - b. Institute of Electrical and Electronic Engineers (IEEE).
  - c. American National Standards Institute (ANSI).
  - d. National Electrical Safety Code (ANSI Standard C2).
  - e. Underwriters Laboratories (UL).
3. Provide products, components and materials which are listed and labeled by Underwriters Laboratories (UL).

**PART 2 - PRODUCTS - NOT APPLICABLE**

**PART 3 - EXECUTION**

- A. Install equipment and materials in a neat and workmanlike manner and align, level, and adjust for satisfactory operation. Install equipment so that all parts are easily accessible for inspection, operation, maintenance and repair.

B. SUPPORTS

1. Provide the design, fabrication, and erection of supplementary structural framing required for attachment of hangers or other devices supporting electrical equipment.
2. Provide members welded to structural members equal to the specification for the main structural member. Provide "simple beam" type framing with end connections welded or bolted for shear loads. Use cantilevers only when detailed

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or specifically approved by the Engineer. The Engineer's approval is required for location of supplementary framing.

3. Design framing members for their actual loads, with allowable stresses specified by AISC, without excessive deflection and with consideration for rigidity under vibration, in accordance with standard structural practices.
4. When supplementary framing is indicated, verify that dimensions are suitable for the equipment furnished. Provide additional strength when equipment furnished is heavier than that specified.

### C. OUTLET LOCATION

1. Position of Outlets: Center all outlets with regard to paneling, furring and trim. Symmetrically arrange outlets in the room. Satisfactorily correct outlets improperly located or installed. Repair or replace damaged finishes. Set outlets plumb and extend to the finished surface of the wall, ceiling, or floor without projecting beyond same. Install symmetrically all receptacles, switches, and outlets shown on the trim or casework. Where necessary set the long dimension of the plate horizontal, or ganged in tandem.
2. Mounting heights, to center of box above finished floor, shall be as follows unless otherwise indicated. Other mounting heights are indicated on the drawings by detail or by a plus dimension shown adjacent to the symbol:

Switches	48 inches
Receptacles and similar devices	18 inches
Receptacles in mechanical rooms	48 inches
Motor controllers and disconnect switches	60 inches to top
Panelboards	72 inches to top
Exterior WP convenience outlets	24 inches above grade
Telephone	18 inches
Wall telephone outlets	54 inches
Television outlets	18-90 inches
Doorbell push buttons	48 inches

### D. NAMEPLATES

1. Provide Micarta Nameplates for all Panelboards and Disconnect Switches. The nameplate shall show the equipment mark number or panel number as indicated on the drawings. The nameplates shall be screwed or riveted on. The nameplates for panelboards shall be mounted on the front cover above the door.
2. Nameplates shall be black with 1/4" white letters.

### E. TESTS

1. Provide the tests as outlined hereinafter and other tests necessary to establish the adequacy, quality, safety, completed status and suitable operation of each system.
2. Ground Rod Test: Immediately after installation, test driven grounds and

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counterpoises with a Ground Resistance Direct-Reading Single-Test Megger, utilizing the AC Fall-of-Potential Method and two reference electrodes five (5) feet deep. Disconnect the ground rod to be tested from other ground systems at the time of testing. The ground resistance for the electrical service shall be 15 ohms or less. Submit the results, date of test, and soil conditions, to the Engineer in writing, immediately after testing.

3. Balance phase currents of all distribution panels and branch circuit panels within plus or minus 10 percent variation between average phase current and measured individual phase currents.
4. Written test record shall be supplied to the Owner to show compliance with governing codes for:
  - a. Grounding Continuity
5. Final Corrections: Correct promptly any failure or defects revealed by these tests as determined by the Engineer. Reconduct tests on these corrected items as directed by the Engineer.

**A. CONCRETE WORK**

1. Provide concrete work for electrical equipment as follows:
  - a. 4" concrete pads for switchboards, dry-type transformers, motor control centers, and floor mounted panelboards.
  - b. Concrete base for free-standing exterior lighting equipment, including parking lot light poles, walk lighting and other work as indicated on the drawings.
  - c. Concrete work shall comply with the requirements of Division 3. Minimum concrete strength at 28 days shall be 3000 psi.

**B. CUTTING AND PATCHING**

1. Provide openings for conduit, by means of sleeves.
2. Provide cutting required for conduits if sleeves or openings are not properly provided. Under no circumstances shall any structural members, load bearing walls or footings be cut without first obtaining written permission from the Structural Engineer.
3. Cutting shall be limited to the size necessary for working conditions. When cutting surfaces are difficult or costly to replace, such as marble, glazed tile, wood paneling, etc., each obtain the Owner's approval in advance of the cutting and patching.

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### **C. ROOF OPENINGS**

1. Provide cutting, patching and flashing of roof for conduits through roof. Roof cutting and patching shall be coordinated with the roof installer. The original roof warranty shall be maintained.

### **D. PAINTING**

1. Electrical equipment shall be factory finished standard color as furnished by the manufacturer. Scratches shall be touched up in the field after equipment is installed with paint which matches the original color.

### **E. EXCAVATION**

1. Excavate, as necessary, for underground conduit, etc.
2. Material to be excavated shall be nonclassified and shall include all earth or other materials encountered.
3. Unless otherwise shown, provide separate trenches for each utility. Install all conduit in open trench.
4. Excavation of trenches from surface to top of conduit shall be kept to a minimum but shall be of sufficient width for proper installation of the work. Provide ample excavation under and around all conduit joints to permit proper installation of connectors.
5. Excavations shall be properly protected by the necessary bracing and timbers to prevent any cave-ins or injury to adjacent improvements and workmen. The sides of all trenches shall be securely held by bracing or sheeting, which shall not be removed until the level of the backfill has reached the point where such removal can be safely carried out. The thickness of the sheeting and the dimensions of the cross-braces, shoes, etc., shall be satisfactory to protect properly the sides of the trench and to prevent injurious cave-ins or erosions.
6. Grading in the area of the excavation will be such that it shall prevent surface water from flowing into the excavated trench. Do not install conduit in water.
7. Where underground conduits cross, the trench of the lower conduit shall be backfilled with sharp sand, well tamped, to provide bed for higher conduit. Lines which run parallel and at different levels shall be adequately separated to provide firm bedding for the conduits.

### **F. BACKFILLING**



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1. Excavations shall be promptly backfilled.
2. Trenches for conduit, etc., shall be backfilled for a depth of at least one (1) foot over the top of conduit with sand. It shall be carefully deposited in uniform layers not exceeding six (6) inches in depth. Each layer shall be carefully and solidly tamped with appropriate tools in such a manner as to avoid injuring or disturbing the completed work. Backfill shall be placed thoroughly compacted to prevent lateral displacement.
3. Backfill from 1'-0" above the top of the conduit to the surface shall be with clean on-site materials. Large rocks (over 3/4") or other materials shall be removed. Backfill shall be compacted. Compaction shall be at least 90% measured by the Proctor Test (ASTM D 698). Backfill shall be constructed in uniform layers of approximately 6 to 8 inches in loose dimension. Each layer shall be compacted.
4. Backfill from 1'-0" above the top of the conduit to the bottom side of sidewalks, parking areas, streets, floor slabs or other paved areas shall be with crushed stone or gravel with maximum size of 1/2".
5. Do not place fill during rainy or freezing weather or on subgrade softened by rain or thawing action. When filling is interrupted by weather, top surface of fill shall be scarified, recompact, and tested before placing new fill. If the soils are too wet during construction of the fill, dry by discing or other similar methods. If the soils are too dry during construction of the fill, add water in such a way as to permit uniform dispersion of the moisture through the layer to be compacted.
6. Provide compaction tests when required by Owner. If the material tested does not meet these tests, pay for the cost of retesting and remedial work.

END OF SECTION 260500

**SECTION 260511 - REQUIREMENTS FOR ELECTRICAL INSTALLATIONS**

**PART 1 - GENERAL**

**A. WORK INCLUDED**

1. Applicable provisions of Bidding Requirements and Division 1 General Requirements apply to work of this Section.
2. Should a conflict arise between this section and other Sections, the General and Supplementary Conditions of Division 1 shall take precedence.
3. The word "Contractor" as used in these specifications shall be held to mean the person, firm or corporation contracting to do the herein described work.
4. The submittal of a proposal carries with it the agreement to all items and conditions referred to in the specifications and accompanying drawings.

**B. RULES AND REGULATIONS**

1. Comply with the rules, regulations, ordinances of all applicable governing bodies in force at the time of execution of the Contract, as well as the requirements of the local utility companies.

**C. PERMITS AND FEES**

1. Pay the cost of all fees, permits or licenses that may be required for the performance of the work described herein.

**D. PLANS AND SPECIFICATIONS**

1. The specifications and the accompanying drawings plans (architectural, site, structural, mechanical, electrical, fire protection and plumbing) are mutually explanatory and anything described or shown on one, but not on the other, shall be considered as if shown or described on all. The intention of the drawings and specifications is to provide complete functioning systems in every respect. Furnish all material and equipment and perform all labor to achieve this intent, whether or not such material or equipment is indicated herein. Whenever the term "provide" is used, it shall mean "furnish and install."
2. Data given herein and on the drawings is as exact as could be secured. Their absolute accuracy is not guaranteed. Obtain and verify exact locations, measurements, levels, space requirements, etc., at the site, and adapt the work to actual conditions at the building as constructed.
3. The drawings shall be considered schematic and are not intended to indicate all required

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materials. Conduit, wiring, equipment, etc., shall be installed so all items clear the structure and other building elements and maintain appropriate clearances for access, service and maintenance.

4. Some of the details on the drawings are schematic or diagrammatic. These details are not intended to show all materials, etc., required to achieve the arrangement shown. Adapt these details to the actual conditions of the job.
5. Routing of conduit and location of equipment and other devices are shown on plans for general guidance. This Contractor shall coordinate his work with other Contractors and shall provide necessary deviations in routing as far as 10 feet from those shown to provide systems as specified or implied, without interference and pursuant to these requirements at no additional cost to the Owner, Architect or Engineer.
6. Contractor shall not scale the drawings. Refer to architectural and structural drawings for building construction and dimensions and to room finish schedule on architectural drawings for material, finish and construction method of walls, floors and ceilings in order to insure proper rough-in and installation of contractor=s work.
7. Changes, modifications or variations to the plans and specifications will be issued by the Engineer in writing.

### E. DISCREPANCIES OR OMISSIONS

1. During the bidding period, any discrepancies or omissions in any of the documents or any doubt as to their meaning, should be reported to the Engineer who will, time permitting, issue a written instruction in the form of an addendum to all bidders of record. The Engineer will not be responsible for any oral explanations or interpretations of the documents.
2. During construction, should a discrepancy or omission be found, it shall be brought to the attention of the Engineer at once for resolution.
3. No changes in contract price will be allowed for minor changes in layout or location required to avoid interferences, obstructions, etc. Contract price changes will be considered only for changes in the scope of the project requirements. All such scope changes and price revisions must be authorized in writing.

### F. VISITING THE SITE

1. Before submitting a bid, visit the site and become acquainted with the conditions under which the work will be performed.
2. Failure to fully understand the existing site conditions under which the work is to be performed will not be justification for additional compensation after the award of the contract.

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### G. SHOP DRAWINGS

1. Submit shop drawings in compliance with the General and Special Conditions for all electrical equipment by specification section.
  2. Submit four (4) copies of all required Shop Drawings and material and equipment lists for the Engineer and Owner's sole use and any additional copies required for other use.
  3. Review and correct shop drawings before they are submitted. Shop drawings shall bear the signed and dated approval stamp of the Contractor.
  4. Shop drawings shall include the plan mark used on the plans.
  5. Equipment shop drawings shall give capacities at conditions specified, shall include manufacturer's catalog numbers and cuts. Shop drawings shall be clearly marked and shall indicate all accessories, items, conditions, etc., which are being furnished and all conditions of the plans and specifications are being met. Wiring diagrams shall also be submitted.
1. Submittals which do not provide the required information will be returned unchecked.
  2. Contractor shall be responsible for deviations, errors and omissions in submittals, and this responsibility shall not be relieved by Engineers' review of submittals.
  3. Coordinate each submittal with the contract documents, work of other contractors, and job site conditions.

### H. MAINTENANCE AND OPERATING INSTRUCTIONS AND MANUALS

1. Upon completion of the job, instruct the Owner's representatives in the proper operation and maintenance of the systems installed by this Contractor. Submit documentation indicating the date of instruction; names and organization of persons providing and receiving the instructions; systems the instructions covered; and materials received.
2. Submit three (3) complete sets of properly bound operating manuals to the Engineer for review. These manuals shall include the following:
  - a. Complete set of shop drawings.
  - b. Copies of all submittals.
  - c. Parts lists, wiring diagrams, piping diagrams, etc.
  - d. Manufacturers' operating and maintenance instructions.
  - e. Written operating and maintenance instructions for the system. This is a written version of Paragraph H-1 above.
  - f. Copies of warranties.

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g. Parts lists for each piece of equipment and name of local supplier.

### I. TEMPORARY POWER

1. The contractor=s temporary electric service facilities shall include all required panels, switches, protective devices, conduit, wiring, receptacles, etc., required to extend service and adequately distribute light and power in accordance with NEC Article 527. Coordinate details of service and metering for job site and construction offices with local utility company. Energy charges shall be paid by the General Contractor.
2. Temporary lighting shall consist of protected incandescent or fluorescent fixtures symmetrically spaced to produce a minimum of 3 footcandles throughout the work areas.
3. The service shall be available during all working hours and scheduled overtime hours and otherwise as necessary for security and safety purposes, with security lighting to be provided during all hours of darkness. All such facilities shall conform to all requirements of the National Electrical Code, the local utility, and all other governmental authorities having jurisdiction.

### J. AS-BUILT RECORD DRAWINGS

1. During construction, maintain a separate set of drawings at the jobsite to keep a record of all changes of locations. See additional requirements in General Conditions and Supplementary Conditions.
2. Locations of conduit and other concealed facilities shall be shown if and when they differ from the drawings. Underground conduit shall be dimensioned on those drawings.
3. "As built" drawings are to be submitted to Architect/Engineer for review prior to the time of request for final payment. Submit as-built record drawings in accordance with the General Conditions.

### K. GUARANTEE AND WARRANTY

1. Guarantee and warrant equipment, materials, workmanship, installation, etc., for a period of one year in accordance with the General Conditions.
2. During the guarantee period, make all required repairs and replacements, and provide necessary service, labor, tools, materials, parts, etc., at no additional cost to the Owner.

## PART 2 - PRODUCTS

### A. MATERIAL SUBSTITUTION

1. Equipment selection has been based on one manufacturer to establish the desired type,

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style, quality, performance, etc. When other manufacturers are listed as equally acceptable, the product of those manufacturers will be accepted if their product complies with these specifications and drawings. The listing of a manufacturer does not relieve that manufacturer from complying with the specifications and drawings.

2. Equipment and materials are subject to the review and approval of the Engineer and Architect.
3. Differences in cost involved in using an equally acceptable manufacturer shall be included in the bid. Contractor shall be responsible for any and all engineering and installation variations due to the substituted equipment. These include structural, electrical, architectural, plumbing, mechanical, fire protection, etc. changes.
4. Deviations from these specifications are not solicited and are not encouraged. If a deviation between the specifications or drawings and items bid does exist, then that deviation must be clearly itemized and explained on the bid form.

### PART 3 - EXECUTION

#### A. RESPONSIBILITY

1. Provide material, equipment, labor, services, supplies, etc., required to execute to completion work shown on the drawings, described in these specifications, or made necessary by the work shown on the drawings and/or described in these specifications.
2. Schedule work and furnish the required materials in such a manner that the work may progress from start to finish in an expeditious and efficient manner without undue interruption. Schedule the work to coordinate with the construction.

#### B. COORDINATION OF TRADES

1. Prior to the installation of any materials, review the drawings indicating work to be performed by each trade. If conflicts occur, they shall be brought to the attention of the Engineer for resolution.
2. Work installed without coordinating with the other trades, which causes interferences, shall be removed and reworked, at no cost to the Owner.
3. The Contractor supplying the equipment shall furnish all motors and components which are part of the equipment.
4. Control wiring is defined as that wiring which conducts electrical energy at a voltage of less than 100 volts. Interlock wiring is defined as that wiring which performs a control function, but at a voltage of 100 volts or greater. All other wiring shall be considered power wiring.

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5. The Electrical Contractor shall furnish and install all power wiring to, and including connection to the equipment. Unless specifically noted otherwise, all interlock wiring shall be furnished and installed by the Electrical Contractor. Unless noted otherwise, the control wiring shall be furnished and installed by the Contractor furnishing the controlled equipment.
6. Unless noted otherwise, the Electrical Contractor shall furnish and install all starters, disconnects, switches, push-button stations, etc., except those which are furnished with the equipment as a part of a factory-assembled package. Heater elements for overload relays on magnetic motor starters (except the starters factory pre-wired with equipment) shall be sized, furnished and installed by the Electrical Contractor. Magnetic motor starters for mechanical equipment (except starters factory pre-wired with equipment such as chillers and packaged air conditioners) shall be furnished by the Electrical Contractor. Magnetic motor starters will be provided with:
  - a. Auxiliary contacts as required by the interlocks defined on the drawings or in the specifications.
  - b. Control Power Transformer - 120 volt secondary, minimum 40 Volt Amps.
7. Each Contractor furnishing motor-operated equipment shall furnish a list of motor characteristics to the Electrical Contractor so that properly sized heater elements may be provided. The list shall include equipment identification by name and by number, the full load current, locked rotor current, voltage rating, and suggested service factor to compensate for operating duty cycle and ambient temperatures.
8. Unless specifically noted otherwise, pilot controllers (aquastats, flow switches, pressure switches, etc.) shall be furnished and mounted by the Contractor furnishing the controlled equipment.

### C. PROTECTION OF EQUIPMENT AND WORK

1. Protect and preserve materials, supplies, equipment, piping, etc., from damage due to weather, corrosion, dirt, vandalism, theft, etc. Provide enclosures or special protection as indicated by circumstances.
2. Should any of the materials, equipment, etc., be damaged as a result of his negligence, then this Contractor shall be held responsible for all such damage and costs incurred for repair or replacement.

### D. CONSTRUCTION STAGING

1. Plan, coordinate and schedule the work to satisfy the project schedule.
2. Work shall be so arranged that electrical power and other services are available to the building at all times, except for short periods of interruption necessary for the

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performance of new work. Interruptions shall not be requested until the new services are complete and ready for final connection.

3. Interruptions shall be scheduled, and services shall not be interrupted without written approval of the Owner's Representative. Notification to the Owner's Representative shall include the exact time and estimated duration of any interruption.

### A. EQUIPMENT FURNISHED BY OTHERS

1. Some pieces of equipment, as indicated on the drawings, will be furnished by the Owner and/or under other Divisions of these specifications. Provide electrical work as shown for connections to this equipment.
2. Start-up of equipment furnished by the Owner or under other Divisions of these specifications shall be the responsibility of this Contractor under the Section assigned the responsibility to receive and set in place or to move and set in place.
3. Warranties for equipment furnished shall be by the equipment manufacturer.

### B. MAINTENANCE OF WORK AREAS

1. This Contractor shall maintain the work area in an organized manner, shall not allow debris to accumulate, and shall store equipment, tools and supplies in a manner which shall not cause interference with the activities of others engaged on the project.
2. Open ends of conduit, equipment and specialties shall be kept properly closed during construction and installation so as to avoid contamination.

### I. CLEANING AND CLEANUP

1. Upon completion of this work, clean all panels, fixtures, and equipment. Leave all work in a finished, clean, and satisfactory working condition.

END OF SECTION 260511



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### SECTION 260519 – CONDUCTORS AND CABLE

#### PART 1 - GENERAL

##### A. SUMMARY

1. This section includes conductors, wires, cables and associated splices, connections and terminations for wiring systems rated 600V or less.

##### B. QUALITY ASSURANCE

1. Conductors and cable shall conform to UL, NEMA and IPCEA requirements.

#### PART 2 - PRODUCTS

##### A. CONDUCTORS

1. Provide copper conductors with insulation rated for 600 volts, type THHN or THWN.
2. Conductors No. 10 AWG and smaller shall be solid. Conductors No. 8 AWG and larger shall be stranded.
3. Provide single copper conductors throughout. Provide No. 12 AWG minimum branch circuit wire size. Provide No. 14 AWG for control circuits, unless otherwise specified or required by overcurrent protection.
4. For exterior feeders or branch circuits, provide Type RHW-USE or THW-THWN conductors installed in underground raceways.

##### B. CONNECTORS FOR CONDUCTORS

1. Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for application and for service indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

##### C. CABLES

1. Type MC cable shall be THHN/THWN insulated circuit conductors with full size insulated ground wire enclosed within flexible metal covering. Metal covering shall be galvanized steel or aluminum.

Type AC cable shall have THHN/THWN insulate circuit conductors with bonding conductor enclosed with flexible metal covering. Metal covering shall be galvanized steel or aluminum.

2. Connectors and fittings for type MC and type AC cable shall be manufactured and listed for that purpose.

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3. Type NM cable is permitted as allowed by the NEC.

### PART 3 - EXECUTION

#### A. CONDUCTOR SIZES AND TYPES

1. Low voltage wire and cable for audio, signal and control cables are specified elsewhere in this Specification.
2. Any 120V lighting and receptacle circuit, whose home run length from panel to first fixture or device exceeds seventy-five (75) feet for 120V circuits, shall not be less than 10 gauge for the entire length of run, to minimize voltage drop.
3. Wire size and insulation type entering any lighting fixture or equipment shall be as recommended by the manufacturer and as minimally required by the codes. Where no recommendation is given by the manufacturer, the wire size and insulation type shall meet the minimum rating of the wiring or terminations used in the fixture or equipment.
4. Conductor sizes for motors, equipment and feeders shall be as indicated. See Schedules on drawings.
5. Type AC cable may be used only for flexible connections to recessed lighting fixtures from separately mounted outlet boxes. Length shall not exceed six feet.
6. Type MC cable may be used only for flexible wiring from outlet boxes mounted above accessible ceilings to wall switches and wall mounted 120V duplex receptacles. Outlet box when flexible cable starts shall be part of branch circuit conduit system mounted in accessible ceiling space.

#### B. INSTALLATION

1. Wire and cable shall be installed in conduit, duct, wireway, surface raceway or other raceway specified. No conductors or cables shall be installed in conduits, ducts or raceways until the raceway system has been completed and free of any dirt or water. When installing conductors, exercise due care to prevent damage to conductors and insulation.
1. Wire 10 gauge or smaller shall be spliced, tapped or joined in outlet or junction boxes with solderless spring-type connectors. Bakelite insulated wire nuts are not approved.
2. Conductors 8 gauge and larger shall be terminated using bolted pressure or compression type connectors. They shall be specifically designed for use with the type conductors being installed in compliance with manufacturer's recommendations.
3. Uninsulated splices, joints and free ends of conductors shall be covered with rubber and friction tape or high dielectric polyvinylchloride Scotch No. 33 Plus electrical tape.

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4. Feeder cables shall be continuous from origin to panel or equipment termination without splices in intermediate pull or splice boxes or raceway runs. Where taps and splices are necessary, they shall be made in approved splice boxes with suitable compression type connectors.
5. Fixture and branch circuit wiring joints in exterior junction and outlet boxes shall be made with waterproof connectors rated at 600 volts maximum (1,000 volts when enclosed in fixture or sign).
6. Exterior branch circuit conductor splices below grade shall occur only in gasketed weatherproof junction boxes. Use split bolt connector with Okonite self fusing tape #35, wrapped by Scotch #33 Plus tape and sealed with A3M@ Gella encapsulant.
7. Coordinate wire installation with other work.
8. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary.
9. Use pulling means including fish tape, cable, rope and basket weave wire/cable grips which will not damage cable or raceways. Do not use rope hitches for pulling attachment to wire or cable.
10. Keep conductor splices to a minimum. Provide splice and tap connectors which possess better mechanical strength and insulation rating than conductors being spliced. Use splice and tap connectors which are compatible with conductor materials.
11. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Make terminations so there is no bare conductor at the terminal. Bundle conductor sizes #12 and #10 together. Bundle individual circuits larger than #10 separately.
12. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer=s published torque tightening values. Where manufacturer=s torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.
13. Connect wiring devices, light fixtures, panelboard devices and other electrical equipment to the wiring systems as indicated and in accordance with manufacturer=s instructions.
14. Leave a minimum of 12" pigtail at each outlet for termination purposes.
15. Home runs shall be in conduit. Not more than six (6) branch circuits may be grouped in one (1) homerun to a branch circuit panelboard.
16. Through-wiring is not permitted for recessed lighting fixtures. Each recessed lighting fixture shall be connected by flexible metal-clad cable to a separate junction box mounted above ceiling, which may serve no more than four fixtures.

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This flexible cable shall be Type MC or AC cable, with ground.

C. FIELD QUALITY CONTROL

1. Prior to energizing, check installed wires and cables with megohm meter to determine insulation resistance levels to assure requirements are fulfilled.
2. Prior to energizing test wires and cables for electrical continuity and for short-circuits and proper phase relationship.
3. Subsequent to wire and cable hook-ups, energize circuits and demonstrate proper functioning. Correct malfunctioning units, and retest to demonstrate compliance.

END OF SECTION 260519

**SECTION 260521 - ELECTRICAL CONNECTIONS FOR EQUIPMENT**

**PART 1 - GENERAL**

A. SUMMARY

1. This section covers electrical connections to equipment.

B. EQUIPMENT CONNECTIONS

1. Extent of electrical connections for equipment is indicated by drawings and schedules. Electrical connections are hereby defined to include connections used for providing electrical power to equipment.
2. Refer to drawings for additional requirements.
3. Applications of electrical power connections specified in this section include the following:
  - a. From electrical source to motor starters.
  - b. From motor starters to motors.
  - c. From electrical source to equipment with pre-wired control panels.
4. Provide electrical connections for equipment, specified in Division 22,23 and in other Division 26 sections.
5. Provide motor starters and controllers, not furnished as part of equipment.
6. Refer to Division 22 and 23 sections for motor starters and controllers furnished with equipment.
7. Provide disconnect switches and junction boxes required for connecting motors and other electrical units of equipment.
8. Provide electrical identification for wire/cable conductors.
9. Provide raceways and wires/cables required for connecting motors and other electrical units of equipment.
10. Temperature control system wiring will be provided under Division 23.
11. Provide electrical work for kitchen equipment as described herein, and as indicated on the drawings.
12. Refer to sections of other divisions for specific individual equipment power requirements requiring electrical connections.

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### C. QUALITY ASSURANCE

1. ANSI Compliance: Comply with applicable requirements of ANSI/NEMA and ANSI/EIA standards pertaining to products and installation of electrical connections for equipment.
2. U.L. Compliance: Comply with U.L. Std. 486A, Wire Connectors and Soldering Lugs for Use with Copper Conductors including, but not limited to, tightening of electrical connectors to torque values indicated. Provide electrical connection products and materials which are U.L. listed and labeled.
3. Comply with NFPA 70 National Electrical Code for components and installation.

### PART 2 - PRODUCTS (NOT APPLICABLE)

### PART 3 - EXECUTION

#### A. INSPECTION

1. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

#### B. INSTALLATION OF ELECTRICAL CONNECTIONS

1. Install electrical connections as indicated, in accordance with equipment manufacturer's written instructions and with recognized industry practices and complying with applicable requirements of U.L., NEC and NECA's Standard of Installation to ensure that products fulfill requirements.
2. Coordinate with other work, including wire/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
3. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and

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wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

4. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating than, electrical insulation rating of those conductors being spliced.
5. Prepare cables and wires by cutting and stripping covering armor, jacket and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid Aringing@ copper conductors while skinning wire.
6. Trim cables and wires as short as practicable and arrange routing to facilitate inspections, testing and maintenance.
7. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer=s published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench and ratchet wrench with adjustable torque settings. Where manufacturer=s torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in U.L=s 486A.
8. Provide flexible conduit for motor connections and other electrical equipment connections, where subject to movement and vibration.
9. Provide liquid-tight flexible conduit for connection of motors and other electrical equipment where subject to movement and vibration, and also where connections are subjected to one or more of the following conditions:
  - Exterior location
  - Moist or humid atmosphere where condensate can be expected to accumulate
  - Corrosive atmosphere
  - Water spray
  - Dripping oil, grease or water
10. Fasten identification markers to each electrical power supply wire/cable conductor which indicates their voltage, phase and feeder numbers. Affix markers on each terminal conductor, as close as possible to the point of connection.

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C. FIELD QUALITY CONTROL

1. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION 260521



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### **SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

#### **PART 1 - GENERAL**

- A. Section Includes
  - 1. Conduit and equipment supports.
  - 2. Anchors and fasteners.
- B. References
  - 1. NECA - National Electrical Contractors Association.
  - 2. ANSI/NFPA 70 - National Electrical Code.

#### **PART 2 - PRODUCTS**

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide material, sizes and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- C. Anchors and Fasteners:
  - 1. Concrete structural elements: Use expansion anchors.
  - 2. Steel structural elements: Use beam clamps, spring steel clips, steel ramset fasteners, or welded fasteners.
  - 3. Concrete surfaces: Use self-drilling anchors and expansion anchors.
  - 4. Hollow Masonry, plaster, and gypsum board partitions: Use toggle bolts and hollow wall fasteners.
  - 5. Solid masonry walls: Use expansion anchors.
  - 6. Sheet Metal: use sheet metal screws.
  - 7. Wood elements: Use wood screws.
- D. Steel strut framework: Provide 12 gauge minimum size framework for supporting electrical enclosures where noted or where necessary for a rigid installation.

#### **PART 3 - EXECUTION**

- A. Installation
  - 1. Install products in accordance with manufacturer=s instructions.

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2. Provide anchors, fasteners, and supports in accordance with NECA AStandard of Installation@.
3. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
4. Do not drill or cut structural members.
5. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
6. Install surface-mounted equipment enclosures with minimum of four anchors.
7. In wet and damp locations use steel channel supports to stand equipment enclosures one inch off wall.
8. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

ENDO OF SECTION 260529

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### SECTION 260533 - RACEWAYS, FITTINGS AND BOXES

#### PART 1 - GENERAL

##### A. SUMMARY

1. This section includes raceways, fittings and outlet boxes.

##### B. QUALITY ASSURANCE

1. Comply with NFPA 70 ANational Electrical Code® for components and installation.

#### PART 2 - PRODUCTS

##### A. RACEWAYS. Raceways shall be new and shall bear the UL label.

1. Electrical Metallic Tubing: Shall be cold rolled welded steel conduit, galvanized on both the outside and inside. Connectors and couplings shall be steel alloy, raintight and concrete tight. Setscrew connectors and couplings are approved for indoor exposed or concealed (but not encased in concrete or masonry) work only. Gland compression connectors and couplings are approved for all locations. Indenter type connectors and couplings are not approved. Connectors up to and including size 1-1/2" shall be with insulated throat. Connectors shall be terminated with a bonding type locknut and for conduit sizes 2" and larger, a plastic insulated bushing. Threaded steel insulated grounding bushings having solderless lugs shall be used where required. Comply with ANSI C80.3.
2. Intermediate Metal Conduit (IMC): Shall be zinc-coated steel tubing. Comply with ANSI C80.6.
3. Rigid Steel Conduit: Shall be zinc-coated rigid steel conduit and conduit fittings. Comply with ANSI C80.1 and UL 6. Couplings and fittings shall be of the threaded type. Threadless fittings shall be used only when specific approval is given by the engineer.
4. Flexible Metallic Conduit: Shall be zinc-coated steel, single strip type, UL listed. Use American Brass "Sealtite" flexible, liquid-tight conduit in damp or wet locations.
5. Surface Metal Raceways: Shall be a two-piece steel raceway with removable covers, sizes indicated on the drawings, complete with fittings and all components necessary for a complete installation.
6. Rigid Pvc Conduit: Shall be heavy wall polyvinyl chloride conduit, Carlon Type 40 (NEMA EPC-40-PVC, Type II/III).
7. Wireway: Shall be constructed of code gauge steel and shall be in accordance with Underwriters Laboratories Standard UL-870 for Wireways, Auxiliary Gutters and Associated Fittings. Wireway shall be lay-in type (no cross bars or straps) with hinged cover. Indoor wireway shall be constructed with knockouts.

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Outdoor wireway shall be raintight with no knockouts. Sheet metal parts shall be coated with a rust-inhibiting primer and a gray baked enamel finish. Hardware shall be plated to prevent corrosion. Wireway shall be of standard dimensions and sized in accordance with the National Electrical Code for the particular installation.

### B. OUTLET BOXES

1. Provide outlet boxes, pull boxes, and conduit fittings as described below. Catalog numbers shown are those of Appleton Electric Company, Steel City, National Electric Products Corp., and Raco are equally acceptable.
  - a. Lighting Boxes (concealed) - No. 40-3/4
  - b. Lighting Boxes (concrete) - No. OCR Series
  - c. Lighting Boxes (exposed) - No. 4S-3/4 or 40-3/4
  - d. Switch, Receptacle, Telephone and Junction Boxes (flush) - No. 4S-3/4 or No. 225 where separate extension or plaster ring cannot be used.
  - e. Switch, Receptacle, Telephone and Junction Boxes (exposed) - FS Series
  - f. Weatherproof or Exterior Boxes - FS Series with cast cover and neoprene gasket.
2. Where space is limited, No. 4CS-3/4 handy boxes may be used for a switch, receptacle, telephone or other outlet.
3. Provide extension and plaster rings as required.
4. Size outlet boxes in accordance with the allowable fill permitted by the National Electrical Code.

- C. PULL BOXES. Provide code gauge galvanized sheet metal pull boxes sized as per the National Electrical Code or as shown on the drawings. Provide a removable cover on the largest access side of the box unless otherwise detailed. Where cast boxes are specified, provide conduit entrances with threaded hubs. Provide stainless steel screws in all exterior locations and in wet or damp locations.

## PART 3 - EXECUTION

### A. RACEWAYS - GENERAL

1. Install all wiring, including telephone, dictation, low voltage, etc., in metal raceways as indicated on the plans.
2. Install raceways concealed, except in mechanical equipment rooms or where indicated on the plans.
3. Minimum raceway size shall be 1/2".

### B. APPLICATION

1. Conduits located exposed, concealed inside shafts, in concrete slabs above grade,

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above ceilings, and in walls shall be EMT.

2. Conduits run horizontally between boxes containing wiring devices in walls shall be either EMT, metallic flexible conduit or MC cable. The maximum length of metallic flexible conduit between wiring devices in furred walls shall be ten (10) feet. All other horizontal conduit in furred walls shall be EMT.
3. Exterior conduits exposed above grade shall be IMC, 3/4" minimum.
4. Sleeves, conduits in slabs on grade, and conduits for feeders over 600 volts shall be rigid steel conduit.
5. Conduits for connection to vibrating equipment such as motors, transformers, etc., and for heat loops to light fixtures from junction boxes above them shall be metallic flexible conduit, maximum length of six feet. Weatherproof Sealtite shall be used in damp or wet locations.
6. Conduits located below grade in direct contact with the earth shall be schedule 40 PVC or rigid steel conduit. These raceways shall be encased in 3 inches of concrete where indicated.

### C. INSTALLATION

1. Continuity. Provide metallic raceways continuous from outlet to outlet, and from outlets to cabinets, junction or pull boxes. Enter and secure conduit to all boxes to provide electrical continuity from the point of service to outlets. Provide double locknut and bushing on terminals of metallic conduits.
2. Raceways Exposed. Run exposed raceways in straight lines at right angles or parallel with walls, beams or columns.
3. Raceways in Concrete
  - a. Do not place raceways in plain concrete, such as cement toppings on structural floors, without special approval of the Architect.
  - b. Do not displace reinforcing steel to accommodate the installation. In general, locate all embedded conduits in the physical center of the particular section of concrete. Provide raceways embedded in reinforced concrete conforming to the following usual types of conditions.
  - c. Floors and Walls - Maximum Allowance: displacement of 1/3 of thickness of concrete, spaced not less than three diameters on centers.
4. Sleeves: Sleeves through floors and walls shall be not less than three diameters on centers. Conduit sleeves in floors shall be steel and shall extend 3 inches above the finished floor and flush with the underside of the floor slab.
5. Sealing of Sleeves. Openings and sleeves through which a conduit passes in

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walls, floors, and ceilings shall be properly sealed after the conduit is installed to prevent transmission or leakage of liquids, fire, smoke, and sound. Openings in concrete or masonry wall construction through which conduit passes shall be sealed, after the conduit is installed with material similar to that which surrounds the opening. Conduit passing through drywall construction or sleeves shall be sealed with mineral wool tightly packed around the conduit in the opening after which both sides of the opening shall be caulked with a resilient non-hardening caulking such as U.S.G. Acoustical Sealant, Tremco, or approved equal. Conduit passing through a fire rated acoustical tile ceiling shall be sealed with mineral wool tightly packed around the conduit in the opening, maintaining the fire rating of the acoustical tile ceiling. Conduit passing through concrete floor construction or sleeves shall be sealed with mineral wool tightly packed around the conduit in the opening, after which both sides of the opening shall be caulked with a resilient non-hardening caulking such as U.S.G. Acoustical Sealant, Tremco, or approved equal. The use of Chase Foam or "Fire-Seal" fittings as manufactured by O-Z/Gendey is approved for conduit passing through fire rated walls.

6. Raceways Through Roof. Where raceways penetrate the roof seal, provide suitable pitch pockets of lead flashing.
7. Raceways Entering the Building below Grade. Provide raceways with galvanized cast-iron wall entrance seals, having a watertight sealing gland assembly where the raceways enter into a dry (excavated) area.
8. Bends. Where more than one conduit in a bank of exposed conduit changes direction, all bends shall be concentric. Conduit bends shall not be less than standard radius. Conduit bends for power feeders over 600 volts and for telephone feeders shall be long radius.
9. Threads. Clean all threads of rigid conduit. Coat all male threads of all steel conduit installed underground or in or under concrete slabs with teflon immediately before being coupled together.
10. Running Threads. Use "Erickson" type couplings in lieu of running threads.
11. Protection. Cap raceways stubbed up, including those in cabinets, immediately upon their installation. The use of paper or rag wads will not be permitted.
12. Expansion Joints. Provide raceways crossing expansion joints with Type AJ bonding jumper for rigid conduit, and Type TJ bonding jumper for electric metallic tubing. Where differential settlement may occur, use deflection fittings.
13. General Location Requirements. Raceway runs shown are diagrammatic. Determine exact locations in the field except where otherwise noted or where dimensions are specified on the drawings. Conduits shall not run within 12 inches of pipes carrying hot liquids, steam, or gases.
14. Pull Wires. Empty conduits shall be provided with a pull wire.

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### D. RACEWAY SUPPORTS

1. Supports. Install raceway supports in accordance with the requirements of the National Electrical Code. Do not anchor or strap conduits to the ceiling furring channels or attach to ceiling hanger wires.
2. Straps and Hangers. Conduit shall be supported from building structure on approved types of galvanized brackets, ceiling trapeze or pipe straps, or hangers secured by means of toggle bolts on hollow masonry; or expansion bolts in concrete or brick; or machine screws on metal surfaces; or wood screws on wood construction. Conduits shall be attached to the hanging systems by fittings equal to those manufactured by Caddy Fasteners. Nails shall not be used as a means of fastening boxes or conduits. Perforated flat steel straps shall not be used for supporting conduit. Conduits shall not be supported from ductwork or ductwork supports. Conduit shall be properly supported in order to deter any possible vibration, noise, or chatter.

### E. JOINTS AND CONNECTIONS

1. Metal Conduits. Make watertight all couplings and threaded connections in threaded conduit. Cut all joints square, ream smooth, and properly thread. Fit all box connections with a minimum of two approved locknuts and one steel, plastic or fiber bushing forming an approved tight bond with box. Provide locknuts both inside and outside of the enclosure to which the conduit is attached. Use raintight compression type fittings for electrical metallic tubing systems and use at least one locknut on the inside of each enclosure entry. Provide grounding locknuts or bushings where required in Section GROUNDING SYSTEM.
2. PVC Conduits. Make watertight all couplings and connectors in conduit runs. Utilize solvent cement joints of a type approved by the manufacturer for all couplings and fittings. Provide adapters and locknuts where conduit is attached to metal junction boxes, panels, etc.
3. Join raceways with fittings designed and approved for the purpose and make joints tight. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight. Use insulating bushings to protect conductors.
  1. Tighten set screws of threadless fittings with suitable tool.
  2. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely, and install the locknuts with dished part against the box.
  3. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
  4. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixture; for equipment subject to vibration,

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noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor in flexible connections.

### F. BOX APPLICATIONS

1. Outlet Boxes and Fittings: Install outlet and device boxes and associated covers and fittings of materials and NEMA types suitable for each location and in conformance with the following requirements:
  - a. Interior Dry Locations: Sheet steel, NEMA type 1.
  - b. Locations Exposed to Weather or Dampness: Cast metal, NEMA type 3R.
  - c. Wet Locations: NEMA type 4 enclosures.
2. Through-wall boxes are not permitted. Offset back-to-back boxes in the same wall not less than 3".
3. Pull and Junction Boxes: Install pull and junction boxes of materials and NEMA types suitable for each location, except as otherwise indicated.

### G. OUTLET BOX INSTALLATION

1. Install items where indicated and where required to suit code requirements and installation conditions.
2. Cap unused knockout holes where blanks have been removed and plug unused conduit hubs.
3. Support and fasten items securely in accordance with Division 16 Section ASupporting Devices.©
4. Sizes shall be adequate to meet NEC volume requirements, but in no case smaller than sizes indicated.
5. Remove sharp edges where they may come in contact with wiring or personnel.
6. Mounting: Mount outlet boxes for switches with the long axis vertical. Mount boxes for receptacles vertically. Three or more gang boxes shall be mounted with the long axis horizontal. Locate box covers or device plates so they will not cover different types of building finishes either vertically or horizontally. Locate boxes for switches near doors on the side opposite the hinges.
7. Ceiling Outlets: For fixtures, where wiring is concealed, use outlet boxes 4-inches square by 1-1/2 inches deep, minimum.
8. Protect outlet boxes to prevent entrance of plaster and debris. Thoroughly clean foreign material from boxes before conductors are installed.

END OF SECTION 260533



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### SECTION 262416 - PANELBOARDS

#### PART 1 - GENERAL

##### A. SUMMARY

1. This section covers circuit breaker lighting and power panelboards and fusible panelboards.

##### B. QUALITY ASSURANCE

1. Panelboards shall comply with the requirements of the National Electrical Code, NEMA, ANSI, IEEE and OSHA. Panelboards shall bear the Underwriter's Laboratories Label.
2. Comply with NEMA Standard PBI, .
3. Comply with UL Standards 67, and UL50.

#### PART 2 - PRODUCTS

##### A. CIRCUIT BREAKER LIGHTING AND POWER PANELBOARDS

1. Panelboards shall be dead front safety type equipped with circuit breakers. Each panelboard shall have an integrated short circuit withstand rating equal to the short circuit interrupting capacity of the circuit breakers. Panelboard bus structure and main lugs or main circuit breaker shall have current and voltage ratings, and number of phases, poles, and wires as indicated on the drawings.
2. Circuit breakers shall be quick-make, quick-break, bolt-on type having over-center toggle mechanisms with thermal-magnetic trips and shall be trip free. Multi-pole circuit breakers shall have common trips and a single operating handle. Handle tie bars will not be accepted. Circuit breakers shall be provided with a means for indicating a tripped position. Branch circuit breakers shall be replaceable without disturbing adjacent units. Circuit breaker voltage, ampere rating, and number of poles shall be as indicated on the drawings. Circuit breakers shall have a minimum short-circuit interrupting capacity of 22,000 amperes RMS for 120/240V panels. Circuit breakers shall be equipped with individually insulated, braced, and protected connectors.
  - a. Circuit breakers for switching light at panelboards shall be type SWD.
  - b. Circuit breakers for equipment marked HACR Type shall be HACR type.
  - c. circuit breakers in dwelling units shall be arc fault type as required by the NEC
3. UL class A (5 milliampere sensitivity) ground fault circuit protection shall be provided on 120 VAC branch circuits as shown on the plans or in the panelboard details. This protection shall be an integral part of the branch circuit breaker

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which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit breaker containing ground fault circuit interruption shall not disturb the feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard branch circuit space than a conventional single pole circuit breaker.

4. The panel box shall be fabricated from code gauge galvanized steel. Unless otherwise indicated, panelboards shall be standard width with boxes having a minimum width of 20 inches and a maximum depth of 5-3/4 inches.
5. The panelboard front shall be surface or flush mounted as indicated on the drawings, fabricated from cold-rolled steel, coated with rust-inhibiting primer, finished with ANSI-61 light gray baked-on enamel paint, and shall have a door equipped with concealed hinges, a semi-flush or flush lock requiring a milled key, a framed directory card with a clear plastic covering mounted on the inside of the door. At least two keys shall be provided with each panelboard and all panelboard locks shall be keyed alike. The panelboard front shall be fastened to the panel box with machine screws or other approved fastening hardware and shall not be removable with the door in the closed position.
6. Interiors shall be equipped with bussing, circuit breakers, and adjustable means for positioning the interior within the enclosure.
7. Main bus and circuit breaker branch bus shall be copper having 98% conductivity. Aluminum bus shall not be acceptable. Full size neutral busses shall be insulated from the panelboard. The location of the main terminations shall be determined by the entrance of the feeders to the panelboard enclosure. In those cases where the feeders pass through the panelboard assembly, extra wide gutters shall be provided.
8. Double width panels: Where more than 42 poles are indicated or where otherwise indicated, provide two panelboards under single front, each section with separate door and each section with similar space configuration.
9. The panelboard interior shall be provided with a copper ground bus, which shall be bonded to the panelboard enclosure. Provide separate isolated ground bus where indicated, or where required.
10. The neutral bus and the ground bus shall be provided with an individual terminal or lug for each wire connected to it.
11. Terminals for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminal for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type of conductor specified.
12. Bussing sequence shall be distributed phase sequence type. Bus sequence shall start at the top left phase bus of the interior for both top and bottom feed panels. Provisions or spaces for future breakers shall be located at the bottom of the panel and be fully bussed complete with all necessary mounting hardware less

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the breaker. Locate next to each breaker, space, or provision an individual number permanently affixed to the panelboard. Numbering tape or painted numbers shall not be acceptable.

13. The inside of the panel or door shall have a printed nameplate indicating the name of the panel manufacturer, shop order number, panel type, system voltage and bus ampacity. Panel shall be marked with its UL short circuit withstand ratings.
14. Load centers are permitted for interior of cabins.

### B. FUSIBLE PANELBOARDS

1. Fusible power panelboards shall be dead-front safety type. The panel, including all bus bracing, disconnect switches, fuse clips, and associated current carrying components, shall have a minimum integrated short circuit withstand rating of 200,000 amperes RMS symmetrical. The panel bus structure and main lugs or main switch shall have current and voltage ratings, and number of phases, poles, and wires as indicated on the drawings.
2. Bus bars shall be copper. Neutral busses shall be insulated from the panel. Main horizontal bussing shall be full size throughout without reduction. The bus structure shall accommodate bolted branch switches as indicated on the drawings without modification to the bus assembly. No additional lineside wiring shall be necessary to add disconnect switches. Space for future switches shall be bussed for the maximum devices that can be fitted into them.
3. The disconnect switches shall be quick-make, quick-break, fusible, dual horsepower rated, dead front, front accessible, having visible blades. Switch handles shall physically indicate ON and OFF position. Such handles shall also be able to accept three padlocks having heavy duty industrial type shackles, and be padlocked in the OFF position. Covers shall be interlocked with the switch handles to prevent opening in the ON position. An interlock override device shall be provided to allow authorized personnel to release the interlock for inspection purposes when the switch is in the ON position. Switch ampere rating and number of poles shall be as indicated on the drawings. Fuse clips shall accommodate the classification of fuses as indicated in the FUSES specification section.
4. Panel interiors shall be provided with a copper ground bus bonded to the panel enclosure.
5. The panel assembly shall be enclosed in a surface mounted steel cabinet. The rigidity and gauge of the steel shall be as specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with UL Standard 67. Cabinets shall be quipped with a four-piece front without door and shall have self-adjusting trim clamps or other approved fastening hardware. Fronts shall be of full-finished steel, coated with rust-inhibiting primer and finished with ANSI-61 light gray baked-on enamel paint.
6. The outside of the panel shall have a printed nameplate indicating the name of

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the panel manufacturer, the manufacturer's shop order number, panel type, system voltage, and bus ampacity.

7. Wiring terminals for conductors leaving the panel shall be designed to be used with the type of conductor specified.

### PART 3 - EXECUTION

- A. General: Install panelboards and accessory items in accordance with NEMA PB 1.1, *General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less* and manufacturer's written installation instructions.
- B. Ground Fault Protection: Install panelboard ground fault circuit interrupter devices in accordance with installation guidelines of NEMA 289, *Application Guide for Ground Fault Circuit Interrupters*.
- C. Mounting Heights: Top of trim 6'-0" above finished floor, except as indicated.
- D. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish.
- E. Circuit Directory: Provide typed directory reflective of final circuit changes required to balance panel loads.
- F. Install filler plates in unused spaces.
- G. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future.
- H. Auxiliary Gutter: Install where a panel is tapped to a riser at an intermediate location.
- I. Wiring in Panel Gutters: Train conductors neatly in groups, bundle and wrap with wire ties after completion of load balancing.
- J. Install panelboards with proper area code required clearances at front of and above equipment. Coordinate with other trades prior to rough-in. Verify proper wall thickness for recessed panels.
- K. Each panelboard shall have a black plastic nameplate with 1/4" white letters, indicating the panel number as shown on the drawings.

END OF SECTION 262416

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### SECTION 262726 - WIRING DEVICES

#### PART 1 - GENERAL

##### A. SUMMARY

1. This section covers wiring devices, including floor boxes and outlets, and multi-outlet surface metal raceways.

##### B. RELATED SECTIONS

1. Provide boxes and raceways as specified in Section RACEWAYS, FITTINGS AND BOXES.

##### C. QUALITY ASSURANCE

1. Wiring devices shall comply with NEMA Standards WD-1 and WD-6.

#### PART 2 - PRODUCTS

##### A. SWITCHES

1. Switches shall be specification grade, quiet operating type rated 120/277V, 20 amperes, ivory color, types as listed below:
2. Switches shall comply with UL Standard 20, and with Federal Specification W-S-896.

##### B. RECEPTACLES

1. Receptacles shall be NEMA 5-20R, grounding type, rated 20 amperes, 125 volt, ivory color, types as listed below:
2. Dryer receptacle shall be NEMA 14 30R grounding type, rated 30 amperes, 3 pole, 4 wire, 125/250 volt black color, types as listed below:
3. Range receptacle shall be NEMA 14-50R grounding type, rated 50 amperes, 3 pole, 4 wire, 125/250 volt black color types as listed below:
4. Receptacles shall comply with UL Standard 498 Federal Specification WC596F

##### A. COVERPLATES

1. Provide coverplates of the appropriate type and size on all devices.
2. Coverplates shall be Ivory color, smooth thermoplastic.
3. Where devices are installed in exposed fittings or boxes, use "FSK" covers.
4. Install blank covers on boxes without devices.

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5. Weatherproof Cover Plates
  - a. Vertical mounting: Cast aluminum mounted on FS/FD box, suitable for GFI receptacle; Horizontal Mounting: Cast aluminum, mounted on FS/FD box, suitable for GFI receptacle.

### PART 3 - EXECUTION

#### A. INSTALLATION

1. Install devices and assemblies plumb and secure.
2. Install wall plates when painting is complete.
3. Arrangement of Devices: Except as otherwise indicated, mount flush, with long dimension vertical and grounding terminal of receptacles on top. Group adjacent devices under single, multi-gang wall plates.
4. Protect devices and assemblies during painting.
5. Adjust location where floor service outlets and telephone/power service poles are installed to suit the indicated arrangement of partitions and furnishings.
6. Receptacles shall be repositioned not more than 10 feet from location indicated, when so directed by the Architect, at no cost to the owner.

Install exterior GFI receptacles horizontally, with weatherproof cover plate.

#### B. GROUNDING

1. Receptacle ground terminal: Connect ground terminal to grounding conductor routed with circuit conductors.

#### C. FIELD QUALITY CONTROL

1. Testing: Test wiring devices for proper polarity and ground continuity.
2. Test ground-fault circuit interrupter operation according to manufacturer recommendations.
3. Replace damaged or defective components.

#### D. CLEANING

1. General: Internally clean devices, device outlet boxes and enclosures. Replace stained or improperly painted wall plates or devices.

END OF SECTION 262726

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### SECTION 262728 - SAFETY SWITCHES

#### PART 1 - GENERAL

##### A. SUMMARY

1. This section covers Safety Switches.
2. Furnish and install safety disconnect switches where indicated on the drawings and as specified elsewhere herein.

##### B. QUALITY ASSURANCE

1. Switches shall be Underwriter's Laboratories, Inc., listed, and shall meet Federal Specification WS-865c and NEMA Specifications KS1.

#### PART 2 - PRODUCTS

##### A. SAFETY SWITCHES

1. Disconnect safety switches shall be single-throw, nontearable positive quick-make, quick-break contact mechanism, fusible or non-fusible as indicated, heavy duty, horsepower rated, dead front, and front accessible. The switch handle shall physically indicate the ON and OFF positions. Such handles shall also be able to accept a padlock having heavy duty industrial type shackles, and be padlocked either in the ON or the OFF position. Covers shall be interlocked with the switch handles to prevent opening in the ON position. An interlock override device shall be provided to allow authorized personnel to release the interlock for inspection purposes when the switch is in the ON position. Switch ampere rating and number of poles shall be as indicated on the drawings. Fuse clips shall be positive pressure cartridge type and shall accommodate the classification of fuses as indicated on the drawings and/or as specified.
2. The disconnect handle shall be attached to the box or enclosure base, and not to the cover. Terminal lugs shall be Underwriter's Laboratories listed for copper and aluminum cables and shall be front removable. All current carrying parts shall be plated by electrolytic processes.
3. Switch enclosures shall generally be NEMA 1 general purpose, code gauge sheet steel. Switches located outdoors or in wet locations shall be NEMA 3R raintight, code gauge galvanized steel and are identified on the drawings as weatherproof (WP). Switches located in food service preparation and dishwashing areas shall be NEMA 4 watertight, stainless steel. Switches located in hazardous areas shall have enclosures of the proper NEMA type construction for the location and application and will be so indicated on the drawings. Enclosures shall meet Underwriter's Laboratories Standard 98, and shall be treated with a rust-inhibiting phosphate and finished in gray baked enamel paint.
4. Heavy duty switches shall have permanently attached arc suppressors hinged or otherwise attached to permit easy access to line-side lugs without removal of the

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arc suppressors.

5. Switches used in circuits having a neutral conductor shall be provided with an insulated groundable solid neutral terminal bar.

**PART 3 - EXECUTION**

- A. Properly align Safety Switches and adequately support independent of the connecting raceways. Provide steel straps and appurtenances necessary for the support of the equipment.
- B. Furnish and install fuses in fusible safety switches where required.

END OF SECTION 262728



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### SECTION 311000 - SITE CLEARING

#### 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. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Temporary erosion and sedimentation control.

- B. Related Requirements:

1. Comply with Appendix-Part A-Missouri State Operating Permit for land disturbance activities and Erosion/Sediment Control Drawings.

##### 1.3 DEFINITIONS

- A. 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.
- B. 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.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.
- D. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- E. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- F. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

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### 1.4 PREINSTALLATION MEETINGS

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

### 1.5 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

### 1.6 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
  - 1. Use sufficiently detailed photographs or video recordings.
  - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Topsoil stripping and stockpiling program.
- C. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

### 1.7 QUALITY ASSURANCE

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

### 1.8 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify Missouri One Call (1-800-DigRite) for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

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- D. Tree- and Plant-Protection Zones: Review Tree Protection requirements with State Parks Naturalist prior to beginning directional boring.
- E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
  - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

#### 3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

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### 3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site.
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

### 3.4 EXISTING UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
  - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
  - 1. Arrange with utility companies to shut off indicated utilities.
  - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Architect's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.
- F. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024119 "Selective Demolition."

### 3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
  - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  - 2. Remove stumps and roots larger than 2 inches (50 mm) in diameter, obstructions, and debris to a depth of 18 inches (450 mm) below exposed subgrade.
  - 3. Chip removed tree branches and stockpile in areas approved by Architect.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

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1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

### 3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 6 inches (150 mm) in a manner to prevent intermingling with underlying subsoil or other waste materials.
  1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
  1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
  2. Do not stockpile topsoil within protection zones.
  3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
  4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

### 3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

### 3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Burning tree, shrub, and other vegetation waste is not permitted.

END OF SECTION 311000

**SECTION 312000 - EARTH MOVING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks and pavements.
5. Subbase course and base course for asphalt paving.
6. Excavating and backfilling for utility trenches.

**1.2 DEFINITIONS**

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

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- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

### 1.3 QUALITY ASSURANCE

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

### 1.4 PROJECT CONDITIONS

- A. Utility Locator Service: Notify public utility locator service and Johnson's Shut-Ins State Park staff for area where Project is located before beginning earth moving operations.
- B. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.

## PART 2 - PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

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- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

### 2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored to comply with local practice or requirements of authorities having jurisdiction.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.



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### 3.2 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

### 3.3 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
  - 1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

### 3.4 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

### 3.5 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.
  - 1. Clearance: 12 inches (300 mm) each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

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1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material, 4 inches (100 mm) deeper elsewhere, to allow for bedding course.

### D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

### 3.6 SUBGRADE INSPECTION

- A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### 3.7 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.
  1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

### 3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### 3.9 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

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- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Division 03.
- D. Trenches under Roadways: Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase course. Concrete is specified in Division 03.
- E. Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

### 3.10 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  - 1. Under grass and planted areas, use satisfactory soil material.
  - 2. Under walks and pavements, use satisfactory soil material.
  - 3. Under steps and ramps, use engineered fill.
  - 4. Under building slabs, use engineered fill.
  - 5. Under footings and foundations, use engineered fill.

### 3.11 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

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### 3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
  - 2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 92 percent.
  - 3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.
  - 4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

### 3.13 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
  - 2. Walks: Plus or minus 1 inch (25 mm).
  - 3. Pavements: Plus or minus 1/2 inch (13 mm).
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

### 3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
  - 1. Shape subbase course and base course to required crown elevations and cross-slope grades.
  - 2. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.

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3. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### 3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  1. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
  2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

### 3.16 FIELD QUALITY CONTROL

- A. Geotechnical Report: Review geotechnical report and provide to Testing Agency prior to beginning Earthwork.
- B. Habitat Protection: Review Section 013515 Endangered Species Habitat Protection prior to beginning Earthwork.
- C. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections and provide reports directly to the Owner and Designer.
- D. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- E. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

### 3.17 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

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- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

**3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

**END OF SECTION 312000**

# JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

## SECTION 312319 - DEWATERING

### 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 construction dewatering.
- B. Related Requirements:
  - 1. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Verify availability of Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review condition of site to be dewatered including coordination with temporary erosion-control measures and temporary controls and protections.
  - 3. Review geotechnical report.
  - 4. Review proposed site clearing and excavations.
  - 5. Review existing utilities and subsurface conditions.
  - 6. Review observation and monitoring of dewatering system.

#### 1.4 FIELD CONDITIONS

- A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from this data.
  - 1. The geotechnical report is included elsewhere in Project Manual.

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### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.
  - 1. Prevent surface water from entering excavations by grading, dikes, or other means.
  - 2. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
  - 3. Remove dewatering system when no longer required for construction.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
  - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
  - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Provide temporary grading to facilitate dewatering and control of surface water.
- C. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 312500 "Erosion and Sedimentation Controls" and indicated on the drawings during dewatering operations.

#### 3.2 FIELD QUALITY CONTROL

- A. Prepare reports of observations.

#### 3.3 PROTECTION

- A. Promptly repair damage to adjacent land caused by dewatering.

END OF SECTION 312319



## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 312500 – EROSION AND SEDIMENTATION CONTROLS

#### PART 1 - GENERAL

##### 1.1 SECTION INCLUDES

- A. Installation of temporary and permanent siltation and erosion control measures.
- B. Installation of temporary water pollution control measures to prevent discharge of pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage, or other harmful material from the project.
- C. Other related documents.

##### 1.2 GENERAL

- A. The Contractor shall manage his operations to control water pollution in accordance with this specification and applicable State regulations. Construction of permanent drainage facilities and other contract work, contributing to control of erosion, shall be scheduled at the earliest practicable time.
- B. The Contractor shall furnish, install, maintain, and remove temporary erosion control measures. The Contractor shall prevent silt or polluted storm water discharge from the site.
- C. The Owner's Representative may require installation of additional erosion control facilities, by the Contractor, if in the sole opinion of the Owner's Representative, the Contractor's efforts are inadequate.

##### 1.3 DEFINITIONS

- A. General Permit: The General Permit for storm water discharges associated with construction activity (Land Disturbance General Permit No. MOR100038) issued to FMDC as a blanket permit by the Missouri Department of Natural Resources, Water Pollution Program.
- B. Storm Water Pollution Prevention Plan (SWPPP): A plan required by the General Permit that includes site map(s), an identification of construction/Contractor activities that could cause pollutants in the storm water, and a description of measures or practices to control these pollutants.
- C. Best Management Practice (BMP): Any program, technology, process, siting criteria, operating method, measure, or device that controls, prevents, removes, or reduces pollution.
- D. Ditch Check: An obstruction placed at frequent intervals across ditches, creating small ponds to cause sediment to settle and be contained.
- E. Sediment Basin: An excavated or dammed storage area to trap and store sediment and prevent the discharge of silt.

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- F. Temporary Seeding and Mulching: Placement of a quick ground cover to reduce erosion in areas expected to be re-disturbed.
- G. Straw Bales: Standard agricultural bales used to filter the flow of water, trap, deposit sediment, and/or divert water.
- H. Silt Barrier: A geotextile barrier tube with mulch core to contain sediment by removing suspended particles from water passing through the barrier.
- I. Temporary Pipe: Conduit utilized to carry water under haul roads, silt fences, etc., and prevents equipment from direct contact with water when crossing an active or intermittent stream.
- J. Sediment Removal: Removal of accumulated sediment to restore the efficiency of sediment control features.

### 1.4 SUBMITTALS

- A. The Contractor shall submit his proposed "Erosion Control Plan" for review and approval by the Owner's Representative. Approval of the plan does not relieve the Contractor of his contractual responsibility to prevent the discharge of pollutants into the receiving drainage ways.
- B. The Contractor shall review the Storm Water Pollution Prevention Plan (SWPPP) provided by the Designer, make appropriate field corrections to the document, and submit final corrected copies of the SWPPP to the Owner and Facility.

### 1.5 RELATED SECTIONS

- A. Section 329200 "Seeding and Mulching"

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Temporary slope drains: Stone, concrete or asphalt gutters, half-round pipe, metal pipe, plastic pipe, or flexible rubber pipe.
- B. Ditch Checks:
  - 1. Straw bale ditch checks: Rectangular wheat straw bales in good condition. Other foliage may be substituted for straw in accordance with MoDOT 802.2.1.
  - 2. Silt Barrier ditch checks: Geotextile filter rolls meeting the requirements of this specification.
- C. Riprap for Temporary Erosion Control: Type 1 Rock Blanket conforming to MoDOT 611.32.
- D. Pipe: Corrugated metal (16Ga) or ADS N12 Corrugated Plastic.

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- E. Temporary Seeding:
  - 1. December 1 to March 1: 50lbs oats/acre.
  - 2. March 1 to December 1: 50lbs cereal rye or wheat.
  - 3. Mulch shall be wheat straw.
- F. Geotextile Filter Roll with Mulch Core:
  - 1. Geotextile Fabric:
    - a. Fibers used in geotextiles shall consist of long chain synthetic polymers, composed of at least 85% by weight polyolefins, polyesters, or polyamides. They shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including selvages.
    - b. The geotextile shall be free of any treatment or coating which might adversely alter its physical properties after installation.
    - c. Filter Rolls shall be stored in a manner which protects them from the elements.

### 2.2 CERTIFICATION AND SAMPLING

- A. The Contractor shall furnish a manufacturer's certification, stating the material conforms to the requirements of these specifications.
- B. The certification shall include, or have attached, typical results of tests for the specified properties, representative of the materials supplied.
- C. The Owner's Representative reserves the right to sample and test any material offered for use.

## PART 3 - EXECUTION

### 3.1 GENERAL REQUIREMENTS

- A. The Owner's Representative may limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, or fill operations.
- B. The Owner's Representative may direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams, other watercourses, lakes, ponds, or other areas of water impoundment. Work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, use of temporary mulches, seeding or other control devices or methods to control erosion.

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- C. The Contractor shall incorporate permanent erosion control features at the earliest practicable time.
- D. The Contractor at no additional cost shall provide temporary pollution control measures needed to control erosion during normal construction practices to the Owner.
- E. Contractor shall designate trained and knowledgeable personnel to coordinate all SWPPP activities, and identify these personnel to the Owner's Representative during construction. Missouri Department of Natural Resources offers training classes in Erosion Control free of charge in Jefferson City. Contact the Department of Natural Resources at (800) 361-4827 or view the linked .pdf for the Regional Office that has jurisdiction over this project's location at <J:\Project Management Unit\Land Disturbance Permit\General Permit & Renewals\DNR Reg Offices.pdf>.
- F. The SWPPP is a living document. As the conditions of the site changes, the SWPPP should be updated by the Contractor.
- G. The SWPPP is subject to random inspection by the Owner. The SWPPP should be kept up to date by the Contractor and available for inspection at any time.
- H. If Contractor determines that any BMP should need modification, the changes shall be dated and documented, and all necessary field changes performed.

### 3.2 LIMITATION OF AREA DISTURBED

- A. The Contractor's operations shall be scheduled to install permanent erosion control features immediately after clearing and grubbing, and grading.
- B. The surface area of erodible earth material exposed at one time by clearing and grubbing, excavating, fill, or borrow shall not exceed 200,000 SqFt without written approval of the Owner's Representative.
- C. The Owner's Representative may limit the area of clearing and grubbing, excavation, borrow, and embankment operations commensurate with the Contractor's capability and progress in completing the finish grading, mulching, seeding, and other such permanent pollution control measures current.
- D. The Contractor shall respond to seasonal variations. If required by weather, temporary erosion control measures shall be taken immediately.

### 3.3 CONFLICT WITH FEDERAL, STATE OR LOCAL LAWS, RULES OR REGULATIONS

- A. In case of conflict between these requirements and pollution control laws, rules, or regulations or other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

### 3.4 DITCH CHECKS

- A. General

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1. Straw bale ditch checks may be used on all ditches.
  - a. The silt fence fabric may be eliminated for grades of 2% or less.
2. Silt barrier ditch check may be used on all ditches.
3. A straw bale ditch check or a silt fence ditch check may be used in lieu of a sediment basin for drainage areas less than two acres. The basin shall have a volume of 1,815 CuFt per acre of contributing drainage area.

### B. Construction Requirements

1. Construct straw bale ditch checks in accordance with the drawing detail.

### C. Maintenance

1. Inspect ditch checks for sediment accumulation after each rainfall.
2. Sediment shall be removed when it reaches  $\frac{1}{2}$  of the original height.
  - a. Regular inspections shall insure that the center of a rock check is lower than the edges. Correct erosion caused by high flows around the edges of the check immediately.

## 3.5 TEMPORARY SEEDING AND MULCHING

### A. General

1. This item is applicable to all projects.
2. Seeding and/or mulching shall be a continuous operation on all cut slopes, fill slopes, and borrow pits during the construction process. All disturbed areas shall be seeded and mulched within five (5) working days after the last construction activity in all locations where necessary to eliminate erosion. Prior to seeding wood chips shall be spread on areas as much from on-site stock-piled sources. Additional mulch shall be provided by the contractor as necessary.

### B. Construction Requirements

1. Permanent seeding and mulching following temporary seeding will be performed during the favorable seeding seasons only.
2. Temporary seeding mixtures and planting seasons:
  - a. December 1 to March 1: 50lbs oat grain per acre
  - b. March 1 to December 1: 50lbs (cereal rye or wheat) per acre
3. Temporary mulch, fertilizer, and lime for seeding:

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- a. Mulch for temporary seed mixtures shall be applied in accordance with Section 329200.
- b. `Lime will not be required for temporary seeding.

### 3.6 STRAW BALES

#### A. General

1. Install at the bottom of embankment slopes less than 10' high to divert runoff from sheet flow and intercept some of the sediment in the sheet flow.
2. Install as ditch checks in small ditches and drainage areas.
3. Install on the lower side of cleared areas to catch sediment from sheet flow.

#### B. Construction Requirements

1. Bales of straw may be utilized to control erosion, trap sediment, and divert runoff.
2. Bales must be adequately braced from behind.

### 3.7 SILT BARRIER

#### A. General

1. Install per the siltation control drawings, along the right-of-way line, parallel to streams or around an inlet to prevent sediment from entering the pipe system.

#### B. General Requirements

1. The Contractor shall install a temporary silt barrier in locations shown on the drawings, around inlets that accept flows containing silt, and other locations necessary to prevent the discharge of silt from the site.
2. Installation shall conform to the detail at the end of this section.
3. Barrier construction shall be adequate to handle the stress from hydraulic and sediment loading.

#### C. Installation

1. The silt barrier shall be installed per the manufacturers recommendations and details included in the drawings.
2. Maintenance:
  - a. The Contractor shall maintain the integrity of silt barriers as long as they are necessary to contain sediment runoff.

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- b. The Contractor shall inspect all temporary silt barriers immediately after each rainfall and at least daily, during prolonged rainfall.
  - c. The Contractor shall immediately correct deficiencies.
  - d. The Contractor shall make a daily review of the location of silt barriers in areas where construction activities have changed the natural contour and drainage runoff to ensure that the silt fences are properly located for effectiveness.
  - e. Where a single barrier is not adequate to handle the volume of silt or flows are not completely intercepted, additional silt fences shall be installed.
3. The Contractor shall remove and dispose of sediment deposits when the deposit approaches  $\frac{1}{2}$  the height of the fence.
  4. The silt barrier shall remain in place until the upstream surface is stabilized. Upon removal, the Contractor shall remove the silt barrier, dispose of excess silt, and restore the disturbed area.

### 3.8 TEMPORARY PIPE

#### A. General

1. The Contractor shall install temporary pipes and fill at locations, to be crossed by the Contractor's equipment, which carry a concentrated flow during rain events.

#### B. Construction Requirements

1. All temporary pipes shall be installed in the same manner as permanent pipe is installed on the project to assure that the water does not cause erosion around the pipe.
2. Material to backfill the pipe should be placed in 6" lifts and mechanically compacted. Compaction testing will not be required.

### 3.9 SEDIMENT REMOVAL

#### A. General

1. Sediment deposits shall be removed when:
  - a. The deposits reach approximately  $\frac{1}{2}$  the height of a ditch check, straw bale barrier or silt fence.
  - b. The sediments have reduced the ponded volume of sediment basins to  $\frac{1}{3}$  of the original volume.
  - c. Requested by the Owner's Representative.

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- B. Sediment removed from erosion control features shall be deposited in a location where it will not erode into construction areas or watercourses.

END OF SECTION 312500



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### SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

#### 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 temporary excavation support and protection systems.
- B. Related Requirements:
  - 1. Section 312000 "Earth Moving" for excavating and backfilling and for controlling surface-water runoff and ponding.
  - 2. Section 312319 "Dewatering" for dewatering excavations.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review geotechnical report.
  - 2. Review existing utilities and subsurface conditions.
  - 3. Review coordination for interruption, shutoff, capping, and continuation of utility services.
  - 4. Review proposed excavations.
  - 5. Review proposed equipment.
  - 6. Review monitoring of excavation support and protection system.

#### 1.4 FIELD CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
  - 1. Notify Owner no fewer than **two** days in advance of proposed interruption of utility.
  - 2. Do not proceed with interruption of utility without Owner's written permission.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
  - 1. The geotechnical report is included elsewhere in Project Manual.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.
  - 1. Prevent surface water from entering excavations by grading, dikes, or other means.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
  - 1. Shore, support, and protect utilities encountered.

#### 3.2 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
  - 1. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### SECTION 321216 – ASPHALT PAVING

#### 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. Hot-mix asphalt paving.
- B. Related Sections:
  - 1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.

##### 1.3 DEFINITION

- A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

##### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
  - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
  - 2. Job-Mix Designs: For each job mix proposed for the Work.
- B. Material Test Reports: For each paving material.

##### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications.
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of MoDOT for asphalt paving work.
  - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

##### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

##### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
  - 1. Prime Coat: Minimum surface temperature of 60 deg F.
  - 2. Tack Coat: Minimum surface temperature of 60 deg F.
  - 3. Slurry Coat: Comply with weather limitations in ASTM D 3910.

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4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
  5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, and not exceeding 95 deg F.

### PART 2 - PRODUCTS

#### 2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- C. Fine Aggregate: AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
  1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.
- D. Mineral Filler: AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.
- E. Friction Enhancing Surface Course: Porphyry Trap Rock.

#### 2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22 PG 58-28 PG 70-22.
- B. Asphalt Cement: ASTM D 3381 for viscosity-graded material ASTM D 946 for penetration-graded material.
- C. Prime Coat: Asphalt emulsion prime coat complying with the MoDOT requirements.
- D. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- E. Water: Potable.

#### 2.3 AUXILIARY MATERIALS

- A. Sand: AASHTO M 29, Grade Nos. 2 or 3.
- B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than three minutes.
  1. Color: White and Blue.

#### 2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction; designed according to procedures in AI MS-2, "Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types"; and complying with the following requirements:
  1. Provide mixes complying with composition, grading, and tolerance requirements in ASTM D 3515 for the following nominal, maximum aggregate sizes:
    - a. Base Course: 1 inch.
    - b. Surface Course: 1/2 inch.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to begin paving.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
  - 1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
  - 2. Proof roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  - 3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

#### 3.2 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove moss, vegetative matter, loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.
  - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.

#### 3.3 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
  - 1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
  - 2. Place hot-mix asphalt surface course in single lift.
  - 3. Spread mix at minimum temperature of 250 deg F.
  - 4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
  - 5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
  - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

#### 3.4 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

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1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
3. Offset transverse joints, in successive courses, a minimum of 24 inches.
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations" or as shown on Drawings.
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

### 3.5 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
  1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
  1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
  2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

### 3.6 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  1. Base Course: Plus or minus 1/2 inch.
  2. Surface Course: Plus 1/4 inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
  1. Base Course: 1/4 inch.
  2. Surface Course: 1/8 inch.
  3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

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### 3.7 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

### 3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall engage a qualified testing agency to perform tests and inspections.
- B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to AASHTO T 168.
  - 1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
  - 2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.
    - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
    - b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.
- E. Replace and compact hot-mix asphalt where core tests were taken.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

### 3.9 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow milled materials to accumulate on-site.

**END OF SECTION 321216**

**SECTION 321313 - CONCRETE PAVING**

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. Driveways.
- 2. Roadways.
- 3. Parking lots.
- 4. Curbs and gutters.
- 5. Walks.

B. Related Sections:

- 1. Section 033000 "Cast-in-Place Concrete" for general building applications of concrete.
- 2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and adjacent construction.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.
- D. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:
  - 1. Wheel Stops: 6 inches long showing cross section; with fasteners.



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### E. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

## 1.5 INFORMATIONAL SUBMITTALS

### A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.

### B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.
6. Bonding agent or epoxy adhesive.
7. Joint fillers.

### C. Material Test Reports: For each of the following:

1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

### D. Field quality-control reports.

## 1.6 QUALITY ASSURANCE

### A. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

### B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

### C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

### D. Concrete Testing Service: Contractor shall engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures. Test results shall be provided directly to the Owner and Designer promptly.

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- E. ACI Publications: Comply with ACI 301 unless otherwise indicated.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
  - 2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Designer.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to concrete paving, including but not limited to, the following:
    - a. Concrete mixture design.
    - b. Quality control of concrete materials and concrete paving construction practices.
  - 2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Concrete paving subcontractor.

### 1.7 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

## PART 2 - PRODUCTS

### 2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
  - 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. [ **Do not use notched and bent forms.** ]

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- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

### 2.2 STEEL REINFORCEMENT

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from steel wire into flat sheets.
- C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.
- D. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.
- E. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
  - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

### 2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:
  - 1. Portland Cement: ASTM C 150, gray portland cement Type II.
    - a. Fly Ash: ASTM C 618, Class C.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 4S, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.
  - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: Potable and complying with ASTM C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.

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- E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

### 2.4 CURING MATERIALS

- A. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

### 2.5 RELATED MATERIALS

- A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

### 2.6 PAVEMENT MARKINGS

- A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than **three 45** minutes.
  - 1. Color: White and Blue.

### 2.7 WHEEL STOPS

- A. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.
  - 1. Dowels: Galvanized steel, 3/4 inch in diameter, 10-inch minimum length.

### 2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
  - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.
- B. Proportion mixtures to provide normal-weight concrete with the following properties:

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1. Compressive Strength (28 Days): 4000 psi.
  2. Maximum Water-Cementitious Materials Ratio at Point of Placement: [0.45] [0.50] <Insert ratio>.
  3. Slump Limit: 4 inches, plus or minus 1 inch.
- C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
1. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch nominal maximum aggregate size.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture in concrete as required for placement and workability.
  2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- F. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

### 2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
  2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
  3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 312000 "Earth Moving."

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

### 3.2 PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

### 3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

### 3.5 JOINTS

- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
  - 1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
  - 1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
  - 2. Provide tie bars at sides of paving strips where indicated.
  - 3. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.

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4. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
  2. Extend joint fillers full width and depth of joint.
  3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
  4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
  5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
  6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
    - a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
  2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 3/8-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, **steel reinforcement,**] and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface[ **and steel reinforcement**] before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

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- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement dowels and joint devices.
- H. Screed paving surface with a straightedge and strike off.
- I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.
- K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.
  - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.
- L. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
  - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Fog-spray forms[, **steel reinforcement**,] and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.



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### 3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

### 3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by curing compound as follows:
  - 1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

### 3.9 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
  - 1. Elevation: 1/4 inch
  - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
  - 3. Surface: Gap below 10-foot-long, unlevelled straightedge not to exceed 1/2 inch.
  - 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
  - 5. Lateral Alignment and Spacing of Dowels: 1 inch.
  - 6. Vertical Alignment of Dowels: 1/4 inch.
  - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
  - 8. Joint Spacing: 3 inches.
  - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
  - 10. Joint Width: Plus 1/8 inch, no minus.

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### 3.10 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow concrete paving to cure for a minimum of **28** days and be dry before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
  - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.

### 3.11 WHEEL STOPS

- A. Install wheel stops in bed of adhesive applied as recommended by manufacturer.
- B. Securely attach wheel stops to paving with not less than two [**galvanized-**]steel dowels located at one-quarter to one-third points. Install dowels in drilled holes in the paving and bond dowels to wheel stop. Recess head of dowel beneath top of wheel stop.

### 3.12 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least one composite sample for each [**100 cu. yd.**] [**5000 sq. ft.**] or fraction thereof of each concrete mixture placed each day.
    - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  - 3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  - 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
  - 5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

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6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
  - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Designer, Owner, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.

### 3.13 REPAIRS AND PROTECTION

- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

**SECTION 321373 - CONCRETE PAVING JOINT SEALANTS**

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. Cold-applied joint sealants.
2. Joint-sealant backer materials.
3. Primers.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

1.3 PREINSTALLATION MEETINGS

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

1.4 ACTION SUBMITTALS

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

- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

- C. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

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- B. Product Certificates: For each type of joint sealant and accessory.

### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.

### 1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer[ or are below 40 deg F.
  2. When joint substrates are wet.
  3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, 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.

### 2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.

### 2.3 JOINT-SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

### 2.4 PRIMERS

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

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### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
  - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on 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.

#### 3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.
- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backings to support joint 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 joint-sealant backings.
  - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
  - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
  - 1. Place joint sealants so they fully contact 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.

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- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements 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 joint sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

### 3.4 CLEANING AND PROTECTION

- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.
- B. 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 and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

### 3.5 PAVING-JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Joints within concrete paving.
  - 1. Joint Location:
    - a. Expansion and isolation joints in concrete paving.
    - b. Contraction joints in concrete paving.
    - c. Other joints as indicated.
  - 2. Joint Sealant: Single-component, self-leveling, silicone joint sealant.
  - 3. Joint-Sealant Color: Manufacturer's standard.

END OF SECTION 321373

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## SECTION 321713 - PARKING BUMPERS

### 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 wheel stops.

#### 1.3 ACTION SUBMITTALS

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

### PART 2 - PRODUCTS

#### 2.1 PARKING BUMPERS

- A. Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete, 4000-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.
  - 1. Surface Appearance: Free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
  - 2. Mounting Hardware: Galvanized-steel [spike or dowel, 1/2-inch diameter, 10-inch minimum length.
  - 3. Adhesive: As recommended by wheel-stop manufacturer for adhesion to pavement.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.



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3.2 INSTALLATION

- A. Securely anchor wheel stops to pavement with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION 321713

**SECTION 321723 - PAVEMENT MARKINGS**

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 painted markings applied to asphalt and concrete pavement.
- B. Related Requirements:
  - 1. Section 099113 "Exterior Painting" for painting exterior concrete surfaces other than pavement.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to marking pavement including, but not limited to, the following:
    - a. Pavement aging period before application of pavement markings.
    - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include technical data and tested physical and performance properties.
- B. Shop Drawings: For pavement markings.
  - 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
  - 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

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### 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of MODOT for pavement-marking work.
  - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

### 2.2 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than [three] [45] minutes.
  - 1. Color: White and Blue.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

### 3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for a minimum of 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.

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- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
  - 1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.

3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

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## SECTION 329113 - SOIL PREPARATION

### 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. Related Requirements:
  - 1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
  - 2. Section 329200 "Seeding and Mulching" for placing planting soil.

#### 1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- B. Imported Soil: Soil that is transported to Project site for use.
- C. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- D. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- E. SSSA: Soil Science Society of America.
- F. 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.
- G. 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.
- H. 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.
- I. USCC: U.S. Composting Council.

#### 1.4 PREINSTALLATION MEETINGS

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

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### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Topsoil: Native topsoil stock-piled on-site.

### PART 3 - EXECUTION

#### 3.1 GENERAL

- A. Place top soil 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 top soil.
- C. Proceed with placement only after unsatisfactory conditions have been corrected.

#### 3.2 PLACING TOPSOIL PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply topsoil on-site. 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 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Application: Spread topsoil to total depth of 4 inches, but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
- D. Compaction: Compact each lift of topsoil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698.
- 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.

#### 3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests:
  - 1. Compaction: Test topsoil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 2000 sq. ft. of in-place soil or part thereof.

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- C. Soil will be considered defective if it does not pass tests.
- D. Prepare test reports.
- E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

### 3.4 PROTECTION

- 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. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

### 3.5 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- 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 329113

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## SECTION 329200- SEEDING AND MULCHING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Seeding of lawns and disturbed land areas.
- B. Related Sections include the following:
  - 1. Division 31 Section "Site Clearing" for topsoil stripping and stockpiling.
  - 2. Division 31 Section "Earth Moving" for excavation, filling and backfilling, and rough grading.
  - 3. Division 33 Section "Subdrainage" for subsurface drainage.

#### 1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native topsoil.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of Seed: (Oates or Rye) From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
  - 1. Certification of each seed mixture for seed, identifying source, including name and telephone number of supplier. Annual ryegrass or oates tag from seed bags shall be submitted to Owner Representative for approval before seeding.



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- C. Qualification Data: For landscape Installer.
- D. Planting Schedule: Indicating anticipated planting dates for each type of planting or seed manufacturers recommendations.
- E. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns during a calendar year. Submit before expiration of required maintenance periods.

### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
  - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

### 1.7 SCHEDULING

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

### 1.8 LAWN MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
  - 1. Seeded Lawns: 60 days from date of Substantial Completion.
    - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
- B. Maintain and establish lawn by weeding, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
  - 1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

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### PART 2 - PRODUCTS

#### 2.1 SEED FOR NATIVE GRASS AND WILDFLOWER AREA

- A. Grass seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology: Rules for Testing Seed" for purity and germination tolerances. (To be performed by DNR)
- B. Seed Species: State-certified seed of grass species, as follows:
  - 1. Sun and Shade: Proportioned by weight as follows:
    - a. 100% annual rye grass (*Lolium multiflorum*)

#### 2.2 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.
  - 1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.

#### 2.3 MULCHES.

- A. Hydroseed Paper Mulch: Apply hydroseed paper mulch at rate of 2,000 to 2,500 pounds per acre.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected. All hydroseeded lawn shall be carefully executed where as not to mix, blow, or intrude on native grass and wildflower areas, and undisturbed areas.

#### 3.2 TREE AND SENSITIVE HABITAT PROTECTION

Protect trees and sensitive habitats as directed by the owner with tree protection or barrier fencing.

#### 3.3 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

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1. Protect adjacent and adjoining areas from hydroseeding overspray.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

### 3.4 LAWN PREPARATION

- C. Limit lawn subgrade preparation to areas to be planted.
- D. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  1. Spread topsoil mix to a depth of 4 inches, but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if topsoil or subgrade is frozen, muddy, or excessively wet.
- E. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
- F. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- G. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

### 3.5 SEEDING OF NATIVE GRASSES AND WILDFLOWER AREAS

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 MPH (8km/h). Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
  1. Do not use wet seed that is moldy or otherwise damaged in transit or storage.
- H. Sow seed at the following rates:
  1. Seeding rate: 25 pounds per acre.
- D. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.
- E. Protect seeded areas with slopes greater than 1:6 against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acres to form a continuous blanket 1-1/2 inches loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

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### 3.6 SATISFACTORY LAWNS

- A. Satisfactory Seeded Lawn: 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. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches
- B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

### 3.7 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

END OF SECTION 329200

**SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES**

**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 the following:
  - 1. Piping joining materials.
  - 2. Transition fittings.
  - 3. Dielectric fittings.
  - 4. Sleeves.
  - 5. Identification devices.
  - 6. Grout.
  - 7. Flowable fill.
  - 8. Piped utility demolition.
  - 9. Piping system common requirements.
  - 10. Equipment installation common requirements.
  - 11. Painting.
  - 12. Concrete bases.
  - 13. Metal supports and anchorages.

**1.3 DEFINITIONS**

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- C. ABS: Acrylonitrile-butadiene-styrene plastic.
- D. CPVC: Chlorinated polyvinyl chloride plastic.
- E. PE: Polyethylene plastic.
- F. PVC: Polyvinyl chloride plastic.

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### 1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Dielectric fittings.
  - 2. Identification devices.

### 1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

### 1.6 QUALITY ASSURANCE

- A. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

### 1.8 COORDINATION

- A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.
- C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in **Section 033000 "Cast-in-Place Concrete."**

## PART 2 - PRODUCTS

### 2.1 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.
    - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.

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- b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
- 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- F. 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.
- G. Solvent Cements for Joining Plastic Piping:
  - 1. ABS Piping: ASTM D 2235.
  - 2. CPVC Piping: ASTM F 493.
  - 3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
  - 4. PVC to ABS Piping Transition: ASTM D 3138.

### 2.2 TRANSITION FITTINGS

- A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings NPS 1-1/2 and Smaller:
  - 1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
  - 2. Aboveground Piping: Specified piping system fitting.
- C. AWWA Transition Couplings NPS 2 and Larger:
  - 1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

### 2.3 DIELECTRIC FITTINGS

- A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

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### 2.4 SLEEVES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

### 2.5 IDENTIFICATION DEVICES

- A. General: Products specified are for applications referenced in other utilities Sections. If more than single type is specified for listed applications, selection is Installer's option.
- B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.
  - 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
  - 2. Location: Accessible and visible.
- C. Stencils: Standard stencils prepared with letter sizes complying with recommendations in ASME A13.1. Minimum letter height is 1-1/4 inches for ducts, and 3/4 inch for access door signs and similar operational instructions.
  - 1. Material: **Brass**.
  - 2. Identification Paint: Exterior, oil-based, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.
- D. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch (13-mm) sequenced numbers. Include 5/32-inch hole for fastener.
  - 1. Material: 0.032-inch-thick, **polished brass or aluminum**.
  - 2. Size: 1-1/2 inches in diameter, unless otherwise indicated.
- E. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.
- F. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.
  - 1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

### 2.6 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi, 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.



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### PART 3 - EXECUTION

#### 3.1 PIPED UTILITY DEMOLITION

- A. Refer to Section 024119 "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.

#### 3.2 DIELECTRIC FITTING APPLICATIONS

- A. Wet Piping Systems: Connect piping of dissimilar metals with the following:
  - 1. NPS 2-1/2 to NPS 4: Dielectric nipples.

#### 3.3 PIPING INSTALLATION

- A. Install piping according to the following requirements and utilities Sections specifying piping systems.
- B. Drawing 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 the Coordination Drawings.
- 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 to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are not required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.

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- K. Verify final equipment locations for roughing-in.
- L. Refer to equipment specifications in other Sections for roughing-in requirements.

### 3.4 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.
- I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.
- K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
  - 3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

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4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

### 3.5 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Install dielectric fittings at connections of dissimilar metal pipes.

### 3.6 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

### 3.7 PAINTING

A. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.8 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.

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2. Locate pipe markers on exposed piping according to the following:
  - a. Near each valve and control device.
  - b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
  - c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
  - d. At manholes and similar access points that permit view of concealed piping.
  - e. Near major equipment items and other points of origination and termination.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
  1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches , 1/2 inch high for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
  2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

### 3.9 GROUTING

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 330500

**SECTION 334100 - STORM UTILITY DRAINAGE PIPING**

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. Pipe and fittings.
  - 2. Nonpressure transition couplings.
  - 3. Pressure pipe couplings.
  - 4. Expansion joints and deflection fittings.
  - 5. Backwater valves.
  - 6. Cleanouts.
  - 7. Drains.
  - 8. Encasement for piping.
  - 9. Manholes.
  - 10. Channel drainage systems.
  - 11. Pipe outlets.

1.3 DEFINITIONS

- A. CMP: Corrugated Metal Pipe.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

- A. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- B. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect pipe, pipe fittings, and seals from dirt and damage.

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### 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify **Owner** no fewer than **two** days in advance of proposed interruption of service.
  - 2. Do not proceed with interruption of service without **Owner's** written permission.

### PART 2 - PRODUCTS

#### 2.1 STEEL PIPE AND FITTINGS

- A. Corrugated-Steel Pipe and Fittings: ASTM A 760/A 760M, Type I with fittings of similar form and construction as pipe.
  - 1. Special-Joint Bands: Corrugated steel with O-ring seals.
  - 2. Standard-Joint Bands: Corrugated steel.
  - 3. Coating: [**Aluminum**] [**Zinc**].

### PART 3 - EXECUTION

#### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

#### 3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow.
  - 2. Install corrugated steel piping according to ASTM A 798/A 798M.

#### 3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:

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1. Join corrugated steel sewer piping according to ASTM A 798/A 798M.

### 3.4 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
  1. Submit separate reports for each system inspection.
  2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  4. Reinspect and repeat procedure until results are satisfactory.

### 3.5 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 334100

**SECTION 334500 - DUPLEX GRINDER PUMP STATION**

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 GENERAL

- A. Contractor to provide a complete duplex grinder pump system (station) which shall be a factory assembled fiberglass wet well as described below and shown on drawings.
- B. The manufacturer shall furnish complete factory-built and tested Grinder Pump Station and internal valves consisting of two grinder pumps suitably mounted in a basin constructed of reinforced polyester resin and fiberglass, electrical quick disconnect (NEMA 6), internal junction box, pump removal system, shut-off valve, anti-siphon valve, and check valve assembled within the basin, electrical alarm/disconnect panel, and all necessary internal wiring and controls. For ease of serviceability, all pump motor/grinder units shall be of same manufacturer and horsepower throughout the system.
- C. FRP Wet Wells shall be one piece units manufactured to meet or exceed all specifications of ASTM D3753. Fiberglass reinforced polyester wet wells shall be manufactured from commercial grade unsaturated polyester resin with fiberglass reinforcements as manufactured by the following approved manufacturers:
  - 1. Fiberglass Tank Solutions (FTS), or approved equal
- D. Furnish and install as shown in the project drawings:

Two (2) model KHG7 Keen Grinder Pump or approved equal. Minimum operating conditions required: 60 GPM at 125 TDH

The motors shall be connected for operation on a 230 volt, 60 Hz, single phase service. The motors shall be an integral part of the pumping unit. The pump discharge size shall be 1-1/4".
- E. The grinder unit shall be capable of shearing and reducing to a fine slurry all material normally found in domestic and commercial sewage such as sanitary napkins, disposable diapers, cloth diapers, wash rags, wood, plastic, etc. The slurry shall be capable of freely passing through a 2" piping system including check and gate valves.

1.3 SHOP DRAWINGS



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- A. After receipt of notice to proceed, the manufacturer shall furnish a minimum of six (6) sets of shop drawings detailing the equipment to be furnished including dimensional data and materials of construction. The Designer shall promptly review this data, and return two (2) copies as accepted, or with requested modifications. Upon receipt of accepted shop drawings, the manufacturer shall proceed immediately with fabrication of the equipment.
- B. General - The manufacturer shall supply a complete set of scale drawings detailing dimensions of heights, diameter, elevations to invert, pipe sizes and any other necessary details.
- C. Anti-Flotation (Buoyancy) Calculations - A set of signed and sealed (by a Professional Engineer) anti-flotation calculations shall be provided which meet the following criteria:
  - 1. Wet well weight and soil pressure on concrete base collar may be used to calculate down forces, but pump and piping weights shall not be used.
  - 2. Assume groundwater is at grade.
  - 3. A factor of safety of 1.2, minimum, must be used.
  - 4. The design calculations shall include the design conditions as noted on the drawings.
- D. Engineering Design Report - Manufacturer shall provide a complete **Composite Engineering Design using a Finite Element Analysis** for the wet well. The calculations shall include:
  - 1. Design Inputs
  - 2. Design of Cylindrical Shell
  - 3. Flat Top Head Design
  - 4. Bottom Head Design
  - 5. Pump Anchorage on Flat Bottom
  - 6. Component Weight
  - 7. Buoyancy Calculations
  - 8. Lifting Trunnion Design
  - 9. Access Cover Opening Reinforcement
  - 10. Design Summaries and Sketches
  - 11. P.E. Stamp for the Design
- E. Mounting Plate Calculations - Pumps shall be anchored to a mounting plate (see details on the drawings). The complete design (signed and sealed by a Professional Engineer) shall be submitted.

1.4 OPERATING CONDITIONS

- A. The pump(s) must be capable of operating at negative total dynamic head without overloading the motor(s). Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

1.5 WARRANTY

- A. The Contractor shall furnish the following warranty to the Owner:
  - 1. All installed materials and workmanship for all components of this project shall carry a minimum guarantee for twelve (12) months from THE DATE OF

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SUBSTANTIAL COMPLETION that the materials shall be free from defects in design and workmanship. Some of the specifications may include warranty periods for specific components that exceed 12 months. In such cases, the longer warranty shall be required. In the event a component fails to perform as specified or is proven defective in service during the warranty period, the Contractor shall promptly repair or replace the defective component at no cost to the Owner.

### PART 2 – PRODUCTS

#### 2.1 BASIN

- A. The basin shall be equipped with all piping as shown on the Drawings and described in this Section.
- B. Resin – The resins used shall be commercial grade unsaturated 100% polyester resins. Interior corrosion liner shall be a Vinyl Ester resin.
- C. Reinforcing Materials – The reinforcing materials shall be a commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric, or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcements and the resin.
- D. Surfacing Materials – If reinforcing materials are used on the surface exposed to the contained substance, it shall be a commercial grade chemical-resistant glass that includes a C-Veil or Nexus liner or approved equal that will provide a suitable bond with the resin and leaves a resin rich surface.
- E. Interior Materials - A minimum of a 10mm interior laminate layer of the tank construction shall include the reinforcing materials, C-Veil or Nexus, and a commercial grade Vinyl Ester resin for added chemical resistance.
- F. Fillers and Additives – Fillers, when used, shall be inert to the environment and wet well construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirement of this specification. No sand fillers will be allowed.
- G. The duplex grinder pump system and valve vault shall be a factory assembled basin package incorporating grinder pumps. Every component inside the basin shall be submersible. A 8-inch diameter inlet hub of the caulking type shall be provided. A rubber grommet type flexible inlet is available as an option.

#### 2.2 COVER

- A. Furnish and install where indicated on plans wet well access door W-APD.: The vault access door shall be double leaf with a removable flood resistant beam in the center between the 2 door leaves. Manufacturer shall be U.S.F. Fabrication, Inc. 3200 W. 84 St. Hialeah, FL, or approved equal. Hatches shall come with manufacturers standard 10 year warranty.

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- B. Covers: Shall be reinforced for an ASTM Load Level 2 (300 psf) pedestrian load capable of holding up to 25 ft. of water with a maximum deflection of 1/150th of the span.
- C. The entire assembly shall be designed to be flood resistant so as to allow no more than 4" of water to enter the vault below when subjected to 24" of standing water for a period of 24 hrs.
  - Operation of the cover(s) shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
- D. Cover(s) Shall be 1/4" (6.3 mm) aluminum diamond plate. Underside of cover(s) shall include a 9/16" diameter EPDM gasket securely attached in a continuous groove. Gaskets attached to the frame will not be acceptable. Cover(s) shall close flush with the frame with flood tight 316 stainless steel cam locks.
- E. Frame Shall be 3/8" (6.3mm) extruded aluminum with 3/16" X 1 1/2" strap anchors welded around the entire outside perimeter of the frame. Area of the frame that will come in contact with concrete shall be coated with bituminous paint.
- F. Entire Assembly: shall be designed to be cast-in flush with the surrounding area: products that do not sit flush will not be allowed.
- G. Lift Assist: Shall be equipped with stainless steel gas shocks for lift assist and to retard downward motion when closing. Torsion bar type lift assist will not be allowed.
- H. G. Hinges: 316 Stainless-steel hinges shall be through bolted to the cover with tamperproof Type 316 stainless steel bolts and locknuts and shall be through bolted to the frame with Type 316 stainless- steel bolts and locknuts.
- I. Lift Handles: A Flush, ADA compliant, flood tight lifting handle shall be provided for each door leaf.
- J. Hold-open arms: Each door shall be equipped with a 316 stainless steel hold-open arm with a secondary latch that insures that the hold-open arm properly engages when the door is brought to its full upright and locked position. Hold-open devices that require the manual insertion of pins will not be allowed.
- K. Hardware: Shall be Type 316 stainless-steel throughout.
- L. Finishes: Entire door assembly shall have a clear anodized finish.

### 2.3 WET WELL FABRICATION

- A. Exterior Surface – The exterior surface shall be relatively smooth with no sharp projections. Hand-work finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.
- B. Interior Surface – The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, delamination, blisters larger than 1/2 inch in diameter, and wrinkles of 1/8 inch or greater in depth. Surface pits shall be permitted if they are less than 3/4 inch in diameter and less than 1/16 inch deep.

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- C. Defects Not Permitted –
  - 1. Exposed fibers – Glass fibers not wet out with resin.
  - 2. Resin runs: runs of resin and sand on the surface.
  - 3. Dry areas: areas with glass not wet out with resin.
  - 4. Delamination: separation in the laminate.
  - 5. Blisters – Light colored areas larger than ½ inch in diameter. Crizzling: cracks caused by sharp objects.
  - 6. Pits or Voids – Air pockets.
  - 7. Wrinkles – Smooth irregularities in the surface.
  - 8. Sharp Projection – Fiber or resin projections necessitating gloves for handling.
- D. Installation of Brackets – Manufacturer or Manufacturer-certified field personnel shall glass in all stainless steel fasteners and brackets, discharge piping brackets, etc. Manufacturer of wet well shall be responsible for integrity of all field glassing.
- E. Markings – Each wet well shall have wet well data integrated into fiberglass and affixed inside and top outside walls at or near the top. Data on the inside of the wet well should be legible from the top of the completed lift station installation. Product data shall not be written in ink or paint. Production/serial numbers shall be kept on file by Manufacturer for a minimum of 20 years and shall be accompanied by project data for future reference and recall. Data required includes the following as an example:
  - 1. Manufacturer's Name
  - 2. ASTM Designation
  - 3. Production or Serial Number
  - 4. Production date
  - 5. Wet Well Depth
  - 6. Wet Well Diameter
  - 7. Warranty Length
- F. Wet Well Top Flange - The wet well flange shall have an outside diameter of at least 3.0 inches greater than the diameter of the wet well.

### 2.4 FIBERGLASS CONSTRUCTION METHODS

- A. Wet Well Penetrations – Cutouts/stub-outs must be installed by the manufacturer. Installations in the field are not recommended and may void the manufacturer's warranty. Penetrations of FRP pipe will be performed using resin and reinforced hand lay-up procedures. All resin and fiberglass shall be the same type and grade as used in the manufacturer of the basin.
- B. Pipe Installation – Discharge wall penetrations are to have sleeves large enough to accept O.D. of pipe discharge flange. All discharge sleeves shall be sealed via a gas tight-water tight Link Seal system or approved equal. Influent pipe connections shall be made with a Press Seal Boot with stainless steel band or approved equal.

### 2.5 DESIGN FEATURES

- A. Top Slab Support – Pour reinforced concrete slab support a minimum of two feet outside of fiberglass wet well wall and minimum of six inches thick. Slab designs will be the responsibility of the design firm of record for the project, to include reinforcement and concrete mix for the specific load requirements. All top loaded slabs will provide structural loads to be placed on soil backfill outside the shadow of the fiberglass tank.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

- B. Wet Well Top – Wet well top shall be concrete and designed for 300 PSF or H-2O Traffic loading as noted on the drawings. Hatches shall be as specified in this specification and as detailed on the Contract drawings. Bottom of top slab and around side of hatch opening shall be fiberglass lined and shall meet all the requirements of this specification.
- C. Interior Piping & Pump Discharges
  - 1. Pump discharge systems shall be constructed using SCH 80 PVC. Two shutoff valves and check valves shall be installed in the wetwell.
  - 2. Pump guide rails shall be Sch. 40 Stainless Steel sized per the plans
  - 3. The shut-off valves shall be a 2" Ball or Gate valve. If the valve is located greater than 2'-0" below the top of the basin, an extension handle must be provided.
  - 4. The check valve shall be installed in the riser discharge piping.

### 2.6 PUMP

- A. Pumps shall be of the centrifugal type, Keen model KHG7 or approved equal. All castings must be manufactured and supplied by a domestic source located in the USA. Major pump components shall be of gray cast iron, ASTM A-48, Class 35, with smooth surfaces devoid of blowholes or other irregularities. All exposed nuts or bolts shall be 304 stainless steel. All metal surfaces coming into contact with the pumpage, other than stainless steel, shall be protected by a factory applied spray coating of primer and an air dry acrylic paint finish to the exterior of the pump.
- B. The impeller shall be by Maceration is accomplished by a combination of a rotary slicer and stationary slicer plate. Rotary slicer shall consist of (3) blades which protrude away from the inlet. Rotary slicer shall be bolted to shaft within close tolerance of grinding slicer plate. The stationary slicer plate shall consist of engineered-shaped holes for optimum cutting of debris. A slicer plate shall contain grooved slots to eject pump media away from underside of rotary cutter. Slicer plate shall be fastened with countersunk head screws that are flush with surface of plate. Pumps with protruded or exposed head fasteners shall be considered not equal. Both rotary slicer and slicer plate shall be 440C stainless steel hardened to 60 Rockwell C.

### 2.7 GRINDER

- A. The grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece stainless steel motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft. The grinder will be of the rotating type with a stationary hardened and ground stainless steel shredding ring spaced in accurate close annular alignment with the driven impeller assembly, which shall carry two hardened type 400 series stainless steel cutter bars.
- B. This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour tank free of deposits or sludge banks which would impair the operation of the pump.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### 2.8 ELECTRIC MOTOR

- A. The motor shall be a 7.5 HP, 3450 RPM, 240 Volt, 60 Hertz, 1 Phase, The pump motor construction shall be per NEMA MG-1 1.15 standard and shall be of the submersible type, rated 7.5 HP, 3450 RPM. The motor shall be for 60 Hz, 240 volt, single-phase operation. Single-phase motors shall be capacitor start, capacitor run type for high starting torque. Start & run capacitors, and starting switch for operating the motor will be found in the control box. Major motor operating temperature must not exceed Class B ratings.
- B. The stator winding shall be of the open type with Class F insulation. Any other construction shall not be considered equal. The stator shall be pressed into the cast iron motor housing. Winding housing shall be filled with clean, high dielectric oil that lubricates bearings and seals, transferring heat from windings and rotor to the outer cast housing. Maximum skin temperature of motor assembly shall not exceed a T-4 rating per FM3615 standards. Any motor assembly T-code per FM3615 standard that exceeds a T-4 rating shall be considered not equal.
- C. Single-phase motors shall have automatic reset overload protection attached to the top end of the motor windings to stop the motor if the motor winding temperature reaches 130 degrees C. The high temperature shut-off will cause the pump to cease operation, should a control failure cause the pump to run in a dry wet well. The overload shall automatically reset when the motor cools to a safe operating temperature.

### 2.9 MECHANICAL SEAL

- A. Type 21, domestic manufactured, dual mechanical seal construction mounted in tandem, shall protect the motor. Standard construction of primary seal shall be silicon / carbide with Viton® elastomers. Standard construction of secondary seal shall be silicon / carbide with Viton® elastomers. The seal face shall be lapped to a flatness of one light band. Dual electrodes with 330k ohm resistor shall be mounted in the seal chamber to detect water entering the chamber through the lower seal. Water in the chamber shall cause a red light to turn on at the control box. This signal shall not stop the motor, but shall act as a warning only, indicating service is required. Lip seal arrangements shall not be considered equal.

### 2.10 BEARINGS/SHAFT

- A. The motor shall have two heavy-duty ball bearings and one sleeve bearing to support the pump shaft, taking radial and thrust loadings. Bearings shall be designed to an ABEC® System 1 or better. The upper bearing shall be a Conrad type, single-row, deep groove ball bearing designed to adequately handle the required radial loads. The lower bearing shall be a single-row, deep groove ball bearing designed to adequately compensate for the axial loads and radial forces. Bearings shall be designed to deliver a minimum L-10 bearing life of 100,000 hours when operation is within the limitations of the manufacturer's performance curve. The bearings shall be lubricated in oil and will not require maintenance as described in ANSI/HI 1.4-2010 A.6.

### 2.11 VALVES

- A. Check Valves - The pump discharge shall be equipped with a factory installed, gravity operated, The lift-out check valve shall be of the ball type with a corrosion resistant neoprene ball. The ball shall be the only moving part and shall move automatically out of

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

the path of flow, thus providing an unobstructed smooth flow through the valve body. Upon pump shut-off the ball shall automatically roll to the closed position to provide a positive seal against back pressure or back flow.

- B. Shutoff Valves - The schedule 80 PVC true union ball type shutoff valve shall be furnished and installed as an integral part of the internal pipe assembly. If the discharge depth is more than 2 feet from the surface, a stainless steel handle extension shall be supplied. Handle is attached to the valve stem and is supported near the top of basin within reach for service personnel

### 2.12 CORE UNIT

- A. The Grinder Pump Station shall have cartridge type easily removable core assemblies containing pump, motor, grinder, all motor controls, check valve, anti-siphon valve, electrical quick disconnect and wiring. The watertight integrity of each core unit, shall be established by 100% factory test at a minimum of 5 PSIG.

### 2.13 FLOATS

- A. Four air-filled polypropylene float switches shall be provided for pump on/off control and high level alarm.

### 2.14 CONTROLS

- A. All control elements shall be housed in a NEMA 4X fiberglass enclosure. Control elements shall include a 7.5 HP rated contactor and overload relay, start and run capacitors (single phase models only), hand-off-auto switch, green pump run light, red seal failure light, high water alarm beacon, high water alarm buzzer, alarm-off-auto selector switch, terminal blocks for power, pump, pump thermal protection, and float switch connections.
- B. The enclosure shall include a hinged, pad lockable cover, secured dead front and component knockouts. For each core, the panel shall contain one, double pole circuit breaker for the power circuit and one single pole circuit breaker for the alarm circuit. The panel shall contain terminal blocks, integral power bus, push to run feature and a complete alarm circuit.
- C. The Alarm/Disconnect Panel shall include the following features: audio & visual alarm, push to run switch, and high level (redundant) pump starting control. The alarm sequence is to be as follows:
  - 1. When liquid level in the sewage wetwell rises above the alarm level, visual and audio alarms will be activated. The contacts on the alarm pressure switch will close. The redundant pump starting system will be energized.
  - 2. The audio alarm may be silenced by means of the externally mounted, push-to-silence button.
  - 3. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "offsetting of the alarm pressure switch.
- D. The visual alarm lamp shall be inside a red fluted lens at least 2-5/8" in diameter and 1-11/16" in height. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 3R rating. For duplex units, in addition to the above, two high level indicator lights shall be mounted behind the access cover.

## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

- E. During a high level alarm condition the appropriate light will illuminate to indicate which pump core requires servicing.
- F. The audio alarm shall be a printed circuit board in conjunction with an 86 dB buzzer with quick mounting terminal strip mounted in the interior of the enclosure. The audio alarm shall be capable of being deactivated by depressing a push-type switch which is encapsulated in a Weatherproof silicone boot and mounted on the bottom of the enclosure.
- G. The entire Alarm/Disconnect Panel as manufactured, shall be listed by Underwriters Laboratories, Inc. and provided by pump manufacturer.

### 2.15 SERVICEABILITY

- A. The grinder pump core unit shall have lifting hook complete with stainless steel lifting chains connected to its top housing to facilitate easy core removal when necessary. All mechanical and electrical connections must provide easy disconnect accessibility for core unit removal and installation. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

### 2.16 SAFETY

- A. The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired Grinder Pump Station shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use.
- B. The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications.

## PART 3 – EXECUTION

### 3.1 FACTORY TEST

- A. Each grinder pump shall be submerged and operated for 5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge line, level sensors and each unit's dedicated controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls that will be installed in the field, shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps will not be acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two (2) different points on its curve, with the maximum pressure no less than 100 psi. The Engineer reserves the right to inspect such testing procedures with representatives of the Owner, at the Grinder Pump Manufacturer's facility.
- B. All completed stations shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets etc.).



## JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)

### 3.2 DELIVERY

- A. All Grinder Pump units will be delivered to the job site, 100% completely assembled, including testing, ready for installation. Grinder pump units will be individually mounted on wooden pallets.

### 3.3 INSTALLATION

- A. Earth excavation and backfill are specified under Section "312000 – Earth Moving", but are also to be done as a part of the work under this section, including any necessary sheeting and bracing.
- B. The Contractor shall be responsible for handling ground water to provide a firm, dry subgrade for the structure, and shall guard against flotation or other damage resulting from general water or flooding. The Grinder Pump Stations shall not be set into the excavation until the installation procedures and excavation have been approved by the Engineer.
- C. Remove packing material. Users instructions MUST be given to the OWNER. Hardware supplied with the unit, if required, will be used at installation. The basin will be supplied with a standard 8-inch inlet grommet, for connecting the incoming sewer line. Appropriate inlet piping must be used. The basin may not be dropped, rolled or laid on its side for any reason.
- D. Installation shall be accomplished so that 1" to 4" of accessway, below the bottom of the lid, extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the hole must be large enough to allow for the concrete anchor.
- E. A 6" inch (minimum) layer of naturally rounded aggregate, clean and free flowing, with particle size of not less than 1/8" or more than 3/4" shall be used as bedding material under each unit.
- F. A Bottom of excavation should be compacted in accordance with the Report of Geo Technical Investigation (if available) or to a minimum 95 percent Modified Proctor Density. Pour reinforced concrete base a minimum of one foot deep and at least two feet in diameter larger than the fiberglass wet well outside diameter.
- G. The unit shall be leveled, and filled with water, to the bottom of the inlet, to help prevent the unit from shifting while the concrete is being poured. The concrete must be manually vibrated to ensure there are no voids. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8" sleeve is required over the inlet prior to the concrete being poured.
- H. The electrical enclosure shall be furnished, installed and wired to the Grinder Pump Station by the Contractor. It will be the responsibility of the Contractor and the Engineer to coordinate with the owner(s) to determine the optimum location for the Control Panel.

### 3.4 START-UP AND FIELD TESTING

- A. The Manufacturer shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified

**JOHNSON'S SHUT-INS STATE PARK (PROJECT #X2206-01)**

herein, and instruct the Owner's personnel in the operation and maintenance of the equipment before the stations are accepted by the Owner.

- B. All equipment and materials necessary to perform testing shall be the responsibility of the Contractor. This will include, as a minimum, a portable generator (if temporary power is required) and water in each basin.

The services of a trained factory authorized technician shall be provided at a rate of one (1) day for each grinder pump stations supplied.

- C. Upon completion of the installation, the authorized factory technicians will perform the following test on each station:

1. Make certain the discharge shut-off valve is fully open. This valve must not be closed when the pump is operating. In some installations, there may be a valve(s) at the street main that must also be open.
2. Turn ON the alarm power circuit
3. Fill the wet well with water to a depth sufficient to verify the high level alarm is operating. Shut off water.
4. Turn ON pump power circuit. Initiate pump operation to verify automatic "on/off controls are operative. Pump should immediately turn ON. Within one (1) minute alarm light will turn OFF. Within three (3) minutes the pump will turn OFF.

- D. Upon completion of the start-up and testing, the Manufacturer shall submit to the Engineer the start-up authorization form describing the results of the tests performed for each Grinder Pump Station. Final acceptance of the system will not occur until authorization forms have been received for each pump station installed.

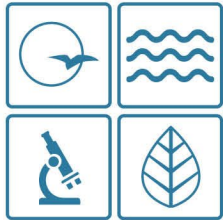
**3.5 OPERATION AND MAINTENANCE**

- A. The Manufacturer shall supply two (2) copies of Operation and Maintenance Manuals to the Owner, and one (1) copy of the same to the Engineer.

**END OF SECTION 334500**

**APPENDIX A:**

**DNR-LAND DISTURBANCE OPERATING PERMIT**



**MISSOURI**  
DEPARTMENT OF  
NATURAL RESOURCES

**Michael L. Parson**  
Governor

**Dru Buntin**  
Director

August 1, 2022

Leanne Mattern  
Office of Administration, Facilities Management Design & Construction  
Harry S. Truman SOB,  
301 West High Street, Room 730  
Jefferson City, MO 65102

Dear Permittee:

Pursuant to the Federal Water Pollution Control Act, under the authority granted to the State of Missouri and in compliance with the Missouri Clean Water Law, we have issued and are enclosing your Missouri State Operating Permit for Office of Administration, MOR-100038.

Please read and review your permit and attached Standard Conditions. They contain important information on site management and reporting requirements. Quarterly reports required by this report must be submitted through our eDMR system.

This permit may include requirements with which you may not be familiar. If you would like The Department of Natural Resources to meet with you to discuss how to satisfy the permit requirements, an appointment can be set up by contacting the permit writer at 573-526-1139. These visits are called Compliance Assistance Visits and focus on explaining the requirements to the permit holder.

This permit is both your Federal NPDES Permit and your new Missouri State Operating Permit and replaces all previous State Operating Permits issued for this facility under this permit number. In all future correspondence regarding this facility, please refer to your State Operating Permit number and facility name as shown on page one of the permit.

If you were adversely affected by this decision, you may be entitled to an appeal before the Administrative Hearing Commission (AHC) pursuant to 10 CSR 20-1.020 and 10 CSR 20-6.020; RSMo Section 621.250, 640.013, and 644.051.6. To appeal, you must file a petition with the AHC within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC. Contact information for the AHC is: Administrative Hearing Commission, Truman State Office Building, Room 640, 301 W. High Street, P.O. Box 1557, Jefferson City, Missouri 65102, phone: (573) 751-2422, fax: (573) 751-5018; website: <http://ahc.mo.gov/>.

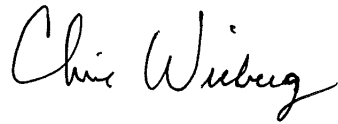


Office of Administration  
Page Two

Please be aware that this facility may also be subject to any applicable county or other local ordinances or restrictions. If you have any questions concerning this permit, please do not hesitate to contact the Water Protection Program at P.O. Box 176, Jefferson City, MO 65102, 573-522-4502.

Sincerely,

WATER PROTECTION PROGRAM

A handwritten signature in black ink that reads "Chris Wieberg". The signature is written in a cursive style with a large initial "C" and a long, sweeping underline.

Chris Wieberg  
Director

CW/qs

Enclosure

STATE OF MISSOURI  
DEPARTMENT OF NATURAL RESOURCES  
MISSOURI CLEAN WATER COMMISSION



## MISSOURI STATE OPERATING PERMIT

### General Operating Permit

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No MOR100038

Owner: OA-Facilities Mgmt, Design, and Construc  
Address: 301 West High Street, Hst Rm 370  
Jefferson City, MO 65101

Continuing Authority: OA Facilities Mgmt Design Construction  
301 West High St.  
HST SOB Rm 730  
Jefferson City, MO 65102

Facility Name: Office of Administration  
Facility Address: OA-FMDC, PO Box 809 301 W High street  
JEFFERSON CITY, MO 65102

Legal Description: Land Grant 02681, Cole County  
UTM Coordinates: 571840.000/4270368.000  
Receiving Stream: Tributary to Wears Creek (U)  
First Classified Stream - ID#: 100K Extent-Remaining Streams (C) 3960.00  
USGS# and Sub Watershed#: 10300102 - 1304

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein.

### **FACILITY DESCRIPTION** All Outfalls SIC #1629

All Outfalls - Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, filling and other activity that results in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution of waters of the state)

Issued to a city, county, state or federal agency, other governmental jurisdiction, or other private area-wide projects as determined by the Department on a case-by-case basis

This permit authorizes only wastewater, including storm water, discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System, it does not apply to other regulated areas. This permit may be appealed in accordance with RSMo Section 644.051.6 and 621.250, 10 CSR 20-6.020, and 10 CSR 20-1.020.

August 01, 2022

Issue Date

Chris Wieberg, Director  
Water Protection Program

July 04, 2027

Expiration Date

## **I. APPLICABILITY**

### **A. Permit Coverage and Authorized Discharges**

1. This Missouri State Operating Permit (permit) authorizes the discharge of stormwater and certain non-stormwater discharges from land disturbance sites that disturb one or more acres, or disturb less than one acre when part of a larger common plan of development or sale that will disturb a cumulative total of one or more acres over the life of the project.

A Missouri State Operating Permit must be issued before any site vegetation is removed or the site disturbed. Any site owner/operator subject to these requirements for stormwater discharges and who disturbs land prior to permit issuance from the Missouri Department of Natural Resources (Department) is in violation of both State regulations per 10 CSR 20-6.200(1)(A) and Federal regulations per 40 CFR 122.26. The owner/operator of this permit is responsible for compliance with this permit [10 CSR 20-6.200 (3)(B)].

2. This general permit is issued to a city, county, state or federal agency, other governmental jurisdiction, or other private area-wide projects as determined by the Department on a case-by-case basis, for land disturbance projects performed by or under contract to the permittee.
3. This permit authorizes stormwater discharges from land disturbance support activities (e.g., equipment staging yards, material storage areas, excavated material disposal areas, borrow areas, concrete, or asphalt batch plants) provided appropriate stormwater controls are designed, installed, and maintained and the following conditions are met and addressed in the Stormwater Pollution Prevention Plan (SWPPP). The permittee is responsible for compliance with this permit for any stormwater discharges from construction support activity.
  - (a) The support activity is directly related to the construction site required to have permit coverage for stormwater discharges;
  - (b) The support activity is not a commercial operation or serve multiple unrelated construction sites;
  - (c) The support activity does not continue to operate beyond the completion of the construction activity at the project it supports;
  - (d) Sediment and erosion controls are implemented in accordance with the conditions of this permit; and
  - (e) The support activity is strictly stormwater discharges or non-stormwater discharges listed in PART I, APPLICABILITY, Condition A.4. Support activities which discharge process water shall apply for separate coverage (e.g., a concrete batch plant discharging process water shall be covered under a MOG49).
4. This permit authorizes non-stormwater discharges associated with your construction activity from the following activities provided that these discharges are treated by appropriate Best Management Practices (BMPs) where applicable and addressed in the permittee's site specific SWPPP required by this general permit:
  - (a) Discharges from emergency fire-fighting activities;
  - (b) Hydrant flushing and water line flushing, provided the discharged water is managed to avoid instream water quality impacts;
  - (c) Landscape watering, including to establish vegetation;
  - (d) Water used to control dust;
  - (e) Waters used to rinse vehicles and equipment, provided there is no discharge of soaps, solvents, or detergents used for such purposes;
  - (f) External building washdown, provided soaps, solvents, and detergents are not used, and external surfaces do not contain hazardous substances (e.g., paint or caulk containing polychlorinated biphenyls (PCBs))
  - (g) Pavement wash waters, provided spills or leaks of toxic or hazardous substances have not occurred (unless all spill material has been removed) and where soaps, solvents, and detergents are not used. Directing pavement wash waters directly into any water of the state, storm drain inlet, or stormwater conveyance (constructed or natural site drainage features), unless the conveyance is connected to an effective control, is prohibited;
  - (h) Uncontaminated air conditioning or compressor condensate;
  - (i) Uncontaminated, non-turbid discharges of ground water or spring water;
  - (j) Foundation or footing drains where flows are not contaminated with process materials; and
  - (k) Uncontaminated construction dewatering water discharged in accordance with requirements found in this permit for specific dewatering activities.

## **B. Permit Restrictions and Limitations**

1. This permit does not authorize the discharge of process wastewaters, treated or otherwise.
2. For sites operating within the watershed of any Outstanding National Resource Water (which includes the Ozark National Riverways and the National Wild and Scenic Rivers System), sites that discharge to an Outstanding State Resource Water, or facilities located within the watershed of an impaired water as designated in the Clean Water Act (CWA) Section 303(d) list with an impairment for sedimentation/siltation:
  - (a) This permit authorizes stormwater discharge provided no degradation of water quality occurs due to discharges from the permitted facility per 10 CSR 20-7.031(3)(C).
  - (b) A site with a discharge found to be causing degradation or contributing to an impairment by discharging a pollutant of concern, during an inspection or through complaint investigations, may be required to become a no discharge facility or obtain a site-specific permit with more stringent monitoring and SWPPP requirements.
3. This permit does not allow placement of fill material into any stream or wetland, alteration of a stream channel, or obstruction of stream flow unless the appropriate CWA Section 404 permitting authority provides approval for such actions or determines such actions are exempt from Section 404 jurisdiction. Additionally, this permit does not authorize placement of fill in floodplains unless approved or determined exempt by appropriate federal and/or state floodplain development authorities.
4. This operating permit does not affect, remove, or replace any requirement of the National Environmental Policy Act; the Endangered Species Act; the National Historic Preservation Act; the Comprehensive Environmental Response, Compensation and Liability Act; the Resource Conservation and Recovery Act; or any other relevant acts. Determination of applicability to the above mentioned acts is the responsibility of the permittee. Additionally, this permit does not establish terms and conditions for runoff resulting from silvicultural activities listed in Section 402(1)(3)(a) of the Clean Water Act.
5. Compliance with all requirements in this permit does not supersede any requirement for obtaining project approval from an established local authority nor remove liability for compliance with county and other local ordinances.
6. The Department may require any facility or site authorized by a general permit to apply for a site-specific permit [10 CSR 20-6.010(13)(C)].
7. If a facility or site covered under a current general permit desires to apply for a site-specific permit, the facility or site may do so by contacting the Department for application requirements and procedures.
8. Any discharges not expressly authorized in this permit and not clearly disclosed in the permit application cannot become authorized or shielded from liability under CWA section 402(k) or Section 644.051.16, RSMo, by disclosure to EPA, state, or local authorities after issuance of this permit via any means, including any other permit applications, funding applications, the SWPPP, discharge monitoring reporting, or during an inspection. Discharges at the facility not expressly authorized by this permit must be covered by another permit, be exempt from permitting, or be authorized through some other method.

## **II. EXEMPTIONS FROM PERMIT REQUIREMENTS**

1. Sites that discharge all stormwater runoff directly to a combined sewer system (as defined in 40 CFR 122.26 and 40 CFR 35.2005) connecting to a publicly owned treatment works which has consented to receive such a discharge are exempt from Department stormwater permit requirements.
2. Land disturbance activities that disturb less than one (1) acre of total land area which are not part of a common plan or sale where water quality standards are not exceeded are exempt from Department stormwater permit requirements.



3. Oil and gas related activities as listed in 40 CFR 122.26(a)(2)(ii) where water quality standards are not exceeded are exempt from Department stormwater permit requirements.
4. Linear, strip, or ribbon construction or maintenance operations meeting one (1) of the following criteria are exempt from Department stormwater permit requirements:
  - (a) Grading of existing dirt or gravel roads which does not increase the runoff coefficient and the addition of an impermeable surface over an existing dirt or gravel road;
  - (b) Cleaning or routine maintenance of roadside ditches, sewers, waterlines, pipelines, utility lines, or similar facilities;
  - (c) Trenches two (2) feet in width or less; or
  - (d) Emergency repair or replacement of existing facilities as long as BMPs are employed during the emergency repair.

### **III. REQUIREMENTS**

1. The permittee shall post a public notification sign at the main entrance to the site, or a publically visible location, with the specific MOR100 permit number. The public notification sign must be visible from the public road that provides access to the site's main entrance. An alternate location is acceptable provided the public can see it and it is noted in the SWPPP. The public notification sign must remain posted at the site until the site is finalized.
2. The permittee shall be responsible for notifying the land owner and each contractor or entity (including utility crews and city employees or their agents) who will perform work at the site of the existence of the SWPPP and what actions or precautions shall be taken while on site to minimize the potential for erosion and the potential for damaging any BMP. The permittee is responsible for any damage a subcontractor may do to established BMPs and any subsequent water quality violation resulting from the damage.
3. Ensure the design, installation, and maintenance of effective erosion and sediment controls to minimize the discharge of pollutants. At a minimum, such controls must be designed, installed, and maintained to:
  - (a) Control stormwater volume, velocity, and peak flow rates to minimize soil erosion;
  - (b) Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion and scour;
  - (c) Minimize the amount of exposed soil during construction activity;
  - (d) Minimize the disturbance of steep slopes;
  - (e) Minimize sediment discharges from the site. Address factors such as:
    - 1) The amount, frequency, intensity, and duration of precipitation;
    - 2) The nature of resulting stormwater runoff;
    - 3) Expected flow from impervious surfaces, slopes, and drainage features; and
    - 4) Soil characteristics, including the range of soil particle size expected to be present on the site.
  - (f) Provide and maintain natural buffers around surface waters as detailed in Part V. BMP REQUIREMENTS Condition 7, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration and filtering, unless infeasible; and
  - (g) Minimize soil compaction and preserve topsoil where practicable.

A 2-year, 24-hour storm event can be determined for the project location using the National Oceanic and Atmospheric Administration's National Weather Service Atlas 14 which can be located at [https://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_map\\_cont.html](https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html), or the permittee can determine local rainfall distribution for a 2-year, 24 hours storm event using multi-decade local high density rain gauge data, as approved by the Department.

4. BMPs for land disturbance [10 CSR 20-6.200(1)(D)2] are a schedule of activities, practices, or procedures that reduces the amount of soil available for transport or a device that reduces the amount of suspended solids in runoff before discharge to waters of the state. The term BMPs are also used to describe the sediment and erosion controls and other activities used to prevent stormwater pollution. BMPs are divided into two main categories: structural or non-structural; and they are also classified as temporary or permanent. Temporary BMPs may be added and removed as necessary with updates to the SWPPP as specified in the requirements below.

5. Installation of BMPs necessary to prevent soil erosion and sedimentation at the downgradient project boundary (e.g. buffers, perimeter controls, exit point controls, storm drain inlet protection) must be complete prior to the start of all phases of construction. By the time construction activity in any given portion of the site begins, downgradient BMPs must be installed and operational to control discharges from the initial site clearing, grading, excavating, and other earth-disturbing activities. Additional BMPs shall be installed as necessary throughout the life of the project.
6. All BMPs shall be maintained and remain in effective operating condition during the entire duration of the project, with repairs made within the timeframes specified elsewhere in this permit, until final stabilization has been achieved.
  - (a) Ensure BMPs are protected from activities that would reduce their effectiveness.
  - (b) Remove any sediment per the BMP manufacturer's instructions or before it has accumulated to one-half of the above-ground height of any BMP that collects sediment (i.e., silt fences, sediment traps, etc.)
  - (c) The project is considered to achieve final stabilization when Part V. BMP REQUIREMENTS, Condition 13 is met.
7. Minimize sediment trackout from the site and sediment transport onto roadways.
  - (a) Restrict vehicle traffic to designated exit points.
  - (b) Use appropriate stabilization techniques or BMPs at all points that exit onto paved roads or areas outside of the site.
  - (c) Use additional controls or BMPs to remove sediment from vehicle and equipment tires prior to exit from facility where necessary.
  - (d) Any sediment or debris that is tracked out past the exit pad or is deposited on a roadway after a precipitation event shall be removed by the shorter of either the same business day (for business days only), or by the end of the next business day if track-out occurs on a non-business day, and before predicted rain events. Remove the track-out sediment by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. Sediment or debris tracked out on pavement or other impervious surfaces shall not be disposed of into any stormwater conveyance, storm drain inlet, or water of the state.
  - (e) Stormwater inlets susceptible to receiving sediment or other pollutants from the permitted land disturbance site shall have curb inlet protection. This may include inlets off the active area where track out from vehicles and equipment could impact the stormwater runoff to those inlets.
8. Concrete washout facilities shall be used to contain concrete waste from the activities onsite, unless the washout of trucks and equipment is managed properly at an off-site location. The washout facility shall be managed to prevent solid and/or liquid waste from entering waters of the state by the following:
  - (a) Direct the wash water into leak-proof containers or pits designed so that no overflows can occur due to inadequate sizing or precipitation;
  - (b) Locate washout activities away from waters of the state, stormwater inlets, and/or stormwater conveyances where practicable. If not practicable, use BMPs to reduce risk of waste leaving the washout facility;
  - (c) Washout facilities shall be cleaned, or new facilities must be constructed and ready for use, once the washout is 75% full;
  - (d) Designate the washout area(s) and conduct such activities only in these areas.
  - (e) Ensure contractors are aware of the location, such as by marking the area(s) on the map or signage visible to the truck and/or equipment operators.
9. Good housekeeping practices shall be maintained at all times to keep waste from entering waters of the state.
  - (a) Provide solid and hazardous waste management practices, including providing trash containers, regular site cleanup for proper disposal of solid waste such as scrap building material, product/material shipping waste, food/beverage containers, spent structural BMPs;
  - (b) Provide containers and methods for proper disposal of waste paints, solvents, and cleaning compounds.
  - (c) Manage sanitary waste. Portable toilets shall be positioned so that they are secure and will not be tipped or knocked over and so that they are located away from waters of the state and stormwater inlets and stormwater conveyances.
  - (d) Ensure the storage of construction materials be kept away from drainage courses, stormwater conveyances, storm drain inlets, and low areas.

10. All fueling facilities present shall at all times adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers.
11. Any hazardous wastes that are generated onsite shall be managed, stored, and transported according to the provisions of the Missouri Hazardous Waste Laws and Regulations.
12. Store all paints, solvents, petroleum products, petroleum waste products, and storage containers (such as drums, cans, or cartons) so they are not exposed to stormwater or provide other prescribed BMPs (such as plastic lids and/or portable spill pans) to prevent the commingling of stormwater with container contents. Commingled water may not be discharged under this permit. Provide spill prevention, control, and countermeasures to contain the spill. Any containment system used to implement this requirement shall be constructed of materials compatible with the substances contained and shall prevent the contamination of groundwater.
13. Implement measures intended to prevent the spillage or loss of fluids, oil, grease, fuel, etc. from vehicles and equipment to thereby prevent the contamination of stormwater from these substances. This may include prevention measures such as, but not limited to, utilizing drip pans under vehicles and equipment stored outdoors, covering fueling areas, using dry clean-up methods, use of absorbents, and cleaning pavement surfaces to remove oil and grease.
14. Spills, Overflows, and Other Unauthorized Discharges.
  - (a) Any spill, overflow, or other discharge not specifically authorized in the permit above are unauthorized.
  - (b) Should an unauthorized discharge cause or permit any contaminants, other than sediment, or hazardous substance to discharge or enter waters of the state, the unauthorized discharge must be reported to the regional office as soon as practicable but no more than 24 hours after the discovery of the discharge. If the spill or overflow needs to be reported after normal business hours or on the weekend, the facility must call the Department's Environmental Emergency Response hotline at (573) 634-2436. Leaving a message on a Department staff member voice-mail does not satisfy this reporting requirement.
  - (c) A record of all spills shall be retained with the SWPPP and made available to the Department upon request.
  - (d) Other spills not reaching waters of the state must be cleaned up as soon as possible to prevent entrainment in stormwater but are not required to be reported to the Department.
15. The full implementation of this operating permit shall constitute compliance with all applicable federal and state statutes and regulations in accordance with RSMo 644.051.16 and the CWA §402(k); however, this permit may be reopened and modified or alternatively revoked and reissued to comply with any applicable effluent standard or limitation issued or approved under Clean Water Act §§ 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) if the effluent standard or limitation so issued or approved contains different conditions or is otherwise more stringent than any effluent limitation in the permit or controls any pollutant not limited in the permit. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, termination, notice of planned changes, or anticipated non-compliance does not stay any permit condition.

#### **IV. STORMWATER POLLUTION PREVENTION PLAN (SWPPP) MANAGEMENT REQUIREMENTS**

1. The primary requirement of this permit is the development and implementation of a SWPPP which incorporates site specific practices to best minimize the soil exposure, soil erosion, and the discharge of pollutants, including solids for each site covered under this permit.

The purpose of the SWPPP is to ensure the design, implementation, management, and maintenance of BMPs in order to prevent sediment and other pollutants in stormwater discharges associated with the land disturbance activities [40 CFR 122.44 (k)(4)] from entering waters of the state above established general and narrative criteria; compliance with Missouri Water Quality Standards; and compliance with the terms and conditions of this general permit.

- (a) **The SWPPP must be developed and implemented prior to conducting any land disturbance activities and must be specific to the land disturbance activities at the site.**
- (b) The permittee shall fully implement the provisions of the SWPPP required under this permit as a condition of this general permit throughout the term of the land disturbance project. Failure to develop, implement, and maintain a SWPPP may lead to immediate enforcement action.

- (c) The SWPPP shall be updated any time site conditions warrant adjustments to the project or BMPs.
  - (d) Either an electronic copy or a paper copy of the SWPPP, and any required reports, must be accessible to anyone on site at all times when land disturbance operations are in process or other operational activities that may affect the maintenance or integrity of the BMP structures and made available as specified under Part VIII. STANDARD PERMIT CONDITIONS, Condition 1 of this permit. The SWPPP shall be readily available upon request and should not be sent to the Department unless specifically requested
2. Failure to implement and maintain the BMPs chosen, which can be revised and updated, is a permit violation. The chosen BMPs will be the most reasonable and cost effective while also ensuring the highest quality water discharged attainable for the facility. Facilities with established SWPPPs and BMPs shall evaluate BMPs on a regular basis and change the BMPs as needed if there are BMP deficiencies.
  3. The SWPPP must:
    - (a) List and describe the location of all outfalls;
    - (b) List any allowable non-stormwater discharges occurring on site and where these discharges occur;
    - (c) Incorporate required practices identified below;
    - (d) Incorporate sediment and erosion control practices specific to site conditions;
    - (e) Discuss whether or not a 404 Permit is required for the project; and
    - (f) Name the person(s) responsible for inspection, operation, and maintenance of BMPs. The SWPPP shall list the names and describe the role of all owners/primary operators (such as general contractor, project manager) responsible for environmental or sediment and erosion control at the land disturbance site.
  4. The SWPPP briefly must describe the nature of the land disturbance activity, including:
    - (a) The function of the project (e.g., low density residential, shopping mall, highway, etc.);
    - (b) The intended sequence and timing of activities that disturb the soils at the site; and
    - (c) Estimates of the total area expected to be disturbed by excavation, grading, or other land disturbance support activities including off-site borrow and fill areas;
  5. In order to identify the site, the SWPPP shall include site information including size in acres. The SWPPP shall have sufficient information to be of practical use to contractors and site construction workers to guide the installation and maintenance of BMPs.
  6. The function of the SWPPP and the BMPs listed therein is to prevent or minimize pollution to waters of the state. A deficiency of a BMP means it was not effective in preventing or minimizing pollution of waters of the state.

The permittee shall select, install, use, operate and maintain appropriate BMPs for the permitted site. The following manuals are acceptable resources for the selection of appropriate BMPs.

*Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites*, (Document number EPA 833-R-06-004) published by the United States Environmental Protection Agency (USEPA) in May 2007. This manual as well as other information, including examples of construction SWPPPs, is available at the USEPA internet site at [https://www.epa.gov/sites/production/files/2015-10/documents/sw\\_swppp\\_guide.pdf](https://www.epa.gov/sites/production/files/2015-10/documents/sw_swppp_guide.pdf); and <https://www.epa.gov/npdes/developing-stormwater-pollution-prevention-plan-swppp>.

The latest version of *Protecting Water Quality: A field guide to erosion, sediment and stormwater best management practices for development sites in Missouri*, published by the Department. This manual is available at: <https://dnr.mo.gov/document-search/protecting-water-quality-field-guide>.

The permittee is not limited to the use of these guidance manuals. Other guidance publications may be used to select appropriate BMPs. However, all BMPs must be described and justified in the SWPPP. Although the use of these manuals or other resources is recommended and may be used for BMP selection, they do not supersede the conditions of this permit. They may be used to inform in the decision making process for BMP selection but they are not themselves part of the permit conditions.

The permittee may retain the SWPPP, inspection reports, and all other associated documents (including a copy of this permit) electronically pursuant to RSMo 432.255. The documents must be made available to all interested persons in either paper or electronic format as required by this permit and the permittee must remit a copy (electronic or otherwise) of the SWPPP and inspection reports to the Department upon request.

7. The SWPPP must contain a legible site map, multiple maps if necessary, identifying:
  - (a) Site boundaries of the property;
  - (b) Locations of all waters of the state (including wetlands) within the site and half a mile downstream of the site's outfalls;
  - (c) Location of all outfalls;
  - (d) Direction(s) of stormwater flow (use arrows) and approximate slopes before and after grading activities;
  - (e) Areas of soil disturbance and areas that will not be disturbed (or a statement that all areas of the site will be disturbed unless otherwise noted);
  - (f) Location of structural and non-structural BMPs, including natural buffer areas, identified in the SWPPP;
  - (g) Locations where stabilization practices are expected to occur;
  - (h) Locations of on-site and off-site material, waste, borrow, or equipment storage areas and stockpiles;
  - (i) Designated points where vehicles will exit the site;
  - (j) Location of stormwater inlets and conveyances including ditches, pipes, man-made conduits, and swales; and
  - (k) Areas where final stabilization has been achieved.
8. An individual shall be designated by the permittee as the environmental lead. This environmental lead shall have knowledge in erosion, sediment, and stormwater control principles, knowledge of the permit, and the site's SWPPP. The environmental lead shall ensure all personnel and contractors understand any requirements of this permit may be affected by the work they are doing. The environmental lead or designated inspector(s) knowledgeable in erosion, sediment, and stormwater control principles shall inspect all structures that function to prevent or minimize pollution of waters of the state.
9. Throughout coverage under this permit, the permittee shall amend and update the SWPPP as appropriate during the term of the land disturbance activity. All SWPPP modifications shall be signed and dated. The permittee shall amend the SWPPP to incorporate any significant site condition changes which impact the nature and condition of stormwater discharges. At a minimum, these changes include whenever the:
  - (a) Location, design, operation, or maintenance of BMPs is changed;
  - (b) Design of the construction project is changed that could significantly affect the quality of the stormwater discharges;
  - (c) The permittee's inspections indicate deficiencies in the SWPPP or any BMP;
  - (d) Department notifies the permittee in writing of deficiencies in the SWPPP;
  - (e) SWPPP is determined to be ineffective in minimizing or controlling erosion and sedimentation (e.g., there is visual evidence of excessive site erosion or sediment deposits in streams, lakes, or downstream waterways, sediment or other wastes off site); and/or
  - (f) Department determines violations of water quality standards may occur or have occurred.
10. Site Inspections: The environmental lead, or a designated inspector, shall conduct regularly scheduled inspections. These inspections shall be conducted by a qualified person, one who is responsible for environmental matters at the site, or a person trained by and directly supervised by the person responsible for environmental matters at the site. Site inspections shall include, at a minimum, the following:
  - (a) For disturbed areas that have not achieved final stabilization, all installed BMPs and other pollution control measures shall be inspected to ensure they are properly installed, appear to be operational, and are working as intended to minimize the discharge of pollutants.
  - (b) For areas on site that have achieved either temporary or final stabilization, while at the same time active construction continues on other areas, ensure that all stabilization measures are properly installed, appear to be operational, and are working as intended to minimize the discharge of pollutants.
  - (c) Inspect all material, waste, borrow, and equipment storage and maintenance areas that are covered by this permit. Inspect for conditions that could lead to spills, leaks, or other accumulations of pollutants on the site.
  - (d) Inspect all areas where stormwater typically flows within the site, including drainage ways designed to divert, convey, and/or treat stormwater.

- (e) All stormwater outfalls shall be inspected for evidence of erosion, sediment deposition, or impacts to the receiving stream. If a discharge is occurring during an inspection, the inspector must observe and document the visual quality of the discharge and take note of the characteristics of the stormwater discharge, including turbidity, color; odor; floating, settled, or suspended solids; foam; oil sheen; and other indicators of stormwater pollutants.
  - (f) When practicable the receiving stream shall also be inspected for a minimum of 50 feet downstream of the outfall.
  - (g) The perimeter of the site shall be inspected for evidence of BMP failure to ensure concentrated flow does not develop a new outfall.
  - (h) The SWPPP must explain how the environmental lead will be notified when stormwater runoff occurs.
11. Inspection Frequency: All BMPs must be inspected in accordance to one of the schedules listed below. The inspection frequency shall be documented in the SWPPP, and any changes to the frequency of inspections, including switching between the options listed below, must be documented on the inspection form:
- (a) At least once every seven (7) calendar days and within 48 hours after any storm event equal to or greater than a 2-year, 24-hour storm has ceased during a normal work day or within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday; or
  - (b) Once every 14 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches of precipitation or greater, or the occurrence of runoff from snowmelt. To determine if a storm event of 0.25 inches or greater has occurred on the site, the permittee shall either keep a properly maintained rain gauge on site, or obtain the storm event information from a weather station near the site location.
    - 1) Inspections are only required during the project's normal working hours.
    - 2) An inspection must be conducted within 24 hours of a storm event which has produced 0.25 inches. The inspection shall be conducted within 24 hours of the event end, or within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday.
    - 3) If it is elected to inspect every 14 calendar days and there is a storm event at the site that continues for multiple days, and each day of the storm produces 0.25 inches or more of rain, the permittee shall conduct an inspection within 24 hours of the end of the storm or within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday.
  - (c) Areas on site that have achieved stabilization, while at the same time active construction continues on other areas, may reduce inspection frequency to monthly, for those stabilized areas, if the following conditions exist:
    - 1) For areas where disturbed portions have undergone temporary stabilization, inspections shall occur at least once a month while stabilized and when re-disturbed shall follow either frequency outlined in (a),(b), or (c) above.
    - 2) Areas on site that have achieved final stabilization must be inspected at least once per month until the permit is terminated.
  - (d) If construction activities are suspended due to frozen conditions, the permittee may temporarily reduce site inspections to monthly until thawing conditions begin to occur if all of the following are met:
    - 1) Land disturbances have been suspended; and
    - 2) All disturbed areas of the site have been stabilized in accordance with Part V. BMP REQUIREMENTS, Condition 13.
    - 3) The change shall be noted in the SWPPP.
  - (e) Any basin dewatering shall be inspected daily when discharge is occurring. The discharge shall be observed and dewatering activities shall be ceased immediately if the receiving stream is being impacted. These inspections shall be noted on a log or on the inspection report.

If weather conditions or other issues prevent correction of BMPs within seven calendar days, the reasons for the delay must be documented (including pictures), and there must be a narrative explaining why the work cannot be accomplished within the seven day time period. The documentation must be filed with the regular inspection reports. The corrections shall be made as soon as weather conditions or other issues allow.

12. Site Inspection Reports: A log of each inspection and/or copy of the inspection report shall be kept readily accessible and must be made available upon request by the Department. Electronic logs are acceptable as long as reports can be provided within 24 hours. If inspection reports are kept off site, the SWPPP must indicate where they are stored. The inspection report shall be signed by the environmental lead or designated inspector (electronically or otherwise).
- (a) The inspection report is to include the following minimum information:
    - 1) Inspector's name and title.
    - 2) Date and time of inspection.
    - 3) Observations relative to the effectiveness of the BMPs and stabilization measures. The following must be

documented:

- a. Whether BMPs are installed, operational, and working as intended;
  - b. Whether any new or modified stormwater controls are needed;
  - c. Facilities examined for conditions that could lead to spill or leak;
  - d. Outfalls examined for visual signs of erosion or sedimentation at outfalls. Excessive erosion or sedimentation may be due to BMP failure or insufficiency. Response to observations should be addressed in the inspection report.
- 4) Corrective actions taken or necessary to correct the observed problem.
  - 5) Listing of areas where land disturbance operations have permanently or temporarily stopped.
13. Any structural or maintenance deficiencies for BMPs or stabilization measures shall be documented and corrected as soon as possible but no more than seven (7) calendar days after the inspection.
- (a) Corrective action documentation shall be stored with the associated site inspection report.
  - (b) Immediately take all reasonable steps to address the condition, including cleaning up any contaminated surfaces so the material will not discharge in subsequent storm events.
  - (c) If weather conditions or other issues prevent correction of BMPs within seven calendar days, the reasons for the delay must be documented (this may include pictures) and there must be a narrative explaining why the work cannot be accomplished within the seven day time period. The permittee shall correct the problem as soon as weather conditions or issues allow.
  - (d) Corrective actions may be required by the Department. The permittee must comply with any corrective actions required by the Department as a result of permit violations found during an inspection.

## **V. BMP REQUIREMENTS**

1. The information, practices, and BMP requirements in this section shall be implemented on site and, where noted, provided for in the SWPPP.
2. Existing vegetation and trees shall be preserved where practicable. The permittee is encouraged to preserve topsoil where practicable.
3. The permittee shall select appropriate BMPs for use at the site and list them in the SWPPP. When selecting effective BMPs, the permittee shall consider stormwater volume and velocity. A BMP that has demonstrated ineffectiveness in preventing or minimizing sediment or other pollutants from leaving a given site shall be replaced with a more effective BMP, or additional and sequential BMPs and treatment devices may be incorporated as site conditions allow. The permittee should consider a schedule for performing erosion control measures when selecting BMPs.
4. The SWPPP shall include a description of both structural and non-structural BMPs that will be used at the site.
  - (a) The SWPPP shall provide the following general information for each BMP which will be used one or more times at the site:
    - 1) Physical description of the BMP;
    - 2) Site conditions that must be met for effective use of the BMP;
    - 3) BMP installation/construction procedures, including typical drawings; and
    - 4) Operation and maintenance procedures and schedules for the BMP.
  - (b) The SWPPP shall provide the following information for each specific instance where a BMP is to be installed:
    - 1) Whether the BMP is temporary or permanent;
    - 2) When the BMP will be installed in relation to each phase of the land disturbance procedures to complete the project; and
    - 3) Site conditions that must be met before removal of the BMP if the BMP is not a permanent BMP.
5. Structural BMP Installation: The permittee shall ensure all BMPs are properly installed and operational at the locations and relative times specified in the SWPPP.
  - (a) Perimeter control BMPs for runoff from disturbed areas shall be installed before general site clearing is started. Note this requirement does not apply to earth disturbances related to initial site clearing and establishing entry, exit, or access of the site, which may require that stormwater controls be installed immediately after the earth

disturbance.

- (b) For phased projects, BMPs shall be properly installed as necessary prior to construction activities.
  - (c) Stormwater discharges which leave the site from disturbed areas shall pass through an appropriate impediment to sediment movement such as a sedimentation basin, sediment traps (including vegetative buffers), or silt fences prior to leaving the land disturbance site.
  - (d) A drainage course change shall be clearly marked on a site map and described in the SWPPP.
  - (e) If vegetative stabilization measures are being implemented, stabilization efforts are considered “installed” when all activities necessary to seed or plant the area are completed. Vegetative stabilization is not considered “operational” until the vegetation is established.
6. Install sediment controls along any perimeter areas of the site that are downgradient from any exposed soil or other disturbed areas. Prevent stormwater from circumventing the edge of the perimeter control. For sites where perimeter controls are infeasible, other practices shall be implemented to minimize discharges to perimeter areas of the site.
7. For surface waters of the state, defined in Section 644.016.1(27) RSMo, located on or adjacent to the site, the permittee must maintain a riparian buffer or structural equivalent in accordance with at least one of the following options. The selection and location must be described in the SWPPP.
- (a) Provide and maintain a 50-foot undisturbed natural buffer; or
  - (b) Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer; or
  - (c) If infeasible to provide and maintain an undisturbed natural buffer of any size, implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.
  - (d) The permittee is not required to comply with (a), (b), or (c) above if one or more of the following exceptions apply and documentation is provided in the SWPPP:
    - 1) As authorized per CWA Section 404 Department of the Army permit and its associated Section 401 Water Quality Certification from the Department.
    - 2) If there is no discharge of stormwater to waters of the state through the area between the disturbed portions of the site and waters of the state located within 50 feet of the site. This includes situations where the permittee has implemented permanent control measures that will prevent such discharges, such as a berm or other barrier.
    - 3) Where no natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for the current development of the site.
      - a. Where some natural buffer exists but portions of the area within 50 feet of the waters of the state are occupied by preexisting development disturbances the permittee is required to comply with (a), (b), or (c) above.
    - 4) For linear projects where site constraints make it infeasible to implement a buffer or equivalent provided the permittee limit disturbances within 50 feet of any waters of the state and/or the permittee provides supplemental erosion and sediment controls to treat stormwater discharges from earth disturbances within 50 feet of the water of the state. The permittee must also document in the SWPPP the rationale for why it is infeasible for the permittee to implement (a), (b), or (c) and describe any buffer width retained and supplemental BMPs installed.
  - (e) Where the permittee is retaining a buffer of any size, the buffer should be measured perpendicularly from any of the following points, whichever is further landward from the water:
    - 1) The ordinary high water mark of the water body, defined as the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris; or
    - 2) The edge of the stream or river bank, bluff, or cliff, whichever is applicable.
8. Slopes for disturbed areas must be identified in the SWPPP. A site map or maps defining the sloped areas for all phases of the project must be included in the SWPPP. The disturbance of steep slopes shall be minimized.
9. Manage stockpiles or land clearing debris piles composed, in whole or in part, of sediment and/or soil.
- (a) Locate the piles outside of any natural buffers zones, established under the condition above, and away from any stormwater conveyances, drain inlets, and areas where stormwater flow is concentrated;
  - (b) Install a sediment barrier along all downgradient perimeter areas;
  - (c) Divert surface flows around stockpiles to reduce and minimize erosion of the stockpile.



- (d) For piles that will be unused for 14 or more days, provide cover with appropriate temporary stabilization in accordance with Part V. BMP REQUIREMENTS, Condition 13.
  - (e) Rinsing, sweeping, or otherwise placing any soil, sediment, debris, or stockpiled product which has accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or water of the state is prohibited.
10. The site shall include BMPs for pollution prevention measures and shall be noted in the SWPPP. At minimum such measures must be designed, installed, implemented, and maintained to:
- (a) Minimize the discharge of pollutants from equipment and vehicle rinsing; no detergents, additives, or soaps of any kind shall be discharged. Rinse waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
  - (b) Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater;
  - (c) Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures, including, but not limited to, the installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers; and
  - (d) Prevent discharges from causing or contributing to an exceedance of water quality standards including general criteria.
11. Sedimentation Basins: The SWPPP shall include a sedimentation basin for each drainage area with ten or more acres disturbed at one time.
- (a) The sedimentation basin shall be sized, at a minimum, to treat a local 2-year, 24-hour storm.
  - (b) Sediment basins shall not be constructed in any waters of the state or natural buffer zones.
  - (c) Discharges from dewatering activities shall be managed by appropriate controls. The SWPPP shall include a description of any anticipated dewatering methods and specific BMPs designed to treat dewatering water.
    - 1) Appropriate controls include, but are not limited to, sediment socks, dewatering tanks, tube settlers, weir tanks, filtration systems (e.g. bag or sand filters), and passive treatment systems that are designed to remove or retain sediment.
    - 2) Erosion controls and velocity dissipation devices (e.g., check dams, riprap, and vegetated buffers) to minimize erosion at inlets, outlets, and discharge points from shall be utilized.
    - 3) Water with an oil sheen shall not be discharged and shall be marked in SWPPP.
    - 4) Visible floating solids and foam shall not be discharged.
  - (d) Until final stabilization has been achieved, sediment basins and impoundments shall utilize outlet structures or floating skimmers that withdraw water from the surface when discharging.
    - 1) Under frozen conditions, it may be considered infeasible to withdraw water from the surface and an exception can be made for that specific period as long as discharges that may contain sediment and other pollutants are managed by appropriate controls. If determined infeasible due to frozen conditions, documentation must be provided in the SWPPP to support the determination, including the specific conditions or time period when this exception applies.
  - (e) Accumulated sediment shall not exceed 50% of total volume or as prescribed in the design, whichever is less. Note in the SWPPP the locations for disposal of the material removed from sediment basins.
  - (f) Prevent discharges to the receiving stream causing excessive visual turbidity. For the purposes of this permit, visual turbidity refers to a sediment plume or other cloudiness in the water caused by sediment that can be identified by an observer.
  - (g) The SWPPP shall require the basin be maintained until final stabilization of the disturbed area served by the basin.

Where use of a sediment basin is infeasible, the SWPPP shall evaluate and specify other similarly effective BMPs to be employed to control erosion and sediment. These similarly effective BMPs shall be selected from appropriate BMP guidance documents authorized by this permit. The BMPs must provide equivalent water quality protection to achieve compliance with this permit. The SWPPP shall require both temporary and permanent sedimentation basins to have a stabilized spillway to minimize the potential for erosion of the spillway or basin embankment.

12. Soil disturbing activities on site that have ceased either temporarily or permanently shall initiate stabilization immediately in accordance with the options below. For soil disturbing activities that have been temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days:
  - (a) The permittee shall construct BMPs to establish interim stabilization; and
  - (b) Stabilization must be initiated immediately and completed within 14 calendar days.
  - (c) For soil disturbing activities that have been permanently ceased on any portion of the site, final stabilization of disturbed areas must be initiated immediately and completed within 14 calendar days.
    - 1) Allowances to the 14-day completion period for temporary and final stabilization may be made due to weather and equipment malfunctions. The use of allowances shall be documented in the SWPPP. Allowances may be determined unnecessary after review by the Department.
  - (d) Until stabilization is complete, interim sediment control shall consist of well-established and maintained BMPs that are reasonably certain to protect waters of the state from sediment pollution over an extended period of time. This may require adding more BMPs to an area than is normally used during daily operations. The types of BMPs used must be suited to the area disturbed, taking into account the number of acres exposed and the steepness of the slopes. If the slope of the area is greater than 3:1 (three feet horizontal to one foot vertical), then the permittee shall establish interim stabilization within seven days of ceasing operations on that part of the site. The following activities would constitute the immediate initiation of stabilization:
    - 1) Prepping the soil for vegetative or non-vegetative stabilization as long as seeding, planting, and/or installation of non-vegetative stabilization products takes place as soon as practicable;
    - 2) Applying mulch or other non-vegetative product to the exposed areas;
    - 3) Seeding or planting the exposed areas;
    - 4) Finalizing arrangements to have stabilization product fully installed in compliance with the deadlines for completing stabilization.
  - (e) If vegetative stabilization measures are being implemented, stabilization is considered “installed” when all activities necessary to seed or plant the area are completed. Installed does not mean established.
  - (f) If non-vegetative stabilization measures are being implemented, stabilization is considered “installed” when all such measures are implemented or applied.
    - 1) Non-vegetative stabilization shall prevent erosion and shall be chosen for site conditions, such as slope and flow of stormwater.
  - (g) Final stabilization is not considered achieved until vegetation has grown and established to meet the requirements below.
13. Prior to removal of BMPs, ceasing site inspections, and removing from the quarterly report, final stabilization must be achieved. Final stabilization shall be achieved as soon as possible once land disturbance activities have ceased. Document in the SWPPP the type of stabilization and the date final stabilization is achieved.
  - (a) The project is considered to have achieved final stabilization when perennial vegetation (excluding volunteer vegetation), pavement, buildings, or structures using permanent materials (e.g., riprap, gravel, etc.) cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetation must be at least 70% coverage of 100% of the vegetated areas on site. Vegetation must be evenly distributed.
  - (b) Disturbed areas on agricultural land are considered to have achieved final stabilization when they are restored to their preconstruction agricultural use. If former agricultural land is changing to non-agricultural use, this is no longer considered agricultural land and shall follow condition (a).
  - (c) If the intended function of a specific area of the site necessitates that it remain disturbed, final stabilization is considered achieved if all of the following are met:
    - 1) Only the minimum area needed remains disturbed (i.e., dirt access roads, motocross tracks, utility pole pads, areas being used for storage of vehicles, equipment, materials). Other areas must meet the criteria above.

- 2) Permanent structural BMPs (e.g., rock checks, berms, grading, etc.) or non-vegetative stabilization measures are implemented and designed to prevent sediment and other pollutants from entering waters of the state.
- 3) Inspection requirements in Part IV. SWPPP MANAGEMENT REQUIREMENT, Condition 11 are met and documented in the SWPPP.
- (d) Winter weather and frozen conditions do not excuse any of the above final stabilization requirements. If vegetation is required for stabilization the permittee must maintain BMPs throughout winter weather and frozen conditions until thawing and vegetation meets final stabilization criteria above. Document stabilization attempts during frozen conditions in the SWPPP. Consider future freezing when removing vegetation and plan with temporary stabilization techniques before the ground becomes frozen.

## **VI. SITE FINALIZATION & PERMIT TERMINATION**

1. Until a site is finalized, the permittee must comply with all conditions in the permit, including continuation of site inspections and reporting quarterly to the Department. To finalize the site and remove from this permit coverage, the site shall meet the following requirements:
  - (a) For any areas that (1) were disturbed during construction, (2) are not covered over by permanent structures, and (3) over which the permittee had control during the construction activities, the requirements for final vegetative or non-vegetative stabilization in Part V. BMP REQUIREMENTS, Condition 13;
  - (b) The permittee has removed and properly disposed of all construction materials, waste, and waste handling devices and has removed all equipment and vehicles that were used during construction, unless intended for long-term beyond construction phase;
  - (c) The permittee has removed all temporary BMPs that were installed and maintained during construction, except those that are intended for long-term use or those that are biodegradable; and
  - (d) The permittee has removed all potential pollutants and pollutant-generating activities associated with construction, unless needed for long-term use following the construction activities.
2. The permit may be terminated if;
  - (a) There has been a transfer of control of all areas of the site for which the current permittee is responsible under this permit to another operator, and that operator has obtained coverage under this permit;
  - (b) Active sites obtain coverage under an individual or alternative general NPDES permit, with land disturbance conditions; or
  - (c) This permit may be terminated when all projects covered under this permit are finalized. In order to terminate the permit, the permittee shall notify the Department by submitting a Request for Termination along with the final quarterly report for the current calendar quarter.

## **VII. REPORTING AND SAMPLING REQUIREMENTS**

1. The permittee is not required to sample stormwater under this permit. The Department may require sampling and reporting as a result of illegal discharges, compliance issues related to water quality concerns, or evidence of off-site impacts from activities at a site. If such an action is needed, the Department will specify in writing the sampling requirements, including such information as location and extent. If the permittee refuses to perform sampling when required, the Department may terminate the general permit and require the facility to obtain a site-specific permit with sampling requirements.
2. Electronic Discharge Monitoring Report (eDMR) Submission System. The NPDES Electronic Reporting Rule, 40 CFR Part 127, reporting of any report required by the permit shall be submitted via an electronic system to ensure timely, complete, accurate, and nationally consistent set of data for the NPDES program. The eDMR system is currently the only Department-approved reporting method for this permit unless specified elsewhere in this permit, or a waiver is granted by the Department. The facility must register in the Department's eDMR system through the Missouri Gateway for Environmental Management (MoGEM) before the first report is due.
3. Permittees shall prepare a quarterly report with a list of active land disturbance sites including any off-site borrow or depositional areas associated with the construction project and submit the following information electronically as an

attachment to the eDMR system until such a time when the current or a new system is available to allow direct input of the data:

- (a) The name of the project;
- (b) The location of the project (including the county);
- (c) The name of the primary receiving water(s) for each project;
- (d) A description of the project;
- (e) The number of acres disturbed;
- (f) The percent of completion of the project; and
- (g) The projected date of completion.

The quarterly report(s) shall be maintained by the permittee and readily available for review by the Department at the address provided on the application as well as submitted quarterly via the Department’s eDMR system. The permittee shall submit quarterly reports according to Table A.

<b>Table A</b>	<b>Schedule for Quarterly Reporting</b>
Activity for the months of:	Report is due:
January, February, March (1st Quarter)	April 28
April, May, June (2nd Quarter)	July 28
July, August, September (3rd Quarter)	October 28
October, November, December (4th Quarter)	January 28

**VIII. STANDARD PERMIT CONDITIONS**

1. Records: The permittee shall retain copies of this general permit, the SWPPP and all amendments for the site named in the State Operating Permit, results of any monitoring and analysis, and all site inspection records required by this general permit.
  - (a) The records shall be accessible during normal business hours and retained for a period of at least three (3) years from the date of termination.
  - (b) The permittee shall provide a copy (electronic or otherwise) of the SWPPP to the Department, USEPA, or any local agency or government representative if they request a copy in the performance of their official duties within 24 hours of the request (or next working day), unless given more time by the representative.
  - (c) The permittee shall provide a copy of the SWPPP to those who are responsible for installation, operation, or maintenance of any BMP. The permittee, their representative, and/or the contractor(s) responsible for installation, operation and maintenance of the BMPs shall have a current copy of the SWPPP with them when on the project site.
  
2. Land Ownership and Change of Ownership: Federal and Missouri stormwater regulations [10 CSR 20-6.200(1) (B)] require a stormwater permit and erosion control measures for all land disturbances of one or more acres. These regulations also require a permit for less than one acre lots if the lot is part of a larger common plan of development or sale where that plan is at least one acre in size.
  - (a) If the permittee sells any portion of a permitted site to a developer for commercial, industrial, or residential use, this land remains a part of the common sale and the new owner must obtain a permit prior to conducting any land disturbance activity. Therefore, the original permittee must amend the SWPPP to show that the property has been sold and, therefore, no longer under the original permit coverage.
  - (b) Property of any size which is part of a larger common plan of development where the property has achieved final stabilization and the original permit terminated will require application of a new land disturbance permit for any future land disturbance activity unless the activity is by an individual residential building lot owner on a site less than one acre.
  - (c) If a portion of a larger common plan of development is sold to an individual for the purpose of building his or her own private residence, a permit is required if the portion of land sold is equal to or greater than one acre. No permit is required, however, for less than one acre of land sold.
  
3. Permit Transfer: This permit may not be transferred to a new owner.

4. Termination: This permit may be terminated when the project has achieved final stabilization, defined in Part VI. **SITE FINALIZATION & PERMIT TERMINATION.**
  - (a) In order to terminate the permit, the permittee shall notify the Department by submitting the form Request for Termination of Operating Permit Form MO 780-2814. The form should be submitted to the appropriate regional office or through an approved electronic system if it should become available.
  - (b) The Cover Page (Certificate Page) of the Master General Permit for Land Disturbance specifies the “effective date” and the “expiration date” of the Master General Permit. The “issued date” along with the “expiration date” will appear on the State Operating Permit issued to the applicant. **This permit does not continue administratively beyond the expiration date.**
5. Duty to Reapply: If the project or development completion date will be after the expiration date of this general permit, then the permittee must reapply to the Department for a new permit. This permit may be applied for and issued electronically in accordance with Section 644.051.10, RSMo.
  - (a) Due to the nature of the electronic permitting system, a period of time may be granted at the discretion of the Department in order to apply for a new permit after the new version is effective. Applicants must maintain appropriate best management practices and inspections during the discretionary period.
6. Duty to Comply: The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Missouri Clean Water Law and Federal Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.
7. Modification, Revocation, and Reopening:
  - (a) If at any time the Department determines that the quality of waters of the state may be better protected by reopening this permit, or revoking this permit and requiring the owner/operator of the permitted site to apply for a site-specific permit, the Department may revoke a general permit and require any person to obtain such an operating permit as authorized by 10 CSR20-6.010(13) and 10 CSR 20-6.200(1)(B).
  - (b) If this permit is reopened, modified, or revoked pursuant to this Section, the permittee retains all rights under Chapter 536 and 644 Revised Statutes of Missouri upon the Department’s reissuance of the permit as well as all other forms of administrative, judicial, and equitable relief available under law.
8. Other Information: Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.
9. Duty to Provide Information: The permittee shall furnish to the Department, within 24 hours unless explicitly granted more time in writing, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Department upon request, copies of records required to be kept by this permit.
10. Inspection and Entry: The permittee shall allow the Department, or an authorized representative (including an authorized contractor acting as a representative of the Department), upon presentation of credentials and other documents as may be required by law, to:
  - (a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of the permit;
  - (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
  - (c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
  - (d) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Federal Clean Water Act or Missouri Clean Water Law, any substances or parameters at any location.

11. Signatory Requirement:

- (a) All permit applications, reports required by the permit, or information requested by the Department shall be signed and certified. (See 40 CFR 122.22 and 10 CSR 20-6.010)
- (b) The Federal Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit (including monitoring reports or reports of compliance or non-compliance) shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than six (6) months per violation, or by both.
- (c) The Missouri Clean Water Law provides that any person who knowingly makes any false statement, representation or certification in any application, record, report, plan, or other document filed or required to be maintained pursuant to sections 644.006 to 644.141 shall, upon conviction, be punished by a fine of not more than ten thousand dollars, or by imprisonment for not more than six months, or by both.

12. Property Rights: This permit does not convey any property rights of any sort or any exclusive privilege.

13. Notice of Right to Appeal: If you were adversely affected by this decision, you may be entitled to pursue an appeal before the administrative hearing commission (AHC) pursuant to Sections 621.250 and 644.051.6 RSMo. To appeal, you must file a petition with the AHC within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC. Any appeal should be directed to:

Administrative Hearing Commission  
U.S. Post Office Building, Third Floor  
131 West High Street, P.O. Box 1557  
Jefferson City, MO 65102-1557  
Phone: 573-751-2422  
Fax: 573-751-5018  
Website: <https://ahc.mo.gov>



**MISSOURI**  
DEPARTMENT OF  
NATURAL RESOURCES

STORMWATER DISCHARGES FROM  
THIS LAND DISTURBANCE SITE ARE  
AUTHORIZED BY THE MISSOURI  
STATE OPERATING PERMIT NUMBER:

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ANYONE WITH QUESTIONS OR  
CONCERNS ABOUT STORMWATER  
DISCHARGES FROM THIS SITE,  
PLEASE CONTACT THE MISSOURI  
DEPARTMENT OF NATURAL  
RESOURCES AT

**1-800-361-4827**

**MISSOURI DEPARTMENT OF NATURAL RESOURCES**  
**FACT SHEET FOR MASTER GENERAL PERMIT**  
**MO-R100xxx**

The Federal Water Pollution Control Act [Clean Water Act (CWA)] Section 402 of Public Law 92-500 (as amended) established the National Pollution Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States and the release of stormwater from certain point sources. All such discharges are unlawful without a permit (Section 301 of the CWA). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (MSOPs) are issued by the Missouri Department of Natural Resources (Department) under an approved program operated in accordance with federal and state laws (Federal CWA and Missouri Clean Water Law Section 644 as amended). Permits are issued for a period of five (5) years unless otherwise specified.

Per 40 CFR 124.56, 40 CFR 124.8, and 10 CSR 20-6.020(1)(A)2, a Fact Sheet shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the permit. A Fact Sheet is not an enforceable part of an MSOP.

**DEFINITIONS FOR THE PURPOSES OF THIS PERMIT:**

Common Promotional Plan: A plan undertaken by one (1) or more persons to offer lots for sale or lease; where land is offered for sale by a person or group of persons acting in concert, and the land is contiguous or is known, designated, or advertised as a common unit or by a common name or similar names, the land is presumed, without regard to the number of lots covered by each individual offering, as being offered for sale or lease as part of a common promotional plan.

Dewatering: The act of draining rainwater and/or groundwater from basins, building foundations, vaults, and trenches.

Effective Operating Condition: For the purposes of this permit, a stormwater control is kept in effective operating condition if it has been implemented and maintained in such a manner that it is working as designed to minimize pollutant discharges.

Emergency-Related Project: A project initiated in response to a public emergency (e.g. earthquakes, extreme flooding conditions, tornado, disruptions in essential public services, pandemic) for which the related work requires immediate authorization to avoid imminent endangerment to human health/safety or the environment or to reestablish essential public services.

Exposed Soils: For the purposes of this permit, soils that as a result of earth-disturbing activities are left open to the elements.

Immediately: For the purposes of this permit, immediately should be defined as within 24 hours.

Impervious Surface: For the purpose of this permit, any land surface with a low or no capacity for soil infiltration including, but not limited to, pavement, sidewalks, parking areas and driveways, packed gravel or soil, or rooftops.

Infeasible: Infeasible means not technologically possible or not economically practicable and achievable in light of best industry practices.

Install or Installation: When used in connection with stormwater controls, to connect or set in position stormwater controls to make them operational.



Land Disturbance Site or Site: The land or water area where land disturbance activities will occur and where stormwater controls will be installed and maintained. The land disturbance site includes construction support activities, which may be located at a different part of the property from where the primary land disturbance activity will take place or on a different piece of property altogether. Off-site borrow areas directly and exclusively related to the land disturbance activity are part of the site and must be permitted.

Larger Common Plan of Development or Sale: A continuous area where multiple separate and distinct construction activities are occurring under one plan, including any off-site borrow areas that are directly and exclusively related to the land disturbance activity. Off-site borrow areas utilized for multiple different land disturbance projects are considered their own entity and are not part of the larger common plan of development or sale. See definition of Common Promotional Plan to understand what a 'common plan' is.

Minimize: To reduce and/or eliminate to the extent achievable using stormwater controls that are technologically available and economically practicable and achievable in light of best industry practices.

Non-structural Best Management Practices (BMPs): Institutional, educational, or pollution prevention practices designed to limit the amount of stormwater runoff or pollutants that are generated in the landscape. Examples of non-structural BMPs include picking up trash and debris, sweeping up nearby sidewalks and streets, maintaining equipment, and training site staff on stormwater control practices.

Operational: for the purposes of this permit, stormwater controls are made "operational" when they have been installed and implemented, are functioning as designed, and are properly maintained.

Ordinary High Water Mark: The line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris.

Peripheral: For the purposes of this permit, peripheral should be defined as the outermost boundary of the area that will be disturbed.

Permanently: For the purposes of this permit, permanently is defined as any activity that has been ceased without any intentions of future disturbance.

Pollution Prevention Controls (or Measures): Stormwater controls designed to reduce or eliminate the addition of pollutants to construction site discharges through analysis of pollutant sources, implementation of proper handling/disposal practices, employee education, and other actions.

Qualified Person (inspections): A person knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention who possesses the appropriate skills and training to assess conditions at the construction site that could impact stormwater quality and the appropriate skills and training to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.

Stormwater Control (also referred to as sediment/erosion controls): refers to any temporary or permanent BMP or other method used to prevent or reduce the discharge of pollutants to waters of the state.

Structural BMP: Physical sediment/erosion controls working individually or as a group (treatment train) appropriate to the source, location, and area climate for the pollutant to be controlled. Examples of structural BMPs include silt fences, sedimentation ponds, erosion control blankets, and seeding.

Temporary Stabilization: A condition where exposed soils or disturbed areas are provided temporary vegetation and/or non-vegetative protective cover to prevent erosion and sediment loss. Temporary stabilization may include temporary seeding, geotextiles, mulches, and other techniques to reduce or eliminate erosion until either final stabilization can be achieved or until further construction activities take place to re-disturb this area.

Treatment Train: A multi-BMP approach to managing the stormwater volume and velocity and often includes erosion prevention and sediment control practices often applied when the use of a single BMP is inadequate in preventing the erosion and transport of sediment. A good option to utilize as a corrective action.

Volunteer Vegetation: A volunteer plant is a plant that grows on its own, rather than being deliberately planted for stabilization purposes. Volunteers often grow from seeds that float in on the wind, are dropped by birds, or are inadvertently mixed into soils. Commonly, volunteer vegetation is referred to as 'weeds'. This does not meet the requirements for final stabilization.

Waters of the State: Section 644.016.1(27) RSMo. defines waters of the state as, "All waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common."

## **PART I – BASIC PERMIT INFORMATION**

Facility Type: Industrial Stormwater; Land Disturbance  
Facility SIC Code(s): 1629  
Facility Description: Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, filling, and other activities that result in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution to waters of the state).

This permit establishes a Stormwater Pollution Prevention Plan (SWPPP) requirement for pollutants of concern from this type of facility or for all facilities and sites covered under this permit. 10 CSR 20-6.200(7) specifies "general permits shall contain BMP requirements and/or monitoring and reporting requirements to keep the stormwater from becoming contaminated".

Land disturbance activities include clearing, grubbing, excavating, grading, filling and other activities that result in the destruction of the root zone and/or other activities that are reasonably certain to cause pollution to waters of the state. A Missouri State Operating Permit for land disturbance permit is required for construction disturbance activities of one or more acres or for construction activities that disturb less than one acre when they are part of a larger common plan of development or sale that will disturb a cumulative total of one or more acres over the life of the project.

The primary requirement of a land disturbance permit is the development of a SWPPP which incorporates site-specific BMPs to minimize soil exposure, soil erosion, and the discharge of pollutants. The SWPPP ensures the design, implementation, management, and maintenance of BMPs in order to prevent sediment and other pollutants from leaving the site.

When it precipitates, stormwater washes over the loose soil on a construction site and various other materials and products being stored outside. As stormwater flows over the site, it can pick up pollutants like sediment, debris, and chemicals from the loose soil and transport them to nearby storm sewer systems or directly into rivers, lakes, or coastal waters.

The Missouri Department of Natural Resources is responsible for ensuring that construction site operators have the proper stormwater controls in place so that construction can proceed in a way that protects your community's clean water and the surrounding environment. One way the department helps protect water quality is by issuing land disturbance permits.

Local conditions are not considered when developing conditions for a general permit. A facility may apply for a site-specific permit if they desire a review of site-specific conditions.

## **PART II – RECEIVING STREAM INFORMATION**

### **APPLICABLE DESIGNATIONS OF WATERS OF THE STATE:**

Per Missouri Effluent Regulations (10 CSR 20-7.015), the waters of the state are divided into seven (7) categories. This permit applies to facilities discharging to the following water body categories:

- ✓ Missouri or Mississippi River [10 CSR 20-7.015(2)]
- ✓ Lakes or Reservoirs [10 CSR 20-7.015(3)]
- ✓ Losing Streams [10 CSR 20-7.015(4)]
- ✓ Metropolitan No-Discharge Streams [10 CSR 20-7.015(5)]
- ✓ Special Streams [10 CSR 20-7.015(6)]
- ✓ Subsurface Waters [10 CSR 20-7.015(7)]
- ✓ All Other Waters [10 CSR 20-7.015(8)]

Missouri Water Quality Standards (10 CSR 20-7.031) defines the Clean Water Commission water quality objectives in terms of "water uses to be maintained and the criteria to protect those uses." The receiving stream and/or 1<sup>st</sup> classified receiving stream's designated water uses shall be maintained in accordance with 10 CSR 20-7.031(24). A general permit does not take into consideration site-specific conditions.

### **MIXING CONSIDERATIONS:**

This permit applies to receiving streams of varying low flow conditions. Therefore, the effluent limitations must be based on the smallest low flow streams considered, which includes waters without designated uses. As such, no mixing is allowed [10 CSR 20-7.031(5)(A)4.B.(I)(a)]. No Zone of Initial Dilution is allowed. [10 CSR 20-7.031(5)(A)4.B.(I)(b)].

### **RECEIVING STREAM MONITORING REQUIREMENTS:**

There are no receiving water monitoring requirements recommended at this time.

## **PART III – RATIONALE AND DERIVATION OF EFFLUENT LIMITATIONS & PERMIT CONDITIONS**

### **305(B) REPORT, 303(d) LIST, & TOTAL MAXIMUM DAILY LOAD (TMDL):**

Section 305(b) of the Federal CWA requires each state identify waters not meeting Water Quality Standards and for which adequate water pollution controls have not been required. Water Quality Standards protect such beneficial uses of water as whole body contact, maintaining fish and other aquatic life, and providing drinking water for people, livestock, and wildlife. The 303(d) list helps state and federal agencies keep track of waters which are impaired but not addressed by normal water pollution control programs.

A TMDL is a calculation of the maximum amount of a given pollutant a body of water can absorb before its water quality is affected. If a water body is determined to be impaired as listed on the 303(d) list, then a watershed management plan will be developed which shall include the TMDL calculation. For facilities with an existing general permit before a TMDL is written on their receiving stream, the Department will evaluate the permit and may require any facility authorized by this general permit to apply for and obtain a site-specific operating permit.

**ANTI-BACKSLIDING:**

A provision in the Federal Regulations [CWA Section 303(d)(4); CWA Section 402(c); 40 CFR Part 122.44(I)] requires a reissued permit to be as stringent as the previous permit with some exceptions.

- ✓ Not Applicable: All effluent limitations in this permit are at least as protective as those previously established.

**ANTIDEGRADATION:**

Antidegradation policies ensure protection of water quality for a particular water body on a pollutant by pollutant basis to ensure Water Quality Standards are maintained to support beneficial uses such as fish and wildlife propagation and recreation on and in the water. This also includes special protection of waters designated as an Outstanding National Resource Water or Outstanding State Resource Water [10 CSR 20-7.031(3)(C)]. Antidegradation policies are adopted to minimize adverse effects on water.

The Department has determined the best avenue forward for implementing the Antidegradation requirements into general stormwater permits is by requiring the appropriate development and maintenance of a SWPPP. The SWPPP must identify all reasonable and effective BMPs, taking into account environmental impacts and costs. This analysis must document why no discharge or no exposure options are not feasible at the facility. This selection and documentation of appropriate control measures will then serve as the analysis of alternatives and fulfill the requirements of the Antidegradation Rule and Implementation Procedure 10 CSR 20-7.031(3) and 10 CSR 20-7.015(9)(A)5.

Any facility seeking coverage under this permit which undergoes expansion or discharges a new pollutant of concern must update their SWPPP and select reasonable and cost effective new BMPs. New facilities seeking coverage under this permit are required to develop a SWPPP including this analysis and documentation of appropriate BMPs. Renewal of coverage for a facility requires a review of the SWPPP to ensure the selected BMPs continue to be appropriate.

- ✓ Applicable; the facility must review and maintain stormwater BMPs as appropriate.

**BENCHMARKS:**

When a permitted feature or outfall consists of only stormwater, a benchmark may be implemented at the discretion of the permit writer. Benchmarks require the facility to monitor and, if necessary, replace and update stormwater control measures. Benchmark concentrations are not effluent limitations. A benchmark exceedance, therefore, is not a permit violation; however, failure to take corrective action is a violation of the permit. Benchmark monitoring data is used to determine the overall effectiveness of control measures and to assist the permittee in knowing when additional corrective actions may be necessary to comply with the limitations of the permit.

- ✓ Not applicable; this permit does not contain numeric benchmarks.

**BEST MANAGEMENT PRACTICES (BMPs):**

Minimum site-wide BMPs are established in this permit to ensure all permittees are managing their sites equally to protect waters of the state from certain activities which could cause negative effects in receiving water bodies. While not all sites require a SWPPP because the SIC codes are specifically exempted in 40 CFR 122.26(b)(14), these BMPs are not specifically included for stormwater purposes. These practices are minimum requirements for all industrial sites to protect waters of the state. If the minimum BMPs are not followed, the facility may violate general criteria [10 CSR 20-7.031(4)]. Statutes are applicable to all permitted facilities in the state; therefore, pollutants cannot be released unless in accordance with RSMo 644.011 and 644.016 (17).

**CHANGES IN DISCHARGES OF TOXIC POLLUTANT:**

This special condition reiterates the federal rules found in 40 CFR 122.44(f) and 122.42(a)(1). In these rules, the facility is required to report changes in amounts of toxic substances discharged. Toxic substances are defined in 40 CFR 122.2 as "...any pollutant listed as toxic under section 307(a)(1) or, in the case of "sludge use or disposal practices," any pollutant identified in regulations implementing section 405(d) of the CWA." Section 307 of the CWA then refers to those parameters found in 40 CFR 401.15.

The permittee should also consider any other toxic pollutant in the discharge as reportable under this condition.

**EFFLUENT LIMITATION GUIDELINE:**

Effluent Limitation Guidelines, or ELGs, are found at 40 CFR 400-499. These are limitations established by the EPA based on the SIC code and the type of work a facility is conducting. Most ELGs are for process wastewater and some address stormwater. All are technology based limitations which must be met by the applicable facility at all times.

- ✓ The industries covered under this permit have an associated Effluent Limit Guideline (ELG) which is applicable to the stormwater discharges in this permit and is applied under 40 CFR 125.3(a).

**ELECTRONIC DISCHARGE MONITORING REPORT (EDMR) SUBMISSION SYSTEM:**

The U.S. Environmental Protection Agency (EPA) promulgated a final rule on October 22, 2015, to modernize CWA reporting for municipalities, industries, and other facilities by converting to an electronic data reporting system. The final rule requires regulated entities and state and federal regulators to use information technology to electronically report data required by the National Pollutant Discharge Elimination System (NPDES) permit program instead of filing paper reports. To comply with the federal rule, the Department is requiring all permittees to begin submitting discharge monitoring data and reports online.

- ✓ Applicable; this permit requires quarterly reports.

**GENERAL CRITERIA CONSIDERATIONS:**

In accordance with 40 CFR 122.44(d)(1), effluent limitations shall be placed into permits for pollutants determined to cause, have reasonable potential to cause, or to contribute to, an excursion above any water quality standard, including narrative water quality criteria. In order to comply with this regulation, the permit writer has completed a reasonable potential determination on whether discharges have reasonable potential to cause or contribute to an excursion of the general criteria listed in 10 CSR 20-7.031(4). In instances where reasonable potential exists, the permit includes limitations within the permit to address the reasonable potential. In discharges where reasonable potential does not exist, the permit may include monitoring to later determine the discharge's potential to impact the narrative criteria. Additionally, RSMo 644.076.1, as well as Standard Permit Conditions Part VIII of this permit state it shall be unlawful for any person to cause or allow any discharge of water contaminants from any water contaminant or point source located in Missouri in violation of sections 644.006 to 644.141 of the Missouri Clean Water Law or any standard, rule, or regulation promulgated by the commission.

**LAND APPLICATION:**

Land application, or surficial dispersion of wastewater and/or sludge, is performed by facilities to maintain a basin as no-discharge. Requirements for these types of operations are found in 10 CSR 20-6.015; authority to regulate these activities is from RSMo 644.026.

- ✓ Not applicable; this permit does not authorize operation of a surficial land application system to disperse wastewater or sludge.

**LAND DISTURBANCE:**

Land disturbance, sometimes called construction activities, are actions which cause disturbance of the root layer or soil; these include clearing, grading, and excavating of the land. 40 CFR 122.26(b)(14) and 10 CSR 20-6.200(3) requires permit coverage for these activities. Coverage is not required for facilities when only providing maintenance of original line and grade, hydraulic capacity, or to continue the original purpose of the facility.

- ✓ Applicable; this permit provides coverage for land disturbance activities. These activities have SWPPP requirements and may be combined with the standard site SWPPP. Land disturbance BMPs should be designed to control the expected peak discharges. The University of Missouri has design storm events for the 25 year 24 hour storm; these can be found at: [http://ag3.agebb.missouri.edu/design\\_storm/comparison\\_reports/20191117\\_25yr\\_24hr\\_comparison\\_able.htm](http://ag3.agebb.missouri.edu/design_storm/comparison_reports/20191117_25yr_24hr_comparison_able.htm); to calculate peak discharges, the website <https://www.lmnoeng.com/Hydrology/rational.php> has the rational equation to calculate expected discharge volume from the peak storm events.

**NUTRIENT MONITORING:**

Nutrient monitoring is required for facilities characteristically or expected to discharge nutrients (nitrogenous compounds and/or phosphorus) when the design flow is equal to or greater than 0.1 MGD per 10 CSR 20-7.015(9)(D)8.

- ✓ This is a stormwater only permit; therefore, it is not subject to provisions found in 10 CSR 20-7.015 per 10 CSR 20-7.015(1)(C).

**OIL/WATER SEPARATORS:**

Oil water separator (OWS) tank systems are frequently found at industrial sites where process water and stormwater may contain oils and greases, oily wastewaters, or other immiscible liquids requiring separation. Food industry discharges typically require pretreatment prior to discharge to municipally owned treatment works. Per 10 CSR 26-2.010(2)(B), all oil water separator tanks must be operated according to manufacturer's specifications and authorized in NPDES permits per 10 CSR 26-2.010(2) or may be regulated as a petroleum tank.

- ✓ Not applicable; this permit does not authorize the operation of OWS. The facility must obtain a separate permit to cover operation of and discharge from these devices.

**PERMIT SHIELD:**

The permit shield provision of the CWA (Section 402(k)) and Missouri Clean Water Law (644.051.16 RSMo) provides that when a permit holder is in compliance with its NPDES permit or MSOP, they are effectively in compliance with certain sections of the CWA and equivalent sections of the Missouri Clean Water Law. In general, the permit shield is a legal defense against certain enforcement actions but is only available when the facility is in compliance with its permit and satisfies other specific conditions, including having completely disclosed all discharges and all facility processes and activities to the Department at time of application. It is the facility's responsibility to ensure that all potential pollutants, waste streams, discharges, and activities, as well as wastewater land application, storage, and treatment areas, are all fully disclosed to the Department at the time of application or during the draft permit review process. Subsequent requests for authorization to discharge additional pollutants or expanded or newly disclosed flows, or for authorization for previously unpermitted and undisclosed activities or discharges, will likely require permit modification or may require the facility be covered under a site specific permit.

**PRETREATMENT PROGRAM:**

This permit does not regulate pretreatment requirements for facilities discharging to an accepting permitted wastewater treatment facility. If applicable, the receiving entity (the publicly owned treatment works - POTW) must ensure compliance with any effluent limitation guidelines for pretreatment listed in 40 CFR Subchapter N per 10 CSR 20-6.100. Pretreatment regulations per RSMo 644.016 are limitations on the introduction of pollutants or water contaminants into publicly owned treatment works or facilities.

- ✓ Not Applicable; the facilities covered under this permit are not required to meet pretreatment requirements under an ELG.

**PUBLIC NOTICE OF COVERAGE FOR AN INDIVIDUAL FACILITY:**

Public Notice of reissuance of coverage is not required unless the facility is a specific type of facility as defined in 10 CSR 20-6.200(1). The need for an individual public notification process shall be determined and identified in the permit [10 CSR 20-6.020(1)(C)5.].

- ✓ Not applicable; public notice is not required for coverage under this permit to individual facilities. The MGP is public noticed in lieu of individual permit PN requirements.

**REASONABLE POTENTIAL ANALYSIS (RPA):**

Federal regulation 40 CFR Part 122.44(d)(1)(i) requires effluent limitations for all pollutants which are or may be discharged at a level which will cause or have the reasonable potential to cause or contribute to an in-stream excursion above narrative or numeric water quality standard. In accordance with 40 CFR Part 122.44(d)(iii) if the permit writer determines any given pollutant has the reasonable potential to cause or contribute to an in-stream excursion above the water quality standard, the permit must contain effluent limits for the pollutant.

- ✓ The permit writer reviewed industry materials, available past inspections, and other documents and research to evaluate general and narrative water quality reasonable potential for this permit. Permit writers also use the Department's permit writer's manual, the EPA's permit writer's manual (<https://www.epa.gov/npdes/npdes-permit-writers-manual>), program policies, and best professional judgment. For each parameter in each permit, the permit writer carefully considers all applicable information regarding technology based effluent limitations, effluent limitation guidelines, and water quality standards. Best professional judgment is based on the experience of the permit writer, cohorts in the Department and resources at the EPA, research, and maintaining continuity of permits if necessary. For stormwater permits, the permit writer is required per 10 CSR 6.200(6)(B)2 to consider: A. application and other information supplied by the permittee; B. effluent guidelines; C. best professional judgment of the permit writer; D. water quality; and E. BMPs.

#### **SCHEDULE OF COMPLIANCE (SOC):**

Per § 644.051, RSMo, a permit may be issued with a Schedule of Compliance (SOC) to provide time for a facility to come into compliance with new state or federal effluent regulations, water quality standards, or other requirements. Such a schedule is not allowed if the facility is already in compliance with the new requirement or if prohibited by other statute or regulation. An SOC includes an enforceable sequence of interim requirements (e.g. actions, operations, or milestone events) leading to compliance with the Missouri Clean Water Law, its implementing regulations, and/or the terms and conditions of an operating permit. *See also* Section 502(17) of the CWA, and 40 CFR 122.2. For new effluent limitations, the permit may include interim monitoring for the specific parameter to demonstrate the facility is not already in compliance with the new requirement. Per 40 CFR 122.47(a)(1) and 10 CSR 20-7.031(11), compliance must occur as soon as possible. If the permit provides a schedule for meeting new water quality based effluent limits, an SOC must include an enforceable, final effluent limitation in the permit even if the SOC extends beyond the life of the permit.

- ✓ Not Applicable: This permit does not contain a SOC.

#### **SETBACKS:**

Setbacks, sometimes called separation distances, are common elements of permits and are established to provide a margin of safety in order to protect the receiving water and other features from accidents, spills, unusual events, etc. Specific separation distances are included in 10 CSR 20-8 for minimum design standards of wastewater structures. While wastewater is considered separately from stormwater under this permit, the guides and Chapter 8 distances may remain relevant to requirements under this permit if deemed appropriate by the permittee.

- ✓ Discharge to the watersheds of a Metropolitan No-Discharge Stream (10 CSR 20-7.031 Table F) is authorized by this permit if the discharges are in compliance with 10 CSR 20-7.015(5) and 10 CSR 20-7.031(7). Discharges to these watersheds are authorized for uncontaminated stormwater discharges only.
- ✓ This permit authorizes stormwater discharges which are located in a way to allow water to be released into sinkholes, caves, fissures, or other openings in the ground which could drain into aquifers (except losing streams) per 10 CSR 20-7.015(7). It is the best professional judgment of the permit writer to allow discharges to losing streams as the effluent is stormwater only.
- ✓ This permit authorizes stormwater discharge in the watersheds of Outstanding state Resource Waters (OSRW); Outstanding National Resources Waters (ONRW), which includes the Ozark National Riverways and the National Wild and Scenic Rivers System; and impaired waters as designated in the 305(b) Report provided no degradation of water quality occurs in the OSRW and ONRW due to discharges from the permitted facility per 10 CSR 20-7.015(6)(B) and 10 CSR 20-7.031(3)(C). Additionally, if the facility is found to be causing degradation or contributing to an impairment by discharging a pollutant of concern during an inspection or through complaint investigations, they will be required to become a no discharge facility or obtain a site specific permit with more stringent monitoring and SWPPP requirements. Missouri's impaired waters can be found at <https://dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/impaired-waters>. Sites within 1000 feet of a OSRW, ONRW, or water impaired for sediment must operate as a no-discharge facility. These additional protections are borrowed from the USEPA 2021 draft Construction General Permit.

**SLUDGE – DOMESTIC BIOSOLIDS:**

Biosolids are solid materials resulting from domestic wastewater treatment meeting federal and state criteria for beneficial use (i.e. fertilizer). Sewage sludge is solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works; including, but not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment process; and material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in a treatment works.

- ✓ This permit does not authorize discharge or land application of biosolids. Sludge/biosolids is not generated by this industry.

**SLUDGE – INDUSTRIAL:**

Industrial sludge is solid, semi-solid, or liquid residue generated during the treatment of industrial process wastewater in a treatment works; including, but not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment process; scum and solids filtered from water supplies and backwashed; and a material derived from industrial sludge.

- ✓ Not applicable; sludge is not generated by this industry.

**SPILL REPORTING:**

Any emergency involving a hazardous substance must be reported to the Department's 24 hour Environmental Emergency Response hotline at (573) 634-2436 at the earliest practicable moment after discovery. The Department may require the submittal of a written report detailing measures taken to clean up a spill. These reporting requirements apply when the spill results in chemicals or materials leaving the permitted property or reaching waters of the state. This requirement is in addition to the noncompliance reporting requirement found in Standard Conditions Part I. <https://dnr.mo.gov/waste-recycling/investigations-cleanups/environmental-emergency-response>.

Underground and above ground storage devices for petroleum products, vegetable oils, and animal fats may be subject to control under federal Spill Prevention, Control, and Countermeasure Regulation and are expected to be managed under those provisions, if applicable. Substances regulated by federal law under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) which are transported, stored, or used for maintenance, cleaning or repair shall be managed according to the provisions of RCRA and CERCLA.

**STORMWATER POLLUTION PREVENTION PLAN (SWPPP):**

In accordance with 40 CFR 122.44(k), BMPs must be used to control or abate the discharge of pollutants when: 1) Authorized under section 304(e) of the CWA for the control of toxic pollutants and hazardous substances from ancillary industrial activities; 2) Authorized under section 402(p) of the CWA for the control of stormwater discharges; 3) Numeric effluent limitations are infeasible; or 4) the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA. In accordance with the EPA's *Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites*, (Document number EPA 833-R-06-004) published by the EPA in 2007 [https://www.epa.gov/sites/production/files/2015-10/documents/sw\\_swppp\\_guide.pdf](https://www.epa.gov/sites/production/files/2015-10/documents/sw_swppp_guide.pdf), BMPs are measures or practices used to reduce the amount of pollution entering waters of the state from a permitted facility. BMPs may take the form of a process, activity, or physical structure. Additionally, in accordance with the Stormwater Management, a SWPPP is a series of steps and activities to 1) identify sources of pollution or contamination, and 2) select and carry out actions which prevent or control the pollution of storm water discharges. Additional information can be found in *Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices* (EPA 832-R-92-006; September 1992).

A SWPPP must be prepared if the SIC code for the facility is found in 40 CFR 122.26(b)(14) and/or 10 CSR 20-6.200(2). A SWPPP may be required of other facilities where stormwater has been identified as necessitating better management.



The purpose of a SWPPP is to comply with all applicable stormwater regulations by creating an adaptive management plan to control and mitigate stream pollution from stormwater runoff. Developing a SWPPP provides opportunities to employ appropriate BMPs to minimize the risk of pollutants being discharged during storm events. The following paragraph outlines the general steps the permittee should take to determine which BMPs will work to achieve the benchmark values or limits in the permit. This section is not intended to be all encompassing or restrict the use of any physical BMP or operational and maintenance procedure assisting in pollution control. Additional steps or revisions to the SWPPP may be required to meet the requirements of the permit.

Areas which should be included in the SWPPP are identified in 40 CFR 122.26(b)(14). Once the potential sources of stormwater pollution have been identified, a plan should be formulated to best control the amount of pollutant being released and discharged by each activity or source. This should include, but is not limited to, minimizing exposure to stormwater, good housekeeping measures, proper facility and equipment maintenance, spill prevention and response, vehicle traffic control, and proper materials handling. Once a plan has been developed, the facility will employ the control measures determined to be adequate to prevent pollution from entering waters of the state. The facility will conduct inspections of the BMPs to ensure they are working properly and re-evaluate any BMP not achieving compliance with permitting requirements. For example if the BMP being employed is deficient in controlling stormwater pollution, corrective action should be taken to repair, improve, or replace the failing BMP. If failures do occur, continue this trial and error process until appropriate BMPs have been established.

The EPA has developed factsheets on the pollutants of concern for specific industries along with the BMPs to control and minimize stormwater (<https://www.epa.gov/npdes/stormwater-discharges-industrial-activities>). Along with EPA's factsheets, the International Stormwater BMP database (<https://bmpdatabase.org/>) may provide guidance on BMPs appropriate for specific industries.

For new, altered, or expanded stormwater discharges, the SWPPP shall identify reasonable and effective BMPs while accounting for environmental impacts of varying control methods. The antidegradation analysis must document why no discharge or no exposure options are not feasible. The selection and documentation of appropriate control measures shall serve as an alternative analysis of technology and fulfill the requirements of antidegradation [10 CSR 20-7.031(3)].

Alternative analysis evaluation of the BMPs is a structured evaluation of BMPs which are reasonable and cost effective. The alternative analysis evaluation should include practices designed to be: 1) non-degrading; 2) less degrading; or 3) degrading water quality. The glossary of the *Antidegradation Implementation Procedure* defines these three terms. The chosen BMP will be the most reasonable and effective management strategy while ensuring the highest statutory and regulatory requirements are achieved and the highest quality water attainable for the facility is discharged. The alternative analysis evaluation must demonstrate why "no discharge" or "no exposure" is not a feasible alternative at the facility. This structured analysis of BMPs serves as the antidegradation review, fulfilling the requirements of 10 CSR 20-7.031(3) Water Quality Standards and *Antidegradation Implementation Procedure*, Section II.B.

- ✓ Applicable: A SWPPP shall be developed and implemented for each site and shall incorporate required practices identified by the Department with jurisdiction, incorporate control practices specific to site conditions, and provide for maintenance and adherence to the plan.

#### **UNDERGROUND INJECTION CONTROL (UIC):**

The UIC program for all classes of wells in the State of Missouri is administered by the Missouri Department of Natural Resources and approved by EPA pursuant to section 1422 and 1425 of the Safe Drinking Water Act (SDWA) and 40 CFR 147 Subpart AA. Injection wells are classified based on the liquids which are being injected. Class I wells are hazardous waste wells which are banned by RSMo 577.155; Class II wells are established for oil and natural gas production; Class III wells are used to inject fluids to extract minerals; Class IV wells are also banned by Missouri in RSMo 577.155; Class V wells are shallow injection wells; some examples are heat pump wells and groundwater remediation wells. Domestic wastewater being disposed of sub-surface is also considered a Class V well.

In accordance with 40 CFR 144.82, construction, operation, maintenance, conversion, plugging, or closure of injection wells shall not cause movement of fluids containing any contaminant into Underground Sources of Drinking Water (USDW) if the presence of any contaminant may cause a violation of drinking water standards or groundwater standards under 10 CSR 20-7.031 or other health-based standards or may otherwise adversely affect human health. If the Department finds the injection activity may endanger USDWs, the Department may require closure of the injection wells or other actions listed in 40 CFR 144.12(c), (d), or (e). In accordance with 40 CFR 144.26, the permittee shall submit a Class V Well Inventory Form for each active or new underground injection well drilled, or when the status of a well changes, to the Missouri Department of Natural Resources, Geological Survey Program, P.O. Box 250, Rolla, Missouri 65402. Single family residential septic systems and non-residential septic systems used solely for sanitary waste and having the capacity to serve fewer than 20 persons a day are excluded from the UIC requirements (40 CFR 144.81(9)).

- ✓ Not applicable; this permit does not authorize subsurface wastewater systems or other underground injection. These activities must be assessed under an application for a site specific permit. Certain discharges of stormwater into sinkholes may qualify as UIC. It is important the permittee evaluate all stormwater basins, even those holding water; as sinkholes have varying seepage rates. This permit does not allow stormwater discharges into sinkholes. The facility must ensure sinkholes are avoided in the construction process. The State's online mapping resource <https://modnr.maps.arcgis.com/apps/webappviewer/index.html?id=87ebef4af15d438ca658ce0b2bbc862e> has a sinkhole layer.

**VARIANCE:**

Per the Missouri Clean Water Law Section 644.061.4, variances shall be granted for such period of time and under such terms and conditions as shall be specified by the commission in its order. The variance may be extended by affirmative action of the commission. In no event shall the variance be granted for a period of time greater than is reasonably necessary for complying with the Missouri Clean Water Law Section 644.006 to 644.141 or any standard, rule, or regulation promulgated pursuant to Missouri Clean Water Law Section 644.006 to 644.141.

- ✓ Not Applicable: This permit is not drafted under premises of a petition for variance.

**WASTELOAD ALLOCATIONS (WLA) FOR LIMITATIONS:**

Per 10 CSR 20-2.010(78), the amount of pollutant each discharger is allowed by the Department to release into a given stream after the Department has determined total amount of pollutant which may be discharged into the stream without endangering its water quality. Water quality based maximum daily and average monthly effluent limitations were calculated using methods and procedures outlined in USEPA's Technical Support Document For Water Quality-based Toxics Control (TSD) (EPA/505/2-90-001).

- ✓ Not applicable; water quality limitations were not applied in this permit.

**WATER QUALITY STANDARDS:**

Per 10 CSR 20-7.031(4), General Criteria shall be applicable to all waters of the state at all times, including mixing zones. Additionally, 40 CFR 122.44(d)(1) directs the Department to include in each NPDES permit conditions to achieve water quality established under Section 303 of the CWA, including state narrative criteria for water quality.

**WHOLE EFFLUENT TOXICITY (WET) TEST:**

Per 10 CSR 20-7.031(1)(FF), a toxicity test conducted under specified laboratory conditions on specific indicator organism; and per 40 CFR 122.2, the aggregate toxic effect of an effluent measured directly by a toxicity test. A WET test is a quantifiable method of determining if a discharge from a facility may be causing toxicity to aquatic life by itself, in combination with, or through synergistic responses when mixed with receiving water.

- ✓ Not applicable: At this time, permittees are not required to conduct a WET test. This permit is for stormwater only.

## **PART IV – EFFLUENT LIMITATIONS DETERMINATION**

### **EPA Construction General Permit (CGP)**

The CGP was used to research and support best professional judgment decisions made in establishing technology-based conditions for this general permit which are consistent with national standards. The permit writer determined the standards established by the CGP are achievable and consistent with federal regulations. Additionally, the conditions reflecting the best practicable technology currently available are utilized to implement the ELG.

In this general permit, technology-based effluent conditions are established through the SWPPP and BMP requirements. Effective BMPs should be designed on a site-specific basis. The implementation of inspections provides a tool for each facility to evaluate the effectiveness of BMPs to ensure protection of water quality. Any flow through an outfall is considered a discharge. Future permit action due to permit modification may contain new operating permit terms and conditions which supersede the terms and conditions, including effluent limitations, of this operating permit.

## **PART V–REPORTING REQUIREMENTS**

### **SAMPLING:**

The permittee is not required to sample stormwater under this permit. The Department may require sampling and reporting as a result of illegal discharges, compliance issues related to water quality concerns or BMP effectiveness, or evidence of off-site impacts from activities at the facility. If such an action is needed, the Department will specify in writing the sampling requirements, including such information as location and extent. If the permittee refuses to perform sampling when required, the Department may terminate the general permit and require the facility to obtain a site-specific permit with sampling requirements.

### **REPORTING:**

There are quarterly reporting requirements for MO-R100xxx land disturbance permits. Project specific information is required to be report to the Department through the eDMR system.

## **PART VI – RAINFALL VALUES FOR MISSOURI & SURFACE WATER BUFFER ZONES**

Knowledge of the 2-year, 24-hour storm event is used in this permit for two main reasons:

- 1) The design, installation, and maintenance of effective erosion and sediment controls to minimize the discharge of pollutants.
- 2) If the seven-day inspection frequency is utilized, an inspection must occur within 48 hours after any storm event equal to or greater than a 2-year, 24 hour storm has ceased.

For site-specific 2-year, 24-hour storm event information utilize the National Oceanic and Atmospheric Administration’s National Weather Service Atlas 14 (NOAA Atlas 14) which is located at [https://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_map\\_cont.html](https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html). For more information visit; [https://www.weather.gov/media/owp/oh/hdsc/docs/Atlas14\\_Volume8.pdf](https://www.weather.gov/media/owp/oh/hdsc/docs/Atlas14_Volume8.pdf).

**Surface Water Buffer Zones:** In order to design controls that match the sediment removal efficiency of a 50-foot buffer, you first need to know what this efficiency is for your site. The sediment removal efficiencies of natural buffers vary according to a number of site-specific factors, including precipitation, soil type, land cover, slope length, width, steepness, and the types of erosion and sediment controls used to reduce the discharge of sediment prior to the buffer. For additional information;

[https://www.epa.gov/sites/default/files/2017-02/documents/2017\\_cgp\\_final\\_appendix\\_g\\_-\\_buffer\\_reqs\\_508.pdf](https://www.epa.gov/sites/default/files/2017-02/documents/2017_cgp_final_appendix_g_-_buffer_reqs_508.pdf)

## **PART VII – ADMINISTRATIVE REQUIREMENTS**

On the basis of preliminary staff review and applicable standards and regulations, the Department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the permit. The proposed determinations are tentative pending public comment.

### **PUBLIC MEETING:**

The department hosted three public meetings for this permit. The meetings were held on January 27, February 17, and March 9, 2021.

### **PUBLIC NOTICE:**

The Department shall give public notice when a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest or because of water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and facility must be notified of the denial in writing.

The Department must give public notice of a pending permit or of a new or reissued Missouri State Operating Permit. The public comment period is a length of time not less than thirty (30) days following the date of the public notice, during which interested persons may submit written comments about the proposed permit.

For persons wanting to submit comments regarding this proposed permit, please refer to the Public Notice page located at the front of this draft permit. The Public Notice page gives direction on how and where to submit appropriate comments.

- ✓ The Public Notice period for this permit is started March 25, 2022 and ended April 25, 2022. Two comment letters were received.

**DATE OF FACT SHEET:** 03/2/2022

### **COMPLETED BY:**

**SARAH WRIGHT**

**MS4 & LAND DISTURBANCE PERMITTING COORDINATOR**

**MISSOURI DEPARTMENT OF NATURAL RESOURCES**

**WATER PROTECTION PROGRAM**

**OPERATING PERMITS SECTION - STORMWATER AND CERTIFICATION UNIT**

**(573) 526-1139**

**[Sarah.wright@dnr.mo.gov](mailto:Sarah.wright@dnr.mo.gov), [dnr.generalpermits@dnr.mo.gov](mailto:dnr.generalpermits@dnr.mo.gov)**

**APPENDIX B:**

**GEOTECHNICAL REPORT**

**Exploration of Subsurface Conditions  
and  
Foundation Recommendations**

**JOHNSON'S SHUT-INS CABINS  
148 TAUM SAUK TRAIL  
MIDDLE BROOK, MISSOURI**

**May 2022**

**Frontenac Engineering Group, Inc.  
Civil Engineer/Surveyor**

**JGE No. 22047.1**

**JACOBI GEOTECHNICAL ENGINEERING, INC.  
798 Hoff Road, O'Fallon, Missouri 63366  
636-978-7112**

**110 West Main Street, Suite B, Belleville, Illinois 62220  
618-538-6666**

June 1, 2022

Mr. William K. Berthold, P.E.  
Frontenac Engineering Group, Inc.  
2725 Sutton Blvd  
Saint Louis MO 63143-3060

RE: Geotechnical Report  
Johnson's Shut-Ins Cabins  
148 Taum Sauk Trail  
Middle Brook, Missouri  
JGE No. 22047.1

Dear Mr. Berthold:

Enclosed is our report, **Exploration of Subsurface Conditions and Foundation Recommendations – Johnson's Shut-Ins Cabins – 148 Taum Sauk Trail – Middle Brook, Missouri**, dated May 2022.

We appreciate the opportunity to be of service to you on this project. If you have any questions or comments concerning this report, please call.

Sincerely,

**Jacobi Geotechnical Engineering, Inc.**



Allen G. Minks, P.E.  
Geotechnical Manager

AGM/JVH/cm



Distribution: Mr. William K. Berthold, P.E., Frontenac Engineering Group, Inc.,  
via email: [billb@fe-stl.com](mailto:billb@fe-stl.com)

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**Exploration of Subsurface Conditions  
and  
Foundation Recommendations**

**JOHNSON'S SHUT-INS CABINS  
148 TAUM SAUK TRAIL  
MIDDLE BROOK, MISSOURI**

**1.0 INTRODUCTION**

At the request of Mr. Bill Berthold of Frontenac Engineering Group, Inc. (Frontenac), Jacobi Geotechnical Engineering, Inc. (JGE) conducted a subsurface exploration for new cabins and improvements along the Taum Sauk Trail in Middle Brook, Missouri. The purpose of our exploration was to characterize and observe the subsurface conditions, provide recommendations for foundations, and address geotechnical aspects of the project. Our services were provided in general accordance with our proposal dated February 10, 2022, which was authorized by Mr. Berthold on April 11, 2022.

**2.0 PROJECT AND SITE DESCRIPTION**

Six new cabins are planned at Johnson's Shut-Ins State Park in Middle Brook, Missouri. Improvements along the Taum Sauk Trail, including new utilities, are also planned near the proposed cabins. The Location Plan, Figure 1, shows the site relative to the surrounding roads and topography.

The area of the proposed cabins is an open field with grass cover. The existing Black River Trail appears to be concrete paved near the project area. The existing site conditions are shown on the Site Plan, Figure 2.

Structural loads for the proposed cabins were unavailable. We anticipate the buildings will have wall loads less than 1,000 pounds per linear foot, no interior columns, and interior floor loads less than 200 pounds per square foot.

**3.0 FIELD EXPLORATION**

The field exploration consisted of drilling nine (9) borings, designated as B-1 through B-9, at the approximate locations shown on the Site Plan. Borings B-1 through B-7 were drilled for the proposed cabins and Borings B-8 and B-9 were drilled for the proposed improvements to the trail. JGE personnel located the borings in the field, referencing site features. The boring elevations were estimated from Google Earth. The boring locations and elevations are approximate. The project surveyor should be retained if more accurate elevations and location data are necessary.

Hollow-stem augers powered by a CME-45C drill rig were used to advance the borings to a depth of 15 feet, except where auger refusal occurred at shallower depths. Standard penetration tests (SPTs) were performed at 2.5- and 5-foot intervals throughout the boring depths. The SPT provides a correlation to soil strength and a disturbed sample for laboratory testing. The boreholes were backfilled with auger cuttings at the conclusion of drilling.

#### 4.0 LABORATORY TESTING

In our laboratory, the samples were characterized using manual-visual methods. Moisture contents were obtained for each sample. Atterberg limits tests were performed on select samples.

The nature and thickness of the soils encountered, and the results of the field sampling and laboratory testing are shown on the Boring Logs in the Appendix. The Log Notes sheet, included at the front of the Appendix, can be used to interpret the Boring Logs.

#### 5.0 SUBSURFACE CONDITIONS

Presented herein is a general description of the soils encountered. Detailed information regarding the soil types and interpretive soil stratigraphy is presented on the Boring Logs. The observed topsoil thickness, groundwater depths, and termination/refusal depths of the borings are summarized in Table 1.

**Table 1. Boring Data Summary**

<b>Boring Number</b>	<b>Approximate Surface Elevation (feet)</b>	<b>Topsoil Thickness (inches)</b>	<b>Groundwater Depth (feet)</b>	<b>Depth to Termination (feet)</b>
B-1	837	4	9	11.5 R
B-2	837	5	9	10.5 R
B-3	840	3	8	15 T
B-4	840	5	Not Observed	9.5 R
B-5	839	3	7	15 T
B-6	838	2	6	15 T
B-7	837	4	6.5	10 R
B-8	844	4	13	15 T
B-9	859	3	Not Observed	15 T
R-SPT Refusal, T-Termination				

Topsoil was encountered at each of the boring locations, at thicknesses between 2 and 5 inches. Below the topsoil, the subsurface profile generally consists of loose to very dense, clayey gravel (GC), sandy gravel with clay (GC), and sandy gravel (GP) to the termination depths of the borings. Medium stiff to very stiff, sandy clay (CL) was encountered to a depth of 3 feet in B-3, B-4, B-5, and to a depth of 8 feet in B-8. Soft to medium stiff, low plastic, silty clay (CL) was encountered below a depth of 10 feet in B-5. Very soft, high plastic clay was encountered below a depth of 10 feet in B-6.

In B-9, medium stiff to very stiff, low to medium plastic, sandy to silty clay (CL) was observed below the topsoil to the termination depth of the boring. The soil below a depth of 12 feet was soft to medium stiff.

Moisture contents of the gravels ranged from 3 to 28 percent, but were typically between 5 and 10 percent, and higher below groundwater. Moisture contents of the clay soils ranged from 10 to 52 percent, but were typically between 12 and 23 percent.

Bedrock at the site is anticipated to consist of Mississippian Age Warsaw Limestone with shale beds.

Groundwater was encountered in seven of the borings at depths of 6 to 13 feet while drilling. Groundwater levels may not stabilize in a drilled boring even after several days. Groundwater

is subject to seasonal and climatic variations and may be present at different depths in the future.

## **6.0 GEOTECHNICAL CONCERNS AND RECOMMENDATIONS**

Geotechnical concerns were encountered during our exploration. These issues are not unusual or insurmountable but will add to the construction cost of the project. Geotechnical concerns encountered include:

- Expansive soil
- Groundwater
- Chert gravel

### **6.1 Expansive Soil Remediation**

Potentially expansive soils (medium plastic, silty clay and high plastic clay) were encountered at elevations which will impact the proposed improvements. It should be noted that some of the sandy soils consist of high plastic clay, but the sand content (even after screening over the Number 40 sieve) is such that when the Atterberg limits tests were performed, the overall soil was classified as low plastic.

These soils have the potential for volume change with variations in the soil moisture content. The volume change can lead to slab-on-grade movement and cracking, and in severe cases, movement and cracking of foundations and walls.

To reduce heave or settlement related problems associated with expansive soils, we recommend medium and high plastic clays be removed and replaced within 2 feet of the floor slab subgrades and foundation subgrades. The overexcavation should extend 2 feet beyond the edges of foundations and floor slabs if non-expansive soil is used as the replacement material. A representative of JGE should observe the floor slab and foundation subgrades to determine if remedial measures due to potentially expansive soils are necessary. The exposed subgrades must not be allowed to dry during the remediation and construction process.

The overexcavation should be backfilled with properly compacted, non-expansive fill materials such as low plastic soil, lime stabilized clay, or 1-inch minus gradation crushed limestone. Lean concrete may also be used as the replacement material beneath foundations, and if used, the excavation for the concrete can be the same width as the planned footings. Extending the footings 2 feet below the normal bearing elevation and casting taller foundation walls is also an acceptable alternative.

The suggested method of treatment for the medium and high plastic clays is based on generally accepted standards in the local engineering community. These soils may exhibit swell pressures and volumetric changes which exceed the suggested remediation methods. Consequently, the owner should recognize that there is an inherent risk that floor slab and foundation damage may occur, even after remedial treatment of the subgrade soil.

### **6.2 Groundwater**

Groundwater was encountered in seven of the borings at depths of 6 to 13 feet while drilling. We do not anticipate that groundwater will affect shallow foundation and shallow utility construction unless the groundwater rises or deeper excavations are planned. In this case, it may be necessary to excavate multiple sumps and pump the water that accumulates in the sumps. If horizontal drilling is used below the groundwater level, measures will need to be implemented to reduce the potential for excessive removal of materials during drilling, particularly for sands below the groundwater level.

### **6.3 Chert Gravel**

Some of the gravel encountered in the borings is chert. We understand that horizontal boring will be used for some of the utility installation. Chert is a very hard rock and abrasive to some drilling bits. The horizontal boring contractors should be made aware of the potential for drilling through chert materials.

## **7.0 DESIGN RECOMMENDATIONS**

The following sections detail recommendations for the building and site design. These recommendations assume the grading has been performed in general accordance with the recommendations provided above and in the *Construction Considerations* section that follows.

### **7.1 Shallow Foundations**

Shallow foundations bearing in firm, low plastic, natural soil or compacted, non-expansive structural fill are appropriate for support of the proposed structures. The potentially expansive soils should be remediated as discussed in *Section 6.1*. Shallow foundations can be designed for a net allowable bearing pressure of 2,500 pounds per square foot (psf), although some overexcavation of the medium stiff, sandy clay and recompaction of the loose clayey sand around B-5 may be required. Continuous footings should have a minimum width of 18 inches. Any isolated column footings should have a minimum dimension of 30 inches. Exterior footings and foundations in unheated portions of the buildings should be provided with at least 30 inches of soil cover for frost protection. Any interior footings in heated parts of the buildings can be located at nominal depths below the finish floor. If the cabins will not remain heated throughout the winter, then all foundations should be extended to frost depth.

Following the recommendations given in this report, total settlement should be less than 1 inch and differential settlement less than  $\frac{3}{4}$  inch.

### **7.2 Seismic Design Considerations**

In our professional opinion, based on the field data, laboratory data, and assumed depth to rock, the site fits the International Building Code for Site Class D. The proposed buildings can be designed for this or more stringent soil types. We recommend the structural engineer determine the Seismic Design Category.

### **7.3 Floor Slabs**

The floor slabs may be designed using a modulus of subgrade reaction of 150 pounds per square inch per inch of deflection (pci) for a properly compacted subgrade. The following recommendations are not intended to supersede the structural engineer's design for the floor slabs.

The floor slabs should be supported on a layer of crushed stone. This will help distribute concentrated loads and equalize moisture conditions beneath the slabs. If a polyethylene moisture barrier is placed atop the crushed stone and beneath the floor, careful attention to curing of the concrete slab should be followed or excessive shrinkage cracking and "curling" can occur. We suggest the applicable recommendations provided in the American Concrete Institute (ACI) Standards be followed for curing the concrete floor slabs.

The floor slabs should not be structurally connected to the foundation walls and column pads. Isolation joints should be used where the slabs meet a wall or column. We also suggest that joints be placed in the floor slabs on no more than 15-foot intervals for 4-inch thick floors. The joints should be located in such a manner that each floor slab section is rectangular.

Such joints permit slight movements of the independent elements and help prevent random cracking that might otherwise be caused by restraint of shrinkage, slight rotations, heave, or settlement.

#### **7.4 Site Drainage and Final Grading**

Adequate site drainage should be provided to reduce infiltration of surface water around the perimeter of the structures and beneath the slabs. All grades should be sloped away from the structures, and roof and surface drainage should be collected and discharged such that water is not permitted to infiltrate the foundation backfill.

### **8.0 CONSTRUCTION CONSIDERATIONS**

The following sections present recommendations for the construction phase of the project.

#### **8.1 Siltation Control**

Appropriate erosion control measures, such as proper site contouring during general grading and the installation of siltation fences or the placement of staked straw bales, should be used during construction to keep eroded materials on site.

#### **8.2 Site Preparation**

Cut and fill areas must be stripped of surface vegetation and topsoil prior to fill placement. Topsoil and soft surface materials could be stockpiled for later use in green areas or common ground or be removed from the site. The subgrade in all areas to receive fill should then be scarified, proofrolled, and compacted, under the observation of JGE. Soft spots and areas where the recommended compaction cannot be achieved should be undercut and replaced with compacted, non-expansive cohesive soil fill or crushed stone.

Proofrolling should be conducted utilizing a tandem axle dump truck with a load of at least 25 tons, a loaded scraper/pan, or other heavily loaded construction equipment and observed by a JGE representative. Soft or otherwise unsuitable soils should be removed and replaced with engineered fill.

#### **8.3 Structural Fill Considerations**

Low plastic, silty clay soil with a liquid limit less than 45 and a plasticity index less than 20 is suitable for structural fill. Crushed limestone or limestone screenings may also be used as structural fill at the site. The on-site soils consisting of medium and high plastic clay are not suitable for use as structural fill within 2 feet of foundations and 2 feet of floor slabs.

The natural sand and gravel materials at the site can be used as fill, although additional measures will be needed to avoid disturbance to these materials after they have been compacted. Any subgrade that has been disturbed should be recompacted prior to building upon or placing additional fill.

Cohesive fill and aggregate should be placed in maximum 8-inch loose lifts. Cohesive fill should be compacted to at least 95 percent of the standard Proctor maximum dry density for the material (ASTM D 698), and well-graded granular fill should be compacted to at least 100 percent of the maximum dry density as determined by the standard Proctor test. Field density tests should be performed on each lift of fill to check that proper compaction is being achieved.

Cut and fill slopes should be no steeper than 3 horizontal to 1 vertical (3H:1V). Slopes less than 20 feet in height should be stable at this inclination.

## **8.4 Foundation Excavations**

A JGE representative should observe the foundation excavations to check that the foundations bear on competent materials. The base of all excavations should be clean, relatively dry, and free of loose soil or uncompacted fill. The excavations should be protected from extreme temperatures, precipitation, and construction disturbances. To reduce the possibility of excessive wetting or drying of the foundation soils, we recommend the concrete be placed as soon as possible after the excavation is made.

Disturbance of the soils in footing and floor slab excavations should be avoided. The potential for such disturbance will increase during wetter times of the year. Footing subgrade materials that have been excessively disturbed should be overdeepened to firm, undisturbed soil and replaced with properly compacted, non-expansive fill. As previously discussed, the natural sand and gravel materials at the site are susceptible to loss of strength from disturbance. Any subgrade that has been disturbed should be recompacted prior to pouring concrete. It may be necessary to tie rebar next to foundation excavations and then set the tied rebar into the excavation with a backhoe to reduce foot traffic on cohesionless subgrades.

## **8.5 Excavation Bracing Requirements**

The United States Department of Labor, Occupational Safety and Health Administration (OSHA) issued "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P" to provide for the safety of workers entering trenches or excavations. This document should be consulted for safe and legal excavations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean JGE is assuming any responsibility for construction site safety or the contractor's activities.

## **9.0 CONSTRUCTION MONITORING PROGRAM**

The following are highlights of a construction monitoring program. These services are intended to assess our design assumptions and provide construction quality assurance by comparing and documenting procedures and test results with plans, specifications, and good engineering practice. In this endeavor, JGE should:

- Review project plans and construction specifications to assess the interpretation of this report
- Observe site preparation
- Observe remediation of geotechnical concerns
- Observe the suitability of potential fill materials
- Monitor placement and proper compaction of structural fill and backfill
- Observe footing and floor slab subgrades for suitable bearing materials
- Test concrete during building construction

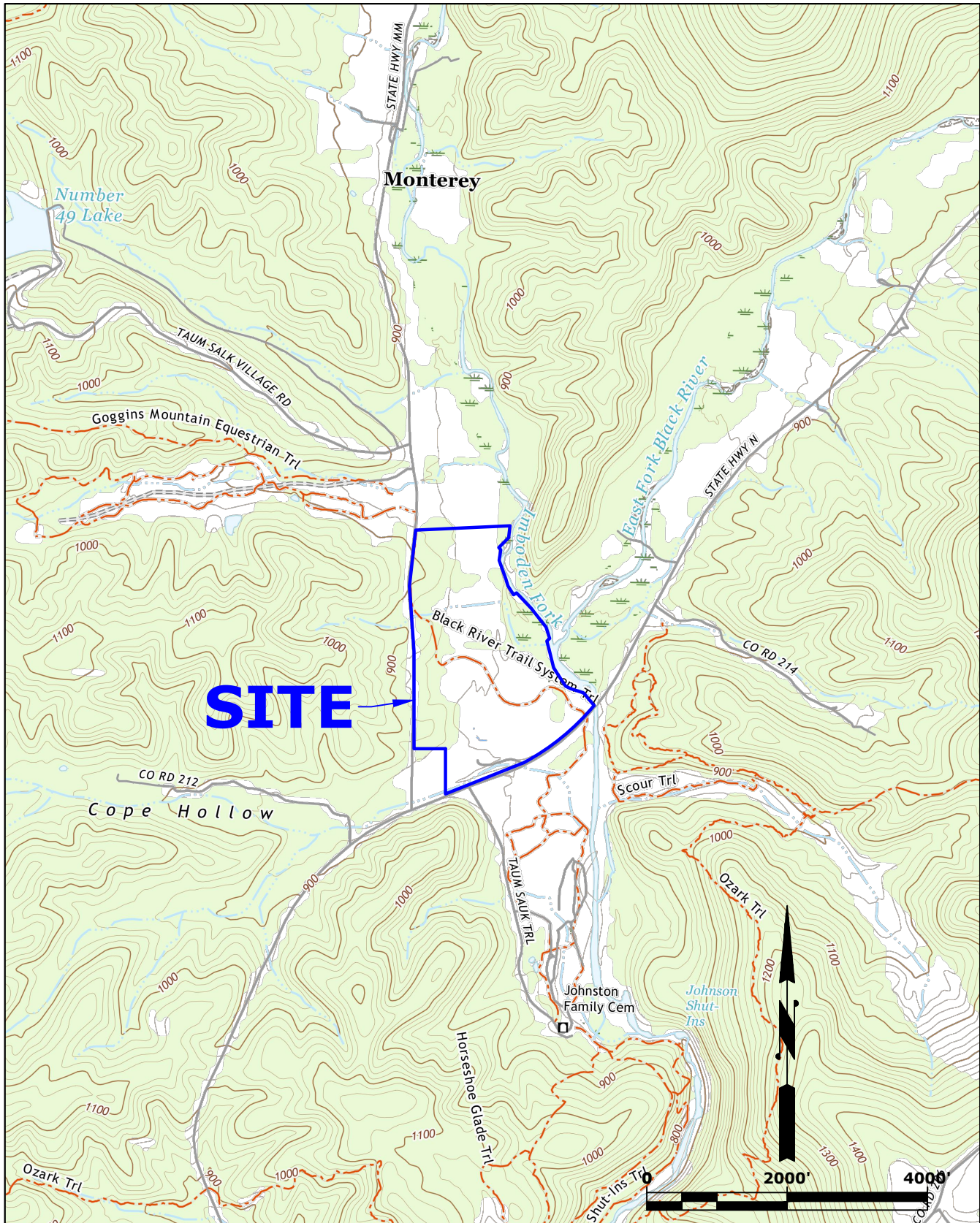
## **10.0 LIMITATIONS**

The recommendations provided herein are based on the information obtained at nine (9) specific boring locations within the project area and regionally accepted practice. Sampling cannot be relied on to accurately reflect natural variations in stratigraphy that may exist between sample locations and depths. Unknowns within the stratigraphy will exist. This report does not reflect any variations beyond or below the borings. JGE should be contacted if conditions encountered are not consistent with those described.

In addition, we should be provided with a set of final development plans, once they are available, to review how our recommendations have been applied to the design and check if changes to the proposed improvement plans require additional recommendations. Construction specifications also merit our review to assess the interpretation of this report. Failure to provide these documents for review may nullify some or all of the recommendations provided herein.

This report has been prepared in accordance with generally accepted geotechnical engineering practices based on the data available to date. No other warranty, expressed or implied, is made to the professional advice and recommendations included herein. This report is for exclusive use by the parties named and for the specific project and purposes stated herein. This report may not contain sufficient information for the use of other parties or for other purposes.





Location Plan based on USGS JOHNSON SHUT-INS, MISSOURI  
 QUADRANGLE  
 7.5-MINUTE SERIES, dated 2021  
 Contour Interval: 20 feet

JACOBI GEOTECHNICAL  
 ENGINEERING, INC.

LOCATION PLAN

Johnson's Shut-Ins Cabins

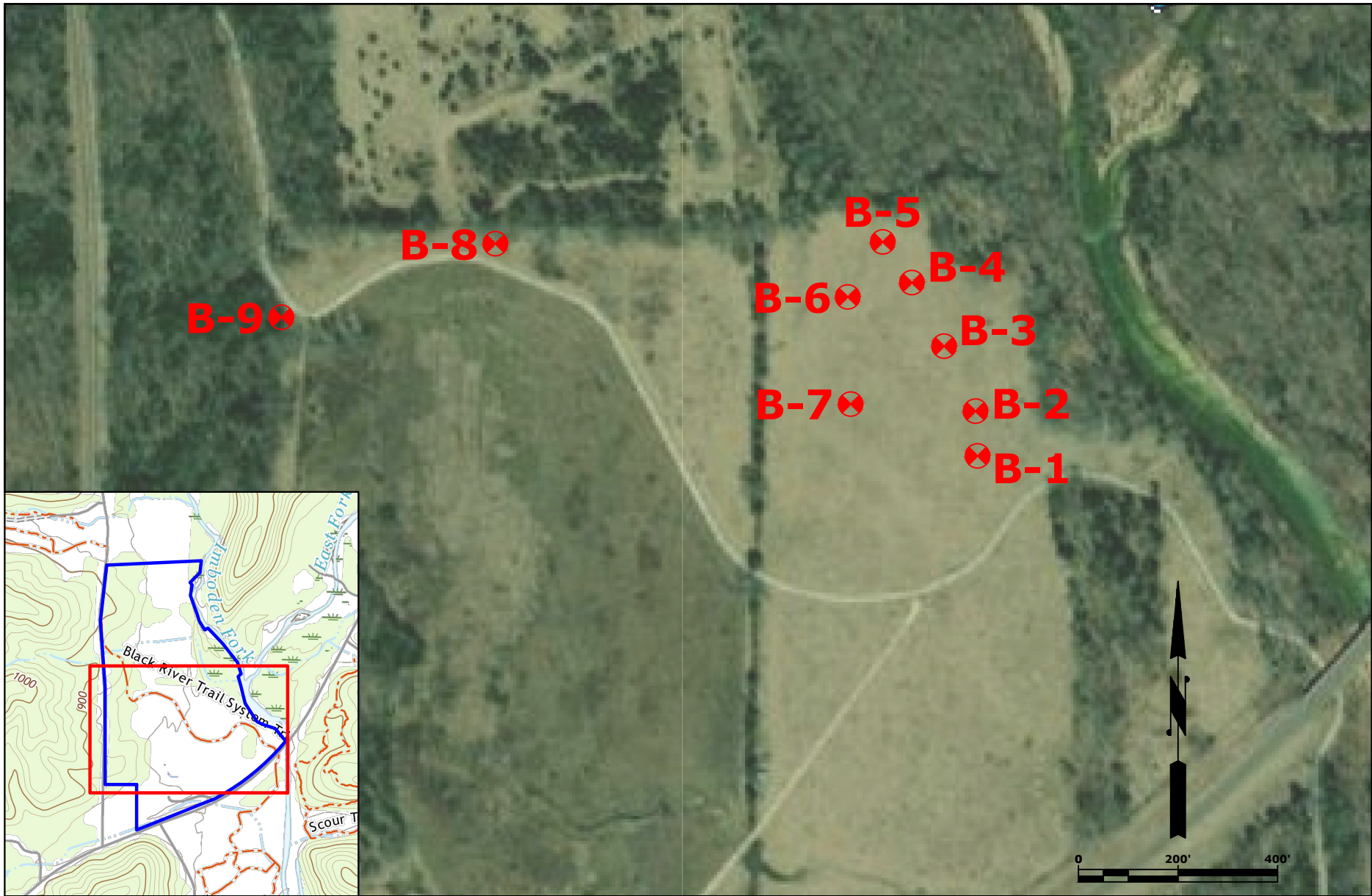
Middle Brook, Missouri

22047.1

May 2022

Figure 1





Site Plan based on USGS JOHNSON SHUT-INS, MISSOURI QUADRANGLE 7.5-MINUTE SERIES, dated 2021,  
and aerial from St. Francois County GIS data, accessed 5/25/2022

 Approximate Boring Location

JACOBI GEOTECHNICAL ENGINEERING, INC.	
SITE PLAN	
Johnson's Shut-Ins Cabins	
Middle Brook, Missouri	
22047.1	May 2022

Figure 2

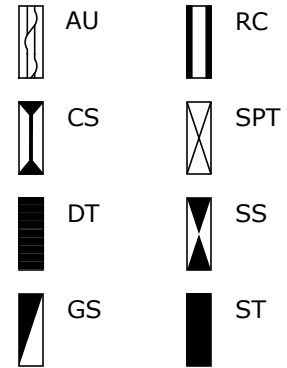
## **APPENDIX**

### GENERAL NOTES

1. The Logs represent interpretation of field and laboratory data. The breaks between strata on the Logs are approximate and the actual material change may occur at a different depth, between samples, or gradually.
2. Groundwater shown on the Logs may not have stabilized and may not represent the present or future groundwater levels. Groundwater levels may vary significantly over time due to precipitation, construction, or other factors.
3. Soil classifications indicated on the Logs are based on visual observations and are considered approximate. Laboratory testing for classification is used only where noted.
4. Soil samples are recovered intermittently and data only represents samples tested. The results of such testing may not conclusively represent the characteristics of all materials collected or subsurface materials present.

### ABBREVIATIONS / SYMBOLS

AU	Auger Cutting	RIMAC	Rimac Unconfined Compressive Test
CFA	Continuous Flight Augers	RQD	Rock Quality Designation
CS	Continuous Sampler	SPT	Standard Penetration Test
DT	Drive Tube	SS	Split-spoon
GS	Grab Sample	ST	Shelby Tube
HSA	Hollow Stem Augers	SV	Shear Vane Test
k <sub>sf</sub>	Kips per Square Foot	TV	Torvane Shear Test
MR	Mud Rotary	USCS	Unified Soil Classification System
pcf	Pound per Cubic Foot	UU	Unconsolidated Undrained Triaxial Test
Unc	Unconfined Compressive Test	WR	Weight of Rods
RC	Rock Core	WH	Weight of Hammer
Recovery    Sample Recovery (inch) / Sample Interval (inch)			



### PENETROMETER DATA

Penetrometer values on the Logs represents the direct reading of estimated unconfined compression strength.

### STANDARD PENETRATION TEST (SPT)

The SPT blow count is the number of impacts a 140-pound hammer falling 30 inches takes to drive a split-spoon sampler 6 inches. The number of blow counts to penetrate the first 6 inches is the seating interval. The sum of the blow counts for the second and third 6-inch interval is the N-value. For example, if blows are 6-8-11, N-value = 8+11 = 19.

If the sampler penetrated a 6-inch interval under the static weight of the drill rods, WR is reported for "Weight of Rods". A 6-inch interval penetrated by the static weight of the drill rods and hammer is reported as WH for "Weight of Hammer". When 50 blow counts are required in a 6-inch interval or less, the SPT test is terminated and reported as 50 over the length of the sample interval. For example, 50 blow counts to drive a sampler 3 inches would be reported as 50/3.

### CORRELATION OF SPT N-VALUE

<u>COHESIVE SOIL</u>		<u>GRANULAR SOIL</u>	
<u>CONSISTENCY</u>	<u>N-VALUE</u>	<u>QUALITATIVE DENSITY</u>	<u>N-VALUE</u>
Very Soft	WR - 1	Very Loose	WR - 4
Soft	2 - 4	Loose	5 - 10
Medium Stiff	5 - 8	Medium Dense	11 - 30
Stiff	9 - 15	Dense	31 - 50
Very Stiff	16 - 30	Very Dense	>50
Hard	>30		

### SOIL PROPORTIONS

Definition of descriptive terms used in soil profile material description with percentage proportions.

<u>DESCRIPTIVE TERM</u>	<u>PERCENT OF PROPORTIONS</u>
Trace	0 to < 15 %
With	15 to < 30 %
Description Modifier	30 to < 50 %
Description Identifier	>50 to 100 %

### SOIL STRUCTURE

Blocky	Cohesive soil that can be broken down in to small angular lumps which resist further breakdown.
Desiccated	Material in a very dry state. Soil structure often becomes fissured, blocky, and brittle.
Fissured	Breaks along definitive planes of fracture with little resistance to fracturing.
Intermixed	Material composed of different soil types which lacks layering, lamination, or stratification.
Laminated	Alternating layers of varying material or color with layers less than 6 mm thick (about a ¼ inch).
Lensed	Inclusions of small pockets of different soil.
Slickensided	Fractured planes appear polished, glossy, or slick.
Stratified	Alternating layers of varying material or color with layers at least 6 mm thick (about a ¼ inch).

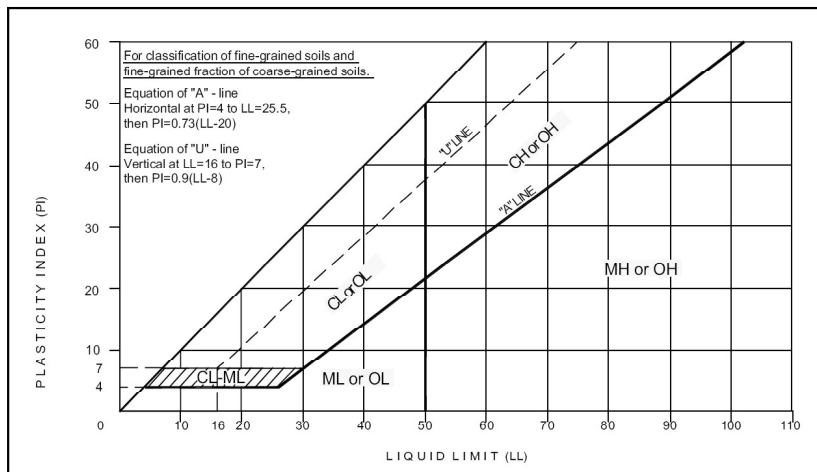
### SOIL GRAIN SIZE

Boulders	Cobbles	Gravel		Sand			Silt	Clay
		Coarse	Fine	Coarse	Medium	Fine		
300 (12-in)	75 (3-in)	19 (3/4-in)	4.75 (#4)	2.0 (#10)	0.425 (#40)	0.075 (#200)	0.002	mm (Sieve)

### UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS		GROUP SYMBOL	DESCRIPTION
COARSE-GRAINED SOIL (> 50% retained on #200 sieve)	GRAVEL (>50% of coarse fraction retained on the #4 sieve)	CLEAN GRAVEL (<5% fines)	GW Well-Graded Gravels, Gravel-Sand Mixtures, little or no fines
		GRAVELS with fines (>12% fines)	GP Poorly-Graded Gravels, Gravel-Sand Mixtures, little or no fines
			GM Silty Gravel, Gravel-Sand-Silt Mixture
			GC Clayey Gravel, Gravel-Sand-Clay Mixture
	SAND (>50% of coarse fraction passes the #4 sieve)	CLEAN SAND (<5% fines)	SW Well-Graded Sand, Gravelly Sands, little or no fines
		SANDS with fines (>12% fines)	SP Poorly-Graded Sand, Gravelly Sands, little or no fines
			SM Silty Sand, Sand-Silt Mixture
			SC Clayey Sand, Sand-Clay Mixture
FINE-GRAINED SOIL (>50% passes the #200 sieve)	SILTS and CLAYS (Liquid Limit <50)	Inorganic	ML Silt, Sandy Silt, Gravelly Silt, Silt with sand or gravel
			CL Lean Clay, Sandy Lean Clay, Gravelly Lean Clay, Lean Clay with sand or gravel, low plasticity
		Organic	OL Organic Clay, Organic Silt, low plasticity
	SILTS and CLAYS (Liquid Limit >50)	Inorganic	MH Silt, Sandy Silt, Gravelly Silt, Silt with sand or gravel, elastic
			CH Fat Clay, Sandy Fat Clay, Gravelly Fat Clay, Fat Clay with sand or gravel, high plasticity
		Organic	OH Organic Clay, Organic Silt, elastic/high plasticity
HIGHLY ORGANIC SOIL		PT	Peat, Primarily Organic Soil

### FINE-GRAINED SOIL PLASTICITY GRAPH



### ROCK QUALITY DESIGNATION (RQD)

PERCENT RQD	ROCK QUALITY
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

RQD is calculated by measuring and adding the length of intact core segments equal to or greater than 4 inches in length and dividing the sum by the core run length. RQD results are a percentage of total core run length.



**JOHNSON'S SHUT-INS CABINS  
MIDDLE BROOK, MISSOURI  
JGE No. 22047.1**

<b>START DATE</b> 5/16/2022	<b>LOGGED BY</b> R. Hall	<b>ELEVATION (ft)</b> 837.0
<b>COMPLETION DATE</b> 5/16/2022	<b>CHECKED BY</b> N. Crank	<b>TOTAL DEPTH (ft)</b> 11.5
<b>CONTRACTOR</b> Jacobi Geotechnical Engineering	<b>GROUND WATER LEVELS:</b>	
<b>EQUIPMENT</b> CME-45C / 3.25-inch HSA	▽ <b>AT TIME OF DRILLING</b> 9.0 ft / EL. 828.0 ft	
<b>SAMPLING</b> 2-inch SS / Automatic Hammer	▼ <b>AT END OF DRILLING</b> 11.0 ft / EL. 826.0 ft	
<b>BACKFILL</b> Auger Cuttings	<b>AFTER DRILLING</b> --	

DEPTH (ft)	FIELD TESTING			MATERIAL DESCRIPTION	WATER LEVEL	GRAPHIC LOG	USCS	LABORATORY TESTING					DEPTH (ft)					
	SAMPLE NUMBER	RECOVERY, in/in (RQD, %)	BLOW COUNTS (N VALUE)					PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	MOISTURE CONTENT (%)		DRY UNIT WT. (pcf)	SHEAR STRENGTH (ksf)	ATTERBERG LIMITS		
																LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
0					0.3	836.7								0				
	SPT 1	5/18	6-9-11 (20)		TOPSOIL: 4 inches Reddish-brown, fine to medium, CLAYEY GRAVEL with sand		GC	5										
					3.0	834.0												
5	SPT 2	7/18	8-8-13 (21)		Reddish-brown, fine to medium, SANDY GRAVEL		GP	4										
	SPT 3	9/18	11-11-13 (24)					5										
10	SPT 4	7/18	7-9-10 (19)					9						10				
					11.5	825.5												

Refusal at 11.5 feet. Boring terminated at 11.5 feet.

**NOTES:** Hard drilling below 2 feet.





**JOHNSON'S SHUT-INS CABINS  
MIDDLE BROOK, MISSOURI  
JGE No. 22047.1**

**START DATE** 5/16/2022

**LOGGED BY** R. Hall

**ELEVATION (ft)** 837.0

**COMPLETION DATE** 5/16/2022

**CHECKED BY** N. Crank

**TOTAL DEPTH (ft)** 10.5

**CONTRACTOR** Jacobi Geotechnical Engineering

**GROUND WATER LEVELS:**

**EQUIPMENT** CME-45C / 3.25-inch HSA

▽ **AT TIME OF DRILLING** 9.0 ft / EL. 828.0 ft

**SAMPLING** 2-inch SS / Automatic Hammer

▼ **AT END OF DRILLING** 8.0 ft / EL. 829.0 ft

**BACKFILL** Auger Cuttings

**AFTER DRILLING** ---

DEPTH (ft)	FIELD TESTING				MATERIAL DESCRIPTION	WATER LEVEL	GRAPHIC LOG	USCS	LABORATORY TESTING					DEPTH (ft)		
	SAMPLE NUMBER	RECOVERY, in/in (RQD, %)	BLOW COUNTS (N VALUE)	PENETROMETER (tsf)					SAMPLE TYPE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SHEAR STRENGTH (ksf)	ATTERBERG LIMITS			
													LIQUID LIMIT		PLASTIC LIMIT	PLASTICITY INDEX
0					DEPTH (ft) ELEVATION (ft)									0		
					0.4 TOPSOIL: 5 inches 836.6											
	SPT 1	3/18	8-10-11 (21)		Reddish-brown, fine to medium, SANDY GRAVEL			GP		3						
5	SPT 2	6/18	7-6-4 (10)							5				5		
	SPT 3	10/18	4-6-11 (17)		trace organics					7						
10	SPT 4	5/18	4-6-3 (9)							11				10		
					10.5 826.5											

Refusal at 10.5 feet. Boring terminated at 10.5 feet.

**NOTES:** Hard drilling from 1 to 4 feet, 6 to 7 feet, and 9 to 10.5 feet.



**JOHNSON'S SHUT-INS CABINS  
MIDDLE BROOK, MISSOURI  
JGE No. 22047.1**

<b>START DATE</b> 5/16/2022	<b>LOGGED BY</b> R. Hall	<b>ELEVATION (ft)</b> 840.0
<b>COMPLETION DATE</b> 5/16/2022	<b>CHECKED BY</b> N. Crank	<b>TOTAL DEPTH (ft)</b> 15.0
<b>CONTRACTOR</b> Jacobi Geotechnical Engineering	<b>GROUND WATER LEVELS:</b>	
<b>EQUIPMENT</b> CME-45C / 3.25-inch HSA	▽ <b>AT TIME OF DRILLING</b> 8.0 ft / EL. 832.0 ft	
<b>SAMPLING</b> 2-inch SS / Automatic Hammer	▼ <b>AT END OF DRILLING</b> 13.0 ft / EL. 827.0 ft	
<b>BACKFILL</b> Auger Cuttings	<b>AFTER DRILLING</b> --	

DEPTH (ft)	FIELD TESTING				MATERIAL DESCRIPTION	WATER LEVEL	GRAPHIC LOG	USCS	LABORATORY TESTING					DEPTH (ft)		
	SAMPLE NUMBER	RECOVERY, in/in (RQD, %)	BLOW COUNTS (N VALUE)	PENETROMETER (tsf)					SAMPLE TYPE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SHEAR STRENGTH (ksf)	ATTERBERG LIMITS			
													LIQUID LIMIT		PLASTIC LIMIT	PLASTICITY INDEX
0					DEPTH (ft) <span style="float:right">ELEVATION (ft)</span>									0		
					0.3 TOPSOIL: 3 inches <span style="float:right">839.8</span> Reddish-brown, lean, SANDY CLAY with gravel, trace organics		CL									
	SPT 1	11/18	1-2-8 (10)	0.75												
					3.0 <span style="float:right">837.0</span> Reddish-brown, fine to medium, SANDY GRAVEL, trace organics											
5	SPT 2	8/18	7-8-8 (16)											5		
	SPT 3	4/18	5-6-11 (17)													
10	SPT 4	11/18	9-10-9 (19)				GP							10		
					organics not observed											
15	SPT 5	9/18	1-1-7 (8)											15		

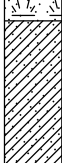

Boring terminated at 15.0 feet.

**NOTES:** Hard drilling from 4 to 6 feet and 7 to 13.5 feet.



**JOHNSON'S SHUT-INS CABINS  
MIDDLE BROOK, MISSOURI  
JGE No. 22047.1**

<b>START DATE</b> 5/16/2022	<b>LOGGED BY</b> R. Hall	<b>ELEVATION (ft)</b> 840.0
<b>COMPLETION DATE</b> 5/16/2022	<b>CHECKED BY</b> N. Crank	<b>TOTAL DEPTH (ft)</b> 9.5
<b>CONTRACTOR</b> Jacobi Geotechnical Engineering	<b>GROUND WATER LEVELS:</b>	
<b>EQUIPMENT</b> CME-45C / 3.25-inch HSA	<b>AT TIME OF DRILLING</b> --- Groundwater not observed	
<b>SAMPLING</b> 2-inch SS / Automatic Hammer	<b>AT END OF DRILLING</b> ---	
<b>BACKFILL</b> Auger Cuttings	<b>AFTER DRILLING</b> ---	

DEPTH (ft)	FIELD TESTING				MATERIAL DESCRIPTION	WATER LEVEL	GRAPHIC LOG	USCS	LABORATORY TESTING					DEPTH (ft)		
	SAMPLE NUMBER	RECOVERY, in/in (RQD, %)	BLOW COUNTS (N VALUE)	PENETROMETER (tsf)					SAMPLE TYPE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SHEAR STRENGTH (ksf)	ATTERBERG LIMITS			
													LIQUID LIMIT		PLASTIC LIMIT	PLASTICITY INDEX
0					DEPTH (ft) <span style="float:right">ELEVATION (ft)</span>									0		
					0.4 TOPSOIL: 5 inches <span style="float:right">839.6</span>											
	SPT 1	12/18	2-5-5 (10)	2.5	Reddish-brown, lean, SANDY CLAY with gravel, trace organics			CL	X	10						
					3.0 <span style="float:right">837.0</span>											
5	SPT 2	7/18	6-8-10 (18)		Reddish-brown, fine to medium, SANDY GRAVEL			GP	X	6				5		
	SPT 3	8/18	10-24-46 (70)						X	8						
	SPT 4	0/5	50/5"						X							
					9.5 <span style="float:right">830.5</span>											

Refusal at 9.5 feet. Boring terminated at 9.5 feet.

**NOTES:** Hard drilling below 4 feet.





**JOHNSON'S SHUT-INS CABINS  
MIDDLE BROOK, MISSOURI  
JGE No. 22047.1**

<b>START DATE</b> 5/16/2022	<b>LOGGED BY</b> R. Hall	<b>ELEVATION (ft)</b> 839.0
<b>COMPLETION DATE</b> 5/16/2022	<b>CHECKED BY</b> N. Crank	<b>TOTAL DEPTH (ft)</b> 15.0
<b>CONTRACTOR</b> Jacobi Geotechnical Engineering	<b>GROUND WATER LEVELS:</b>	
<b>EQUIPMENT</b> CME-45C / 3.25-inch HSA	∇ <b>AT TIME OF DRILLING</b> 7.0 ft / EL. 832.0 ft	
<b>SAMPLING</b> 2-inch SS / Automatic Hammer	<b>AT END OF DRILLING</b> ---	
<b>BACKFILL</b> Auger Cuttings	<b>AFTER DRILLING</b> ---	

DEPTH (ft)	FIELD TESTING				MATERIAL DESCRIPTION	WATER LEVEL	GRAPHIC LOG	USCS	LABORATORY TESTING					DEPTH (ft)				
	SAMPLE NUMBER	RECOVERY, in/in (RQD, %)	BLOW COUNTS (N VALUE)	PENETROMETER (tsf)					DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)		SHEAR STRENGTH (ksf)	ATTERBERG LIMITS		
																LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
0					0.3	838.8								0				
	SPT 1	14/18	1-2-3 (5)	1	TOPSOIL: 3 inches Reddish-brown, lean, SANDY CLAY, trace gravel and organics		∇	CL	16			29	15	14				
					3.0	836.0		SC	16									
5	SPT 2	5/18	2-1-4 (5)	1.75	Reddish-brown, fine to coarse, CLAYEY SAND, trace gravel			GP	14									
					5.5	833.5		GC	17									
	SPT 3	6/18	5-7-7 (14)		Reddish-brown, fine to medium, SANDY GRAVEL													
10	SPT 4	10/18	7-9-7 (16)		8.0 Reddish-brown, fine to medium, SANDY GRAVEL with clay													
					10.0	829.0												
					Tan, lean, SILTY CLAY with gravel													
15	SPT 5	12/18	2-2-2 (4)		15.0				29									

Boring terminated at 15.0 feet.

**NOTES:** Hard drilling from 5 to 10 feet.



**JOHNSON'S SHUT-INS CABINS  
MIDDLE BROOK, MISSOURI  
JGE No. 22047.1**

<b>START DATE</b> 5/16/2022	<b>LOGGED BY</b> R. Hall	<b>ELEVATION (ft)</b> 838.0
<b>COMPLETION DATE</b> 5/16/2022	<b>CHECKED BY</b> N. Crank	<b>TOTAL DEPTH (ft)</b> 15.0
<b>CONTRACTOR</b> Jacobi Geotechnical Engineering	<b>GROUND WATER LEVELS:</b>	
<b>EQUIPMENT</b> CME-45C / 3.25-inch HSA	∇ <b>AT TIME OF DRILLING</b> 6.0 ft / EL. 832.0 ft	
<b>SAMPLING</b> 2-inch SS / Automatic Hammer	<b>AT END OF DRILLING</b> ---	
<b>BACKFILL</b> Auger Cuttings	<b>AFTER DRILLING</b> ---	

DEPTH (ft)	FIELD TESTING			MATERIAL DESCRIPTION	WATER LEVEL	GRAPHIC LOG	USCS	LABORATORY TESTING					DEPTH (ft)					
	SAMPLE NUMBER	RECOVERY, in/in (RQD, %)	BLOW COUNTS (N VALUE)					PENETROMETER (tsf)	DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	MOISTURE CONTENT (%)		DRY UNIT WT. (pcf)	SHEAR STRENGTH (ksf)	ATTERBERG LIMITS		
																LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX
0														0				
					0.2	837.8												
	SPT 1	9/18	3-4-3 (7)		TOPSOIL: 2 inches Reddish-brown, fine, SANDY GRAVEL with clay, trace organics			GC	7									
	SPT 2	10/18	6-6-9 (15)		5.0	833.0		GP	6					5				
	SPT 3	5/18	3-6-6 (12)		Reddish-brown, fine to medium, GRAVEL with sand, trace organics			GP	12									
					8.0	830.0		GC	29									
	SPT 4	6/18	9-25-10 (35)		Reddish-brown, fine to medium, GRAVEL with sand and clay			GC	29									
10					10.0	828.0		CH						10				
					Brown, fat, SANDY CLAY													
	SPT 5	11/18	WH-WH-WH		15.0	823.0			52					15				

Boring terminated at 15.0 feet.

**NOTES:** Hard drilling from 5 to 6 feet and below 8 feet.



**JOHNSON'S SHUT-INS CABINS  
MIDDLE BROOK, MISSOURI  
JGE No. 22047.1**

<b>START DATE</b> 5/16/2022	<b>LOGGED BY</b> R. Hall	<b>ELEVATION (ft)</b> 837.0
<b>COMPLETION DATE</b> 5/16/2022	<b>CHECKED BY</b> N. Crank	<b>TOTAL DEPTH (ft)</b> 10.0
<b>CONTRACTOR</b> Jacobi Geotechnical Engineering	<b>GROUND WATER LEVELS:</b>	
<b>EQUIPMENT</b> CME-45C / 3.25-inch HSA	∇ <b>AT TIME OF DRILLING</b> 6.5 ft / EL. 830.5 ft	
<b>SAMPLING</b> 2-inch SS / Automatic Hammer	<b>AT END OF DRILLING</b> ---	
<b>BACKFILL</b> Auger Cuttings	<b>AFTER DRILLING</b> ---	

DEPTH (ft)	FIELD TESTING				MATERIAL DESCRIPTION	WATER LEVEL	GRAPHIC LOG	USCS	LABORATORY TESTING					DEPTH (ft)		
	SAMPLE NUMBER	RECOVERY, in/in (RQD, %)	BLOW COUNTS (N VALUE)	PENETROMETER (tsf)					SAMPLE TYPE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SHEAR STRENGTH (ksf)	ATTERBERG LIMITS			
													LIQUID LIMIT		PLASTIC LIMIT	PLASTICITY INDEX
0					DEPTH (ft) <span style="float:right">ELEVATION (ft)</span>									0		
					0.3 TOPSOIL: 4 inches <span style="float:right">836.7</span> Brown, fine, CLAYEY GRAVEL with sand											
	SPT 1	7/18	9-9-7 (16)					GC	X	11						
					3.0 <span style="float:right">834.0</span> Brown, fine, SANDY GRAVEL, trace organics			GP	X	5						
5	SPT 2	6/18	6-18-13 (31)											5		
					5.5 <span style="float:right">831.5</span> Brown, fine to medium, CLAYEY SAND			SC	X	17						
	SPT 3	2/18	20-29-22 (51)													
					8.0 <span style="float:right">829.0</span> Brown, fine, GRAVEL, trace sand			GP	X	10						
10	SPT 4	8/18	31-27-22 (49)		10.0 <span style="float:right">827.0</span>									10		

Refusal at 10.0 feet. Boring terminated at 10.0 feet.

**NOTES:** Hard drilling below 1 foot.



**JOHNSON'S SHUT-INS CABINS  
MIDDLE BROOK, MISSOURI  
JGE No. 22047.1**

<b>START DATE</b> 5/16/2022	<b>LOGGED BY</b> R. Hall	<b>ELEVATION (ft)</b> 844.0
<b>COMPLETION DATE</b> 5/16/2022	<b>CHECKED BY</b> N. Crank	<b>TOTAL DEPTH (ft)</b> 15.0
<b>CONTRACTOR</b> Jacobi Geotechnical Engineering	<b>GROUND WATER LEVELS:</b>	
<b>EQUIPMENT</b> CME-45C / 3.25-inch HSA	∇ <b>AT TIME OF DRILLING</b> 13.0 ft / EL. 831.0 ft	
<b>SAMPLING</b> 2-inch SS / Automatic Hammer	<b>AT END OF DRILLING</b> ---	
<b>BACKFILL</b> Auger Cuttings	<b>AFTER DRILLING</b> ---	

DEPTH (ft)	FIELD TESTING				MATERIAL DESCRIPTION	WATER LEVEL	GRAPHIC LOG	USCS	LABORATORY TESTING					DEPTH (ft)		
	SAMPLE NUMBER	RECOVERY, in/in (RQD, %)	BLOW COUNTS (N VALUE)	PENETROMETER (tsf)					SAMPLE TYPE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SHEAR STRENGTH (ksf)	ATTERBERG LIMITS			
													LIQUID LIMIT		PLASTIC LIMIT	PLASTICITY INDEX
0					DEPTH (ft) 0.3									0		
					ELEVATION (ft) 843.7											
	SPT 1	14/18	2-3-4 (7)	2	TOPSOIL: 4 inches Brown, lean, SILTY CLAY, trace sand											
					becomes grayish-brown											
5	SPT 2	17/18	2-2-3 (5)	1.75			CL							5		
					becomes brown, trace gravel											
	SPT 3	16/18	2-3-15 (18)	1.75								42	19	23		
					8.0											
					ELEVATION (ft) 836.0											
	SPT 4	9/18	8-13-15 (28)		Brown, fine, SANDY GRAVEL											
10							GP							10		
					12.0											
					ELEVATION (ft) 832.0											
					Brown, fine, SANDY GRAVEL with clay, trace organics											
					15.0											
					ELEVATION (ft) 829.0											
15	SPT 5	2/18	2-2-3 (5)				GC							15		

Boring terminated at 15.0 feet.

**NOTES:** Hard drilling from 9 to 13.5 feet.



**JOHNSON'S SHUT-INS CABINS  
MIDDLE BROOK, MISSOURI  
JGE No. 22047.1**

<b>START DATE</b> 5/16/2022	<b>LOGGED BY</b> R. Hall	<b>ELEVATION (ft)</b> 859.0
<b>COMPLETION DATE</b> 5/16/2022	<b>CHECKED BY</b> N. Crank	<b>TOTAL DEPTH (ft)</b> 15.0
<b>CONTRACTOR</b> Jacobi Geotechnical Engineering	<b>GROUND WATER LEVELS:</b>	
<b>EQUIPMENT</b> CME-45C / 3.25-inch HSA	<b>AT TIME OF DRILLING</b> --- Groundwater not observed	
<b>SAMPLING</b> 2-inch SS / Automatic Hammer	<b>AT END OF DRILLING</b> ---	
<b>BACKFILL</b> Auger Cuttings	<b>AFTER DRILLING</b> ---	

DEPTH (ft)	FIELD TESTING				MATERIAL DESCRIPTION	WATER LEVEL	GRAPHIC LOG	USCS	LABORATORY TESTING					DEPTH (ft)		
	SAMPLE NUMBER	RECOVERY, in/in (RQD, %)	BLOW COUNTS (N VALUE)	PENETROMETER (tsf)					SAMPLE TYPE	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SHEAR STRENGTH (ksf)	ATTERBERG LIMITS			
													LIQUID LIMIT		PLASTIC LIMIT	PLASTICITY INDEX
0					DEPTH (ft) ELEVATION (ft)									0		
					0.3 TOPSOIL: 3 inches 858.8											
	SPT 1	10/18	1-3-3 (6)	<0.25	Reddish-brown, lean, SANDY SILTY CLAY, trace gravel and organics			CL	X	17						
					3.0 856.0											
	SPT 2	4/18	3-4-3 (7)		Reddish-brown, lean, SANDY CLAY with gravel, trace organics			CL	X	16						
5					organics not observed			CL						5		
	SPT 3	12/18	10-13-4 (17)					CL	X	19						
					8.0 851.0											
	SPT 4	13/18	4-4-4 (8)		Reddish-brown, medium plastic, SILTY CLAY with sand and gravel			CL	X	23						
10								CL						10		
					12.0 847.0											
	SPT 5	18/18	1-2-2 (4)	0.5	Gray, lean, SILTY CLAY			CL	X	26						
15					15.0 844.0									15		

Boring terminated at 15.0 feet.

**NOTES:**