



PROJECT MANUAL

REPLACE 22 ELECTRIC SITES WITH 22 PREMIUM SITES

Table Rock State Park, Campground #2

Branson, Missouri

Designed By: Great River Engineering
2826 S. Ingram Mill Road
Springfield, MO 65804

Date Issued: January 17, 2023

Project No.: X2216-01

STATE *of* MISSOURI

OFFICE *of* ADMINISTRATION
Facilities Management, Design & Construction

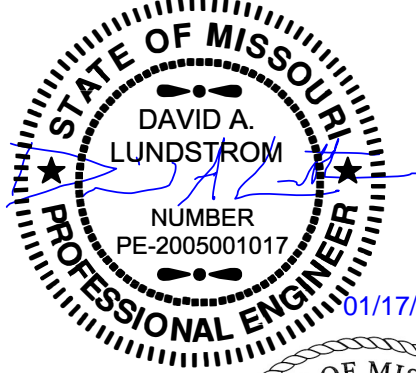
SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: X2116-01

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:

David A. Lundstrom

PE#: MO-2005001017
Sheets: C-101, C-102, C-103, C-502, C-505
Specifications: Division 3, Division 31, Division 32



Connie Walden

PE#: MO-2022008888
Sheets: C-104, C-105, C-106, C-107, C-501, C-503, C-504, M-101, M-102
Specifications: Division 7, Division 33



Allen Davis

PE#: MO-2004017155
Sheets: E-101, E-102
Specifications: Division 26



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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

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

	<u>TITLE</u>	<u>SHEET #</u>	<u>DATE</u>	<u>CAD #</u>
1.	Cover Sheet	Sheet G-001	01/17/23	5603-03018_G-001
2.	Demolition Plan and Existing Conditions	Sheet C-101	01/17/23	5603-03018_C-001
3.	Site Layout	Sheet C-102	01/17/23	5603-03018_C-002
4.	Site Grading	Sheet C-103	01/17/23	5603-03018_C-002
5.	Sediment & Erosion Control Plan	Sheet C-104	01/17/23	5603-03018_C-005
6.	Water Line A	Sheet C-105	01/17/23	5603-03018_C-003
7.	Proposed Water and Sewer	Sheet C-106	01/17/23	5603-03018_C-003
8.	Sanitary Sewer A	Sheet C-107	01/17/23	5603-03018_C-004
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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. REPLACE 22 ELECTRIC SITES WITH 22 PREMIUM SITES
Table Rock State Park, Campground #2
Branson, Missouri
Project No.: X2216-01

3.0 BIDS WILL BE RECEIVED:

- A. Until: 1:30 PM, Thursday, April 27, 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 providing a design for campsites with 50-amp electrical service, water, and wastewater connections by modifying existing electric-only campsites 234, 240-255, 258, 260, 262, 264, and 266, all of which are located in campground 2 at Table Rock State Park.
- 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: 10:30 AM, Tuesday, April, 11, 2023, at the Park Office, 5272 State Highway 165, Table Rock State Park
- 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: Great River Engineering, David Lundstrom, (417) 886-7171, email: dlundstrom@greatriv.com
- B. Project Manager: Sandra Walther, (573) 751-2283, email: sandra.walther@oa.mo.gov

8.0 GENERAL INFORMATION:

- A. The State reserves the right to reject any and all bids and to waive all informalities in bids. No bid may be withdrawn for a period of 20 working days subsequent to the specified bid opening time. The contractor shall pay not less than the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed, as determined by the Missouri Department of Labor and Industrial Relations and as set out in the detailed plans and specifications.
- B. Bid results will be available at <https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans> after it is verified that at least one bid is awardable and affordable.

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://missouribuys.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 ; April Howser: 573-751-0053, April.Howser@oa.mo.gov ; or Mandy Roberson: 573-522-0074, 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.

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***

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: **REPLACE 22 ELECTRIC SITES WITH 22 PREMIUM SITES
Table Rock State Park, Campground #2
Branson, Missouri**

Project Number: **X2216-01**

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

ARTICLE 2. TIME OF COMPLETION

The contract performance time is **200 working days** from the transmittal date of this agreement. The contract completion date is **MONTH, DAY, YEAR**. This time includes ten (10) working days for the Contractor to receive, sign and return the contract form along with required bonding and insurance certificates. Failure of the Contractor to provide correct bonding and insurance within the ten (10) working days shall not be grounds for a time extension. Receipt of proper bonding and insurance is a condition precedent to the formation of the contract and if not timely received, may result in forfeiture of the Contractor's bid security. Work may not commence until the Owner issues a written Notice to Proceed and must commence within seven (7) working days thereafter.

ARTICLE 3. LIQUIDATED DAMAGES

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

ARTICLE 4. CONTRACT SUM

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

Base Bid: \$
Alternate No. 1: \$
Alternate No. 2: \$

TOTAL CONTRACT AMOUNT: (\$CONTRACT AMOUNT)

ARTICLE 5. PREVAILING WAGE RATE

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

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

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

--

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
LOCATION	DATE INSTALLED

SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

REASON FOR SUBSTITUTION

DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?

YES NO

IF YES, EXPLAIN

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

YES NO

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

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

BIDDER/CONTRACTOR

DATE

REVIEW AND ACTION

Resubmit Substitution Request with the following additional information:

Substitution is accepted.

Substitution is accepted with the following comments:

Substitution is not accepted.

ARCHITECT/ENGINEER

DATE



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"/> FINAL	DATE

PROJECT TITLE

PROJECT LOCATION

FIRM

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

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

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

SELECT MBE, WBE, SDVE	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	
	DAY OF	YEAR
	NOTARY PUBLIC SIGNATURE	MY COMMISSION EXPIRES
NOTARY PUBLIC NAME (TYPED OR PRINTED)		USE RUBBER STAMP IN CLEAR AREA BELOW

FILE: Closeout Documents

GENERAL CONDITIONS

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SECTION 007213 - GENERAL CONDITIONS

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

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

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

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

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

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

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

D. Deductibles and Self-Insured Retentions

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

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

E. Other Insurance Provisions and Requirements

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

1. General Liability

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

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

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

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

2. Automobile Insurance

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

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

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

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

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

3. Workers' Compensation/Employer's Liability

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

4. All Coverages

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

F. Insurer Qualifications and Acceptability

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

G. Verification of Insurance Coverage

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

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

ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

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

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

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

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

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

ARTICLE 7.3 -- FOR CONVENIENCE

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

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

B. Upon receipt of notification, the Contractor shall:

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

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

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

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

SECTION 007300 - SUPPLEMENTARY CONDITIONS

1.0 GENERAL:

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

2.0 CONTACTS:

Designer:

David Lundstrom
Great River Engineering
2826 S. Ingram Mill Road
Springfield, MO 65804
Telephone: 417-886-7171
Email: dlundstrom@greatriv.com

Construction Representative:

Don Wagner
Division of Facilities Management, Design and Construction
149 Park Central Square RM 328B
Springfield, MO 65806
Telephone: (816) 565-5098
Email: Don.Wagner@oa.mo.gov

Project Manager:

Sandra Walther
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: 5737512283
Email: sandra.walther@oa.mo.gov

Contract Specialist:

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

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

4.0 FURNISHING CONSTRUCTION DOCUMENTS:

- A. The Owner will furnish the Contractor with approximately 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.

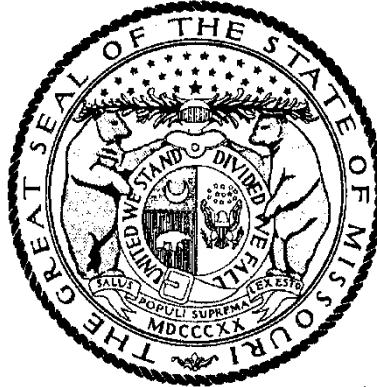
5.0 SAFETY REQUIREMENTS

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 110
TANEY 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	\$21.50*
Boilermaker	\$21.50*
Bricklayer	\$53.56
Carpenter	\$46.77
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	\$38.72
Plasterer	
Communications Technician	\$21.50*
Electrician (Inside Wireman)	\$40.93
Electrician Outside Lineman	\$21.50*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	\$21.50*
Glazier	\$21.50*
Ironworker	\$21.50*
Laborer	\$38.85
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	\$21.50*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	\$21.50*
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	\$36.50
Plumber	\$50.06
Pipe Fitter	
Roofer	\$21.50*
Sheet Metal Worker	\$21.50*
Sprinkler Fitter	\$61.25
Truck Driver	\$21.50*
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
TANEY County

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$47.93
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$21.50*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	\$41.19
General Laborer	
Skilled Laborer	
Operating Engineer	\$45.36
Group I	
Group II	
Group III	
Group IV	
Truck Driver	\$21.50*
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.

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 providing a design for campsites with 50-amp electrical service, water, and wastewater connections by modifying existing electric-only campsites 234, 240-255, 258, 260, 262, 264, and 266, all of which are located in campground 2 at Table Rock State Park.
 - 1. Project Location: 5272 State Hwy 165, Branson, MO 65616
 - 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 **January 17, 2023** were prepared for the Project by Great River Engineering, 2826 S. Ingram Mill Road, Springfield, MO 65804.
- C. The Work consists of providing a design for campsites with 50-amp electrical service, water, and wastewater connections by modifying existing electric-only campsites 234, 240-255, 258, 260, 262, 264, and 266, all of which are located in campground 2 at Table Rock State Park. Additional modifications shall include standard concrete pads and typical campsite amenities such as fire pits, lantern posts, and picnic tables.
 - 1. The Work includes:
 - a. Providing a 50-amp electrical service design for each campsite
 - b. Provide a potable water service design including service connection to each campsite, control valves and campground hydrants
 - c. Provide a booster pump station design for the potable water source
 - d. Provide a wastewater service design including service connection at each campsite, periodic cleanout locations, connection to existing sewer mains and service line sizing
 - e. Provide lift station improvements including emergency generators and a pump railing replacement
 - f. Provide details including campsite pad dimensions and alignments, utility connections and placement, and standard amenities such as picnic table, lantern post, and fire ring with grill.
- D. The Work will be constructed under a single prime contract.

1.3 WORK SEQUENCE

- A. The Work will be conducted in one phase.
 - 1. Phase one: entirety of the contract. Work of this phase shall be substantially complete, ready for occupancy within 200 working days of issuing Notice of Intent To Award.

1.4 CONTRACTOR USE OF PREMISES

- A. General: During the construction period the Contractor shall have full use of the designated construction site area for construction operations, including use of the site. The Contractor's use of the designated construction site area limited only by the Owner's right to perform work or to retain other contractors on portions of the Project.
- B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
 - 1. Owner Occupancy: Allow for Owner occupancy and use by the public.
 - 2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.5 OCCUPANCY REQUIREMENTS

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

1.6 OWNER-FURNISHED PRODUCTS

- A. The Owner will furnish fire rings, lantern posts, and picnic tables. These items will be Owner provided and Contractor furnished.
 - 1. The Owner will arrange for and deliver necessary shop drawings, product data, and samples to the Contractor.
 - 2. The Owner will arrange and pay for delivery of Owner-furnished items according to the contractor's Construction Schedule.
 - 3. The Contractor is responsible for receiving, unloading, and handling Owner furnished items at the site.
 - 4. Following delivery, the Contractor will inspect items delivered for damage. The Contractor shall not accept damaged items and shall notify the Owner of rejection of damaged items.

5. If Owner-furnished items are damaged, defective, or missing, the Owner will arrange for replacement.
6. The Owner will arrange for manufacturer's field services and for the delivery of manufacturer's warranties to the appropriate Contractor.
7. The Contractor shall designate delivery dates of Owner-furnished items in the Contractor's Construction Schedule.
8. The Contractor shall review shop drawings, product data and samples and return them to the Designer noting discrepancies or problems anticipated in use of the project.
9. The Contractor is responsible for protecting Owner-furnished items from damage, including damage from exposure to the elements. The Contractor shall repair or replace items damaged as a result of his operations.

1.7 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF PRODUCTS ORDERED IN ADVANCE

END OF SECTION 011000

SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 WEATHER ALLOWANCE

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

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

1.4 SELECTION AND PURCHASE

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

1.5 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

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

1.7 [LUMP-SUM] ALLOWANCES

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

- A. Weather Allowance: Included within the completion period for this Project, ten (10) “bad weather” days.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 PROCEDURES

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: Provide all site improvements and utility connections for RV sites 234, 255, 258, 260, 262, 264, and 266.
- B. Alternate No. 2: Provide a generator for each lift station, two generators total.

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 013115 "Project Management Communications" for administrative requirements for communications.
 - 3. Division 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
 - 4. Division 0, Section 007213, Article 4.0 "Changes in the Work" for Change Order requirements.

1.3 REQUESTS FOR INFORMATION

- A. In the event that the Contractor or Subcontractor, at any tier, determines that some portion of the Drawings, Specifications, or other Contract Documents requires clarification or interpretation, the Contractor shall submit a "Request for Information" (RFI) in writing to the Designer. A RFI may only be submitted by the Contractor and shall only be submitted on the RFI forms provided by the Owner. The Contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed. In the RFI, the Contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.
- B. Responses to RFI shall be issued within ten (10) working days of receipt of the Request from the Contractor unless the Designer determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Designer, the Designer will, within five (5) working days of receipt of the request, notify the Contractor of the anticipated response time. If the Contractor submits a RFI on a time sensitive activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Designer to respond to the request provided that the Designer responds within the ten (10) working days set forth above.
- C. Responses from the Designer will not change any requirement of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change to the requirements of the Contract Document, the Contractor shall give written notice to the Designer requesting a Change Order for the work. Failure to give such written notice within ten (10) working days, shall waive the Contractor's right to seek additional time or cost under Article 4, "Changes in the Work" of the General Conditions.

1.4 MINOR CHANGES IN THE WORK

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

1.5 PROPOSAL REQUESTS

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

1.6 CHANGE ORDER PROCEDURES

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 013100 – COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 COORDINATION

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

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

- C. Prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate Contractors if coordination of their Work is required.

- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other Contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Startup and adjustment of systems.
 - 8. Project Closeout activities.

- E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

- B. Key Personnel Names: Within fifteen (15) work days of starting construction operations, submit a list of key personnel assignments including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
 - 1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 PROJECT MEETINGS

- A. The Owner's Construction Representative will schedule a Pre-Construction Meeting prior to beginning of construction. The date, time, and exact place of this meeting will be determined after Contract Award and notification of all interested parties. The

Contractor shall arrange to have the Job Superintendent and all prime Subcontractors present at the meeting. During the Pre-Construction Meeting, the construction procedures and information necessary for submitting payment requests will be discussed and materials distributed along with any other pertinent information.

1. Minutes: Designer will record and distribute meeting minutes.
- B. Progress Meetings: The Owner's Construction Representative will conduct Monthly Progress Meetings as stated in Articles 1.8.B and 1.8.C of Section 007213 "General Conditions".
1. Minutes: Designer will record and distribute to Contractor the meeting minutes.
- C. Preinstallation Conferences: Contractor shall conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of Manufacturers and Fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer and Construction Representative of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration including requirements for the following:
 - a. Contract Documents
 - b. Options
 - c. Related RFIs
 - d. Related Change Orders
 - e. Purchases
 - f. Deliveries
 - g. Submittals
 - h. Review of mockups
 - i. Possible conflicts
 - j. Compatibility problems
 - k. Time schedules
 - l. Weather limitations
 - m. Manufacturer's written recommendations
 - n. Warranty requirements
 - o. Compatibility of materials
 - p. Acceptability of substrates
 - q. Temporary facilities and controls
 - r. Space and access limitations
 - s. Regulations of authorities having jurisdiction
 - t. Testing and inspecting requirements

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013115 – PROJECT MANAGEMENT COMMUNICATIONS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

ITEMS IN THE DATABASE! Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).

- G. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using E-Builder® to send messages. Communication functions are as follows:
1. Document Integrity and Revisions:
 - a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
 - b. The system shall make it easy to identify revised or superseded documents and their predecessors.
 - c. Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
 2. Document Security:
 - a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties communication except for Administrative Users. **DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!**
 3. Document Integration:
 - a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
 4. Reporting:
 - a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
 5. Notifications and Distribution:
 - a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.

6. Required Document Types:
 - a. RFI, Request for Information.
 - b. Submittals, including record numbering by drawing and specification section.
 - c. Transmittals, including record of documents and materials delivered in hard copy.
 - d. Meeting Minutes.
 - e. Application for Payments (Draft or Pencil).
 - f. Review Comments.
 - g. Field Reports.
 - h. Construction Photographs.
 - i. Drawings.
 - j. Supplemental Sketches.
 - k. Schedules.
 - l. Specifications.
 - m. Request for Proposals
 - n. Designer's Supplemental Instructions
 - o. Punch Lists

- H. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents shall be submitted by transmission in electronic form to the E-Builder® web site by licensed users.
 - a. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier shall respond to documents received in electronic form on the web site, and consider them as if received in paper document form.
 - b. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.
 - c. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.

- I. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager and his

representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:

1. Providing suitable computer systems for each licensed user at the users normal work location¹ with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
2. Each of the above referenced computer systems shall have the following minimum system² and software requirements:
 - a. Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)
 - 1) Operating System: Windows XP or newer
 - 2) Internet Browser: Internet Explorer 6.01SP2+ (Recommend IE7.0+)
 - 3) Minimum Recommend Connection Speed: 256K or above
 - 4) Processor Speed: 1 Gigahertz and above
 - 5) RAM: 512 mb
 - 6) Operating system and software shall be properly licensed.
 - 7) Internet Explorer version 7 (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.
 - 8) Adobe Acrobat Reader (current version is a free distribution for download).
 - 9) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 013115

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

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

SECTION 013200 – SCHEDULE – BAR CHART

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS – (Not Applicable)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

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

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

3.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE

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

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

3.3 SCHEDULE OF SUBMITTALS

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

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

3.4 SCHEDULE OF INSPECTIONS AND TESTS

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

END OF SECTION 013200

SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 SUBMITTAL PROCEDURES

- A. The Contractor shall comply with the General and Supplementary Conditions and other applicable sections of the Contract Documents. The Contractor shall submit, with such promptness as to cause no delay in his work or in that of any other contractors, all required submittals indicated in Part 3.1 of this section and elsewhere in the Contract Documents. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

- B. Each drawing and/or series of drawings submitted must be accompanied by a letter of transmittal giving a list of the titles and numbers of the drawings. Each series shall be numbered consecutively for ready reference and each drawing shall be marked with the following information:
 - 1. Date of Submission
 - 2. Name of Project
 - 3. Location
 - 4. Section Number of Specification
 - 5. State Project Number
 - 6. Name of Submitting Contractor
 - 7. Name of Subcontractor
 - 8. Indicate if Item is submitted as specified or as a substitution

1.4 SHOP DRAWINGS

- A. Comply with the General Conditions, Article 3.2.

- B. The Contractor shall submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

- C. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings including the following information:
 - 1. Dimensions
 - 2. Identification of products and materials included by sheet and detail number
 - 3. Compliance with specified standards
 - 4. Notation of coordination requirements

5. Notation of dimensions established by field measurement
6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8½"x11" but no larger than 36"x48".

1.5 PRODUCT DATA

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

1.6 SAMPLES

- A. The Contractor shall comply with the General Conditions, Article 3.2.
- B. The Contractor shall submit full-size, fully fabricated samples, cured and finished as specified, and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
 1. The Contractor shall mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Designer's sample including the following:
 - a. Specification Section number and reference
 - b. Generic description of the Sample
 - c. Sample source
 - d. Product name or name of the Manufacturer
 - e. Compliance with recognized standards
 - f. Availability and delivery time
 2. The Contractor shall submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

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

1.7 QUALITY ASSURANCE DOCUMENTS

- A. The Contractor shall comply with the General Conditions, Article 3.2
- B. The Contractor shall submit quality control submittals including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.
- C. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the Manufacturer certifying compliance with specified requirements.
 1. Signature: Certification shall be signed by an officer of the Manufacturer or other individual authorized to contractually bind the Company.
- D. Inspection and Test Reports: The Contractor shall submit the required inspection and test reports from independent testing agencies as specified in this Section and in other Sections of the Contract Documents.
- E. Construction Photographs: The Contractor shall submit record construction photographs as specified in this Section and in other Sections of the Contract Documents.
 1. The Contractor shall submit digital photographs. The Construction Administrator shall determine the quantity and naming convention at the preconstruction meeting.
 2. The Contractor shall identify each photograph with project name, location, number, date, time, and orientation.
 3. The Contractor shall submit progress photographs monthly unless specified otherwise. Photographs shall be taken one (1) week prior to submitting.
 4. The Contractor shall take four (4) site photographs from differing directions and a minimum of five (5) interior photographs indicating the relative progress of the Work.

1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REQUIRED SUBMITTALS

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

SECTION	DESCRIPTION	TYPE OF SUBMITTAL												
		Schedule of Submittals	Shop Drawings	Product Data	Sample	Certifications	Manufacturer' s Instructions	Test report	Inspection Report	Wiring Diagrams	Record Photographs	Maintenance Data	Operating Instruction	Warranty
013200	Construction Schedule	X												
013200	Schedule of Values	X												
013200	Schedule of Subcontracts	X												
013200	Major Material Suppliers	X												
015713	Temporary Erosion Control			X										
033000	Cast-In-Place Concrete			X		X								
071113	Bituminous Dampproofing			X		X								
079200	Joint Sealants			X	X	X								
099000	Painting and Coating			X	X	X	X							X
133423	Fiberglass Reinforced Building		X	X			X							
260720	Electrical Supports			X			X							
260750	Electrical Identification			X			X							
261200	Conductors and Cables			X			X							
261300	Raceways and Boxes			X			X							
262500	Emergency Standby Generator			X			X					X	X	
264410	Switchboards		X	X			X			X				
264420	Panelboards			X			X							
310000	Earthwork			X	X			X						
311000	Site Clearing		X							X				
321123	Aggregate Base Courses					X		X						
321216	Asphalting		X	X	X	X		X						
321313	Concrete Paving			X	X	X		X						
329200	Turf and Grasses			X	X	X	X	X						
330516	Utility Structures	X		X			X							
330523	Trenches Utility Installation		X											
330523.16	Utility Pipe Jacking		X											

331000	Water Utilities		X	X				X				X		
331122	Installation of Trace Wire			X			X							
333000	Sanitary Sewerage Utilities	X	X	X				X						
333122	Installation of Trace Wire			X										
333914	Anti-microbial Additives			X		X		X						

END OF SECTION 013300

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

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

SECTION 015000 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 SUBMITTALS

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

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

1.4 QUALITY ASSURANCE

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

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

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

2.2 EQUIPMENT

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

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

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.
 - 1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.
 - 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
 - 3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.
 - 4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Designer. Neither the Owner nor Designer will accept cost or use charges as a basis of claims for Change Order.

- B. Temporary Water Service: The Owner will provide water for construction purposes from the existing building system. All required temporary extensions shall be provided and removed by the Contractor. Connection points and methods of connection shall be designated and approved by the Construction Representative.
- C. Temporary Electric Power Service: The Owner will provide electric power for construction lighting and power tools. Contractors using such services shall pay all costs of temporary services, circuits, outlet, extensions, etc.
- D. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.
 - 1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.
- E. 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.
- F. 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.
- G. Provide cell phone service throughout the construction period for all personnel engaged in construction activities.
 - 1. At project office and at each construction area, post a list of important and emergency telephone numbers.
- H. Temporary Toilets: Install self-contained toilet units. Use of pit-type privies will not be permitted. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.
 - 1. Shield toilets to ensure privacy.
 - 2. Provide separate facilities for male and female personnel.
 - 3. Provide toilet tissue materials for each facility.
- I. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a health and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

1. Provide paper towels or similar disposable materials for each facility.
 2. Provide covered waste containers for used material.
 3. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.
- J. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled-water drinking-water units, including paper supply.
1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45°F to 55°F (7°C to 13°C).
- K. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.
1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings.
- C. Storage Facilities: Limited areas for storage of building materials are available onsite. Available storage areas are shown on the drawings. The Contractor shall provide his own security. Specific locations for storage and craning operations will be discussed at the Pre-Bid Meeting and the Pre-Construction Meeting.
- 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.
 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.
 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. Rodent Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Designer.
- B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonable predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations”.
 - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each usable stairwell.
 - 2. Store combustible materials in containers in fire-safe locations.
 - 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
 - 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- C. Permanent Fire Protection: At the earliest feasible date in each area of the Project complete installation of the permanent fire-protection facility including connected services and place into operation and use. Instruct key personnel on use of facilities.
- D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting including flashing red or amber lights.
- E. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
 - 1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.
 - 2. Provide plywood fence, 8’ (2.5m) high, framed with (4) 2”x4” (50mm x 100mm) rails, and preservative-treated wood posts spaced not more than 8’ (2.5m) apart.
- F. Covered Walkway: Erect a structurally adequate, protective covered walkway for passage of persons along the adjacent public street. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

1. Construct covered walkways using scaffold or shoring framing. Provide wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage. Extend the back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner and the Designer.
- G. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
1. Storage: Where materials and equipment must be stored and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- H. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the Designer requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
 2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances as required by the governing authority.

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

END OF SECTION 015000

SECTION 015713 – TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. This item shall consist of temporary control measures during the life of the construction contract to control air pollution, soil erosion, and siltation through the use of berms, dikes, dams, sediment basins, fiber mats, gravel mulches, grasses, slope drains, and other erosion control devices or methods.
- B. The Contractor is responsible for controlling erosion and discharge of sediment from the site at all times during construction. The Contractor shall provide necessary measures during all phases of his/her operations regardless of whether they are specifically noted on the Drawings and shall maintain and replace controls as necessary during the course of his/her operations.
- C. The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.
- D. Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.
- E. The Contractor shall clean streets both interior and adjacent to the site as needed after each rainfall, and at the end of construction.
- F. The Contractor is responsible for cleaning silt from storm drains prior to approval of construction.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials shall meet commercial grade standards and shall be approved by the Engineer before being incorporated into the project.
- B. Grass. Grass which will not compete with the grasses sown later for permanent cover shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover.
- C. Mulches. Mulches may be hay, straw fiber mats, netting, bark, wood chips, or other suitable material reasonably clean and free of noxious weeds and deleterious materials.
- D. Fertilizer. Fertilizer shall be a standard commercial grade and shall conform to all Federal and state regulations and to the standards of the Association of Official Agricultural Chemists.
- E. Slope Drains. Slope drains may be constructed of pipe, fiber mats, rubble, Portland cement concrete, bituminous concrete, or other materials that will adequately control erosion.

PART 3 - EXECUTION

3.01 GENERAL

- A. In the event of a conflict between these requirements and pollution control laws, rules, or regulations of other Federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.
- B. The Contractor shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

3.02 SCHEDULE

- A. Prior to the start of construction, the Contractor shall submit schedules for accomplishment of temporary and permanent erosion control work, as are applicable for clearing and grubbing; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the Engineer.
- B. Temporary construction entrance(s) and silt fences, straw bale dikes, or other initial sediment controls shown on the Drawings must be installed prior to any other work.
- C. Sediment basins must be installed within 10 calendar days after construction begins or as soon as 2 or more acres are disturbed, whichever comes first.

3.03 METHODS

- A. Several methods of controlling dust and other pollutants include, but are not limited to, the following:
 - 1. Exposing the minimum area of erodible earth.
 - 2. Applying temporary mulch with or without seeding.
 - 3. Using water sprinkler trucks.
 - 4. Using covered haul trucks.
 - 5. Using dust palliatives or penetration asphalt on haul roads.
 - 6. Using plastic sheet coverings.
 - 7. Using gravel.

3.04 AUTHORITY OF ENGINEER

- A. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, to limit the surface area of erodible earth material exposed by excavation, borrow and fill operations, and to direct the Contractor to provide immediate permanent or temporary erosion control measures to minimize loss of soil due to erosion and contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water empoundment.

3.05 CONSTRUCTION DETAILS

- A. Prior to clearing and grubbing operations for the project, Contractor shall identify all areas where the potential for loss of soil from the construction area due to erosion exists. The Contractor shall be responsible for installation of applicable erosion controls in these areas whether they are shown on the construction plans or not. The erosion controls shall be maintained throughout the construction period and removed when the permanent ground covering is established. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practical time as outlined in the accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.
- B. When erosion is likely to be a problem, clearing and grubbing operations should be scheduled and performed so that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, temporary erosion control measures may be required between successive construction stages.
- C. The Engineer will limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.
- D. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as part of the work as scheduled or are ordered by the Engineer, such work shall be performed by the Contractor at his/her own expense.
- E. The Engineer may increase or decrease the area of erodible earth material to be exposed at one time as determined by analysis of project conditions.

END OF SECTION 015713

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

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

3. Maintain the site in a neat and orderly condition at all times.

C. Structures

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

3.2 FINAL CLEANING

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

obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

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

END OF SECTION 017400

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 INFORMATIONAL SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

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

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

1.5 QUALITY ASSURANCE

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

1.6 COORDINATION

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

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

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

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

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

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTRUCTION

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

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

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

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

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

END OF SECTION 017900

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

1.02 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Form materials and form-release agents.
 - 3. Steel reinforcement and reinforcement accessories.
 - 4. Fiber reinforcement.
 - 5. Admixtures.
 - 6. Waterstops.
 - 7. Curing materials.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Epoxy joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

- B. **Manufacturer Qualifications:** A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. **Testing Agency Qualifications:** An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. **Source Limitations:** Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- E. **ACI Publications:** Comply with the following, unless more stringent provisions are indicated:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
 - 3. Before submitting design mixes, review concrete mix design and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixes.
 - c. Ready-mix concrete producer.
 - d. Concrete subcontractor.

1.04 DELIVERY, STORAGE, AND HANDLING

Deliver, store, and handle steel reinforcement to prevent bending and damage.

- A. Avoid damaging coatings on steel reinforcement.
- B. Repair damaged epoxy coatings on steel reinforcement according to ASTM D 3963.

PART 2 - PRODUCTS

2.01 FORM-FACING MATERIALS

- A. **Smooth-Formed Finished Concrete:** Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints. Plywood, metal or other approved panel materials.
- B. **Rough-Formed Finished Concrete:** Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. **Forms for Cylindrical Columns, Pedestals, and Supports:** Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt

irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

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

2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Epoxy-Coated Reinforcing Bars: ASTM A 775, and Steel Reinforcement: ASTM A 615, Grade 60, deformed.
- C. Steel Bar Mats: ASTM A 184, assembled with clips. Steel Reinforcement: ASTM A 615, Grade 60, deformed bars.
- D. Plain-Steel Wire: ASTM A 82, as drawn.
- E. Deformed-Steel Wire: ASTM A 496.
- F. Epoxy-Coated Wire: ASTM A 884, Class A coated, plain-steel wire.
- G. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- H. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- I. Epoxy-Coated Welded Wire Fabric: ASTM A 884, Class A, plain steel.

2.03 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete 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 or CRSI Class 2 stainless-steel bar supports.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615, Grade 60. Cut bars true to length with ends square and free of burrs.
- C. Epoxy-Coated Joint Dowel Bars: ASTM A 775; with ASTM A 615, Grade 60, plain-steel bars.
- D. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775.

2.04 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
- B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
 - 1. Class: Severe weathering region, but not less than 3S.
 - 2. Nominal Maximum Aggregate Size: 1 inch.
 - 3. Combined Aggregate Gradation: Well graded from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 sieve, and less than 8 percent may be retained on sieves finer than No. 50.
- C. Lightweight Aggregate: ASTM C 330 with nominal Maximum Aggregate Size of 1 inch.
- D. Water: Potable and complying with ASTM C 94.

2.05 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.

- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

2.06 FIBER REINFORCEMENT

- A. Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.
- B. Products: Subject to compliance with requirements, provide one of the following Monofilament Fibers:
 - 1. Fibrasol IIP; Axim Concrete Technologies.
 - 2. Fiberstrand 100; Euclid Chemical Co.
 - 3. Fibermix Stealth; Fibermesh, Div. of Synthetic Industries.
 - 4. Forta Mono; Forta Corporation.
 - 5. Grace MicroFiber; W. R. Grace & Co., Construction Products Div.
 - 6. Hi-Tech PPM Fiber; Hi-Tech Fibers, Div. of Martin Color-Fi, Inc.
 - 7. Polystrand 1000; Metalcrete Industries.

2.07 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes. As indicated in Profile.
- B. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes. As indicated in Profile.
- C. Manufacturers: Subject to compliance with requirements, provide products by one of the following rubber waterstops:
 - 1. Rubber Waterstops:
 - a. Greenstreak.
 - b. Progress Unlimited Inc.
 - c. Wstec Barrier Technologies; Div. of Western Textile Products, Inc.
 - d. Williams Products, Inc.
 - 2. PVC Waterstops:
 - a. Greenstreak.

- b. Meadows: W. R. Meadows, Inc.
 - c. Murphy: Paul Murphy Plastics Co.
 - d. Progress Unlimited Inc.
 - e. Sternson Group.
 - f. Tamms Industries Co.; Div. of LaPorte Construction Chemicals North America, Inc.
 - g. Vinylex Corporation.
 - h. Westec Barrier Technologies; Div. of Western Textile Products, Inc.
- D. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophylic material for adhesive bonding to concrete. Products are subject to comply with requirements. Provide one of the following:
- 1. Volclay Waterstop-RX; Colloid Environmental Technologies Co.
 - 2. Conseal CS-231; Concrete Sealants Inc.
 - 3. Swellseal Joint; De Neef Construction Chemicals (U.S.) Inc.
 - 4. Hydrotite; Greenstreak.
 - 5. Mirastop; Mirafi Moisture Protection, Div. of Royal Ten Cate (USA), Inc.
 - 6. Adeka Ultra Seal; Mitsubishi International Corporation.
 - 7. Superstop; Progress Unlimited Inc.

2.08 VAPOR RETARDERS

- A. Vapor Retarder: ASTM E 1745, Class C, of one of the following materials:
- 1. Polyethylene sheet, ASTM D 4397, not less than 10 mils thick:
 - 2. Nonwoven, polyester-reinforced, polyethylene coated sheet; 10 mils thick.
- B. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a No. 4 sieve and 10 to 30 percent passing a No. 100 sieve; meeting deleterious substance limits of ASTM C 33 for fine aggregates.
- C. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

2.09 CURING MATERIALS

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

- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Solvent-Borne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.10 RELATED MATERIALS

- A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Epoxy Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- C. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
 - 2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 - 3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.11 CONCRETE MIXES

- A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 - 2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.
- C. Proportion normal-weight concrete mix as follows:
 - 1. Compressive Strength (28 Days): 4000 psi.
 - 2. Maximum Slump: 4 inches.
 - 3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches after admixture is added to concrete with 2- to 4-inch

slump.

4. Minimum Cementitious Materials Content: 540 lb/cu. yd.
- D. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.
- E. Maximum Water-Cementitious Materials Ratio: 0.40.
- F. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated. Air content is to be 6 percent.
- G. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.
- H. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- I. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd.
- J. Admixtures: Use admixtures according to manufacturers written instructions.
 1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.12 FABRICATING REINFORCEMENT

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

2.13 CONCRETE MIXING

Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

PART 3 - EXECUTION

3.01 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch.
 - 2. Class B, 1/4 inch.
 - 3. Class C, 1/2 inch.
 - 4. Class D, 1 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

- A. Install anchor bolts, accurately located, to elevations required.
- B. Install reglets to receive top edge of foundation sheet 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.

- C. Install dovetail anchor slots in concrete structures as indicated.

3.03 REMOVING AND REUSING FORMS

- A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.
- B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
 - 1. At least 70 percent of 28-day design compressive strength.
 - 2. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.
 - 3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.04 SHORES AND RESHORES

- A. Comply with ACI 318, ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.05 VAPOR RETARDERS

- A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.
- B. Fine-Graded Granular Material: Cover vapor retarder with fine-graded granular material, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.
- C. Granular Fill: Cover vapor retarder with granular fill, moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch. Place and

compact a 1/2-inch- thick layer of fine-graded granular material over granular fill.

3.06 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
- F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963.

3.07 JOINTS

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

or partially hardened concrete surfaces.

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

3.08 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints as indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's written instructions.

3.09 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Engineer.
- C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit

concrete to avoid segregation.

- D. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Limit dropping height of concrete in forms to 60 inches or less. Place each layer while preceding layer is still plastic, to avoid cold joints.
1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Maintain reinforcement in position on chairs during concrete placement.
 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 4. Slope surfaces uniformly to drains where required.
 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When 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. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R 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 to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch in height. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
- C. Rubbed Finish: Apply the following to smooth-formed finished concrete: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate

concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.
 2. Finish and measure surface so gap at any point between concrete surface and an unlevelled freestanding 10-foot- long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/4 inch.
- E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.
- G. Slip-Resistive Aggregate Finish: Before final floating, apply slip-resistive aggregate finish where indicated and to concrete stair treads, platforms, and ramps. Apply according to manufacturer's written instructions and as follows:
1. Uniformly spread 25 lb/100 sq. ft. of dampened slip-resistive aggregate over surface in one or two applications. Tamp aggregate flush with surface, but do not force below surface.
 2. After broadcasting and tamping, apply float finish.
 3. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose slip-resistive aggregate.

3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-

finish concrete surfaces.

3.13 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing by one or a combination of the following methods:
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.14 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid epoxy joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed-formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 6. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.16 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- 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. or fraction thereof of each concrete mix placed each day. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, 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; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31; cast and laboratory cure one set of four standard cylinder specimens for each composite sample. Cast and field cure one set of four standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39; test two laboratory-cured specimens at 7 days and two at 28 days.
 - a. Test two field-cured specimens at 7 days and two at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.
- C. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- D. Strength of each concrete mix 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.
- E. Test results shall be reported in writing to Engineer, concrete manufacturer, and Owner 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 mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
- F. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.
- G. 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 Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Engineer.

END OF SECTION 033000

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Extent of each type of dampproofing work is indicated on drawings and as follows:
 - 1. Manholes, all types and locations.
 - 2. Valve Vaults and Wet Wells.
 - 3. All underground structures or underground portions thereof.
 - 4. Similar work used as exposed finish is excluded by definition and, if required, is specified as waterproofing, vapor barrier, roofing, flooring, special coating or other appropriate category.
- B. This Section includes the following:
 - 1. Cold-applied, cut-back asphalt dampproofing.

1.02 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: Submit manufacturer's technical product data, installation instructions, and recommendations for each dampproofing material required. Include data substantiating that materials comply with requirements.
- C. Certifications: Submit manufacturer's certification in writing that the product is suitable for the application specified. Certification letter shall state the required application rate to dampproof the indicated structures.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed bituminous dampproofing similar in material, design, and extent to that indicated for this Project and with a record (not less than three years) of successful in-service performance. The Installer must be acceptable to manufacturer of primary materials.
- B. Single-Source Responsibility: Obtain primary dampproofing materials and primers from one source and by a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.

1.04 PROJECT CONDITIONS

- A. Substrate: Proceed with dampproofing only after substrate construction and penetrating work have been completed.
- B. Weather Limitations: Proceed with dampproofing only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements.

- C. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

PART 2 - PRODUCTS

2.01 BITUMINOUS DAMPPROOFING MATERIALS (BIT-DP)

- A. General: Provide bituminous dampproofing materials that comply with the following requirements or provide other similar products that are certified in writing by manufacturer of primary dampproofing materials to be superior in performance for application indicated.
- B. Manufacturer: Subject to compliance with requirements, provide coal-tar products of one of the following:
 - 1. Koppers Company, Inc.
 - 2. GAF Corporation
 - 3. Gardner-Gibson (ICP Group)
 - 4. Or approved equal

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine Substrate and conditions under which dampproofing work is to be performed and notify Contractor in writing of unsatisfactory conditions. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 PREPARATION

- A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.
- B. Install cant strips and similar accessories as shown and as recommended by prime materials manufacturer even though not shown.
- C. Fill voids, seal joints, and apply bond breakers, if any, as recommended by prime materials manufacturer, with particular attention at construction joints.
- D. Install separate flashings and corner protection stripping, as recommended by prime materials manufacturer, where indicated to precede application of dampproofing. Comply with details shown and with manufacturer's recommendations. Pay particular attention to requirements at building expansion joints, if any.
- E. Prime substrate as recommended by prime materials manufacturer.
- F. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work by masking or otherwise protecting adjoining work.

3.03 INSTALLATION

- A. Comply with manufacturer's recommendations except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of work.
- B. Cold Bitumen on Exterior Surfaces:
 - 1. Apply a coat of cold, semi-fibrated, semi-mastic asphalt dampproofing material, by brushing or spraying at rate certified by manufacturer to produce uniform dry film thickness of not less than 30 mils.
- C. Dampproof Protection Course:
 - 1. General: Where indicated, install protection course of type indicated, over completed-and-cured dampproofing treatment. Comply with dampproofing materials manufacturer's recommendations for method of support or attachment of protection materials. Support with spot-application of plastic cement where not otherwise indicated.

END OF SECTION 071113

SECTION 079200 - JOINT SEALANTS

PART I - GENERAL

1.01 DESCRIPTION OF WORK

- A. The extent of each form and type of joint sealer is indicated on drawings and by provisions of this section.
- B. The applications for joint sealers as work of this section include the following:
 - 1. Pavement and sidewalk joints.
 - 2. Concrete construction joints where indicated on the drawings.
 - 3. Concrete and masonry control joints.
 - 4. Door frames to masonry joints.
 - 5. Floor joints (interior).
 - 6. Wall joints (exterior).
 - 7. Flashing and coping joints.
 - 8. Gasketing of assemblies.

1.02 SYSTEM PERFORMANCES

- A. Provide joint sealers that have been produced and installed to establish and maintain watertight and airtight continuous seals.
- B. Provide joint sealers that have been recommended by the manufacturer for service under the conditions of the particular joint application, including but not limited to exterior exposure, thermal or other movement, abrasion, or submergence.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each joint sealer product required, including instructions for joint preparation and joint sealer application.
- B. Product Certification: Submit certification in writing by the sealant manufacturer that each sealer product is recommended and suitable for the proposed application. The written certification shall name the sealer product and shall identify the specific structures and locations where the sealer will be installed.
- C. Product Tests: If required by the Engineer, submit certified test reports for elastomeric sealants on aged performances as specified, including hardness, stain resistance, adhesion, cohesion or tensile strength, elongation, low- temperature flexibility, compression set, modulus of elasticity, water absorption, and resistance (aging, weight loss, deterioration) to heat and exposure to ozone and ultraviolet.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multi-component materials.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. General: Manufacturers listed in this article include those known to produce the indicated category of prime joint sealer material, either as a nominally pure generic product or as an equivalent-performance modification thereof or proprietary product.
- B. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - 1. Manufacturers of Elastomeric Sealants (Liquid):
 - a. Dow Corning Corp.; Midland, MI
 - b. General Electric Co.; Waterford, NY
 - c. Gibson-Homans Co.; Waterford, NY
 - d. W.R. Meadows, Inc.; Elgin, IL
 - e. Pecora Corp.; Harleysville, PA
 - f. Sika Chemical Corp.; Lindhurst, NJ
 - g. Sonneborn, A Division of Rexnord; Minneapolis, MN
 - h. Tremco, Inc.; Cleveland, OH
 - i. Woodmont Products Inc.; Huntingdon Valley, PA
 - j. Or approved equal.
 - 2. Manufacturers of Joint Fillers/Sealant Backers:
 - a. Dow Chemical Co.; Midland, MI
 - b. Hercules, Inc.; Middletown, DE
 - c. W.R. Meadows, Inc.; Elgin, IL
 - d. Sonneborn, A Division of Rexnord, Minneapolis, MN
 - e. Woodmont Products, Inc.; Huntingdon Valley, PA
 - f. Or approved equal.

2.02 MATERIALS

- A. General Sealer Requirements: Provide colors indicated or, if not otherwise indicated, as selected by Engineer from manufacturer's standard colors. Select materials for compatibility with joint surfaces and other indicated exposures, and except as otherwise indicated, select modulus of elasticity and hardness or grade recommended by manufacturer for each application indicated. Where exposed to foot traffic, select non-tracking materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealer system.
- B. Elastomeric Sealants:
1. Single-Component Polyurethane Sealant (1Pu-S): Except as otherwise indicated, provide manufacturer's standard, non-modified, one-part, polyurethane-based, air-curing, elastomeric sealant; complying with either ASTM C 920 type S Class 25, or FS TT-S-00230C Class A; self-leveling grade/type where used in joints of surfaces subject to traffic, otherwise non-sag grade/type. For use in all horizontal paving control joints. Bituminous Modification (-Bit): Where joint surfaces contain or are contaminated with bituminous materials, provide manufacturer's modified type sealant that is compatible with joint surfaces (modified with coal tar or asphalt as required).
 2. Single-Component Silicon Rubber Sealant (1SR-S): Except as otherwise indicated, provide manufacturer's standard, non-modified, one-part, silicone-rubber-based, air-curing, non-sag, elastomeric sealant; complying with either ASTM C 920 Type S Class 25 Grade NS, or FS TT-S-001543A Class A Type S Non-sag. For use in all vertical control joints in masonry, flashing and door frames.
- C. Joint Fillers, Pavement Types:
1. Expanded Polyethylene Joint Filler (ExPe-JF): Provide flexible, compressible, closed-cell, polyethylene of not less than 10 psi compression deflection (25%); except provide higher compression deflection strength as may be necessary to withstand installation forces and provide proper support for sealants; surface water absorption of not more than 0.1 lbs. per sq. ft.
 2. Open-Cell Polyurethane Joint Filler (OcPu-JF): Provide flexible, highly compressible, open-cell polyurethane foam of not less than 1.3 lbs. per cu. ft. density and not less than 2 psi compression deflection (25%), with not more than 10% compression set for 25 hours at 50% compression (ASTM D 3574 test methods).
- D. Miscellaneous Materials
1. Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.
 2. Bond Breaker Tape (BB-Tp): Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant- contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.
 3. Sealant Backer Rod (S-BR): Provide compressible rod stock of polyethylene

foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type that will not be deteriorated by sealant application temperature as indicated.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Installer must examine substrates, (joint surfaces) and conditions under which joint sealer work is to be performed, and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 JOINT PREPARATION

- A. Surface Cleaning of Joints:

Clean out joints immediately before installing joint sealers to comply with recommendations of joint sealer manufacturers and the following requirements.

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellants; water; surface dirt and frost.
2. Clean concrete, masonry, unglazed surface of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, acid washing or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealers. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile and other non-porous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealers.

- B. Joint Priming:

1. Prime joint substrates where indicated, or where recommended by sealant manufacturer based on pre-construction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.

- C. Masking Tape:

1. Use masking tape where required to prevent contact of sealant with adjoining

surfaces which 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.

3.03 INSTALLATION

- A. Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.
- B. Set joint filler units at depth or position in joint as indicated to coordinate with other work, including installation of bond breakers, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.
- C. Install sealant backer rod for liquid-applied sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for application indicated.
- D. Install bond breaker tape where indicated and where required by manufacturer's recommendations to ensure that liquid-applied sealants will perform as intended.
- E. Employ only proven installation techniques, which will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.
- F. Install liquid-applied sealants to depths as shown or, if not shown, as recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of beads; (not applicable to sealants in lapped joints).

For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.

For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.

- G. Spillage:
 - 1. Do not allow sealants or compounds to overflow from confines of joints, or to spill onto adjoining work, or to migrate into voids of exposed finishes. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.
- H. Do not overheat or reheat hot-applied sealants; discard (do not use).
- I. Recess exposed edges of gaskets and exposed joint fillers slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from joints.
- J. Bond ends of gaskets together with adhesive or "weld" by other means as recommended by manufacturer to ensure continuous watertight and airtight performance. Miter-cut and bond ends at corners unless molded corner units are provided.

3.04 CURE AND PROTECTION

- A. Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they 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 sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.
- B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.
- C. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability. Advise Contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion. Cure and protect sealants in a manner that will minimize increases in modulus of elasticity and other accelerated aging effects. Replace or restore sealants that are damaged or deteriorated during construction period.

END OF SECTION 079200

SECTION 099000 – PAINTING AND COATING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Coating systems for above grade ductile iron piping.

1.02 RELATED SECTIONS

- A. Section 013300 – Submittals

1.03 REFERENCES

- A. ASTM D 16 - Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
- B. ASTM D 4263 - Indicating Moisture in Concrete by the Plastic Sheet Method.
- C. ASTM F 1869 - Measuring Moisture Vapor Emission Rate of Concrete Subfloor ng Anhydrous Calcium Chloride.
- D. AWWA D 102 - Painting Steel Water Storage Tanks
- E. International Concrete Repair Institute (ICRI) Guideline No. 310.2-1997 (formerly 03732) - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
- F. NACE SP0188 - Standard Recommended Practice, Discontinuity (Holiday) Testing of Protective Coatings.
- G. NAPF 500-03-04 Abrasive Blast Cleaning.
- H. SSPC-SP 1 - Solvent Cleaning.
- I. SPPC-SP 5/NACE 1 - White Metal Blast Cleaning.
- J. SSPC-SP 6/NACE 3 - Commercial Blast Cleaning.
- K. SSPC-SP 10/NACE 2 - Near-White Metal Blast Cleaning.
- L. SSPC-SP 13/NACE 6 - Surface Preparation of Concrete.
- M. SSPC-SP 16 - Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals
- N. SSPC-TU 11 - Inspection of Fluorescent Coating Systems

1.04 DEFINITIONS

- A. Definitions of Painting Terms: ASTM D 16, unless otherwise specified.
- B. Dry Film Thickness (DFT): Thickness of a coat of cured paint measured in mils (1/1000 inch).

1.05 SUBMITTALS

- A. Comply with Section 013300 – Submittals.
- B. Product Data: Submit manufacturer's product data for each coating, including generic description, complete technical data, surface preparation, and application instructions.
- C. Color Samples: Submit manufacturer's color samples showing full range of standard colors.
- D. Manufacturer's Quality Assurance: Submit manufacturer's certification that coatings comply with specified requirements and are suitable for intended application.
- E. Applicator's Quality Assurance: Submit list of a minimum of 5 completed projects of similar size and complexity to this Work. Include for each project:
 - 1. Project name and location.
 - 2. Name of owner.
 - 3. Name of contractor.
 - 4. Name of engineer.
 - 5. Name of coating manufacturer.
 - 6. Approximate area of coatings applied.
 - 7. Date of completion.
- F. Warranty: Submit manufacturer's standard warranty.

1.06 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Specialize in manufacture of coatings with a proven successful experience.
 - 2. Able to demonstrate successful performance on comparable projects.
 - 3. Single Source Responsibility: Coatings and coating application reducers and additives shall be products of a single manufacturer.
- B. Applicator's Qualifications:
 - 1. Experienced in application of specified coatings on projects of similar size and complexity to this Work.
 - 2. Applicator's Personnel: Employ persons trained for application of specified coatings.
- C. Preapplication Meeting: Convene a preapplication meeting two [2] weeks before start of application of coating systems. Require attendance of parties directly affecting work of this section, including Contractor, Engineer, applicator, and manufacturer's

representative. Review the following:

1. Environmental requirements.
2. Protection of surfaces not scheduled to be coated.
3. Surface preparation.
4. Application.
5. Structural Joints Using ASTM A325 or A490 Bolts.
6. Field quality control.
7. Cleaning.
8. Protection of coating systems.
9. One-year inspection.
10. Coordination with other work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying:
 1. Coating or material name.
 2. Manufacturer.
 3. Color name and number.
 4. Batch or lot number.
 5. Date of manufacture.
 6. Mixing and thinning instructions.
- B. Storage:
 1. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions.
 2. Keep containers sealed until ready for use.
 3. Do not use materials beyond manufacturer's shelf life limits.
- C. Handling: Protect materials during handling and application to prevent damage or contamination.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Weather:
 - 1. Air and Surface Temperatures: Prepare surfaces and apply and cure coatings within air and surface temperature range in accordance with manufacturer's instructions.
 - 2. Surface Temperature: Minimum of 5 degrees F (3 degrees C) above dew point.
 - 3. Relative Humidity: Prepare surfaces and apply and cure coatings within relative humidity range in accordance with manufacturer's instructions.
 - 4. Precipitation: Do not prepare surfaces or apply coatings in rain, snow, fog, or mist.
 - 5. Wind: Do not spray coatings if wind velocity is above manufacturer's limit.
- B. Ventilation: Provide ventilation during coating evaporation stage in confined or enclosed areas in accordance with AWWA D 102.
- C. Dust and Contaminants:
 - 1. Schedule coating work to avoid excessive dust and airborne contaminants.
 - 2. Protect work areas from excessive dust and airborne contaminants during coating application and curing.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

- A. Manufacturer:
 - 1. All paint materials selected for coating systems for each type of surface shall be the product of a single manufacturer.
 - 2. The Basis of Design for the paint specified is Sherwin Williams. Other approved equals such as Valspar and Behr are also acceptable and may be approved by the Engineer.
- B. Compatibility:
 - 1. All paint materials and equipment shall be compatible in use; finish coats shall be compatible with prime coats; prime coats shall be compatible with the surface to be coated; all tools and equipment shall be compatible with the coating to be applied.
 - 2. Thinners shall be only those thinners recommended for that purpose by the manufacturer of the material to be thinned.
- C. Colors and glosses:

All colors and glosses shall be as selected by the Owner.

2.02 COATING SYSTEMS FOR DUCTILE OR CAST IRON - PIPE AND VALVES

A. Exterior Exposed – Pipe:

1. System Type: Epoxy*/epoxy/urethane.
2. Surface Preparation: NAPF 500-03-04 with the exception that ALL rust and mold coating be removed. Only tightly adherent annealing oxide may remain.
3. Primer: Macropoxy 646. DFT 3.0 to 5.0 mils.
4. Intermediate Coat: Macropoxy 646. DFT 3.0 to 5.0 mils
5. Finish Coat: Acrolon Ultra or Hi-Solids Polyurethane. DFT 2.0 to 4.0 mils.
6. Total DFT: 8.0 to 14.0 mils.
7. Finish Color: To be chosen by Owner.

* Macropoxy 240, Macropoxy 5500 Primer or Corothane Galvapac Zinc Primer are also acceptable.

8. Stencil Color: Shall be Black

2.03 ACCESSORIES

A. Coating Application Accessories:

1. Accessories required for application of specified coatings in accordance with manufacturer's instructions, including thinners.
2. Products of coating manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- #### **A.**
- Examine areas and conditions under which coating systems are to be applied. Notify Engineer of areas or conditions not acceptable. Do not begin surface preparation or application until unacceptable areas or conditions have been corrected.

3.02 PROTECTION OF SURFACES NOT SCHEDULED TO BE COATED

- #### **A.**
- Protect surrounding areas and surfaces not scheduled to be coated from damage during surface preparation and application of coatings.
- #### **B.**
- Immediately remove coatings that fall on surrounding areas and surfaces not scheduled to be coated.

3.03 SURFACE PREPARATION OF STEEL

- A. Prepare steel surfaces in accordance with manufacturer's instructions.
- B. Fabrication Defects:
 - 1. Correct steel and fabrication defects revealed by surface preparation.
 - 2. Remove weld spatter and slag.
 - 3. Round sharp edges and corners of welds to a smooth contour.
 - 4. Smooth weld undercuts and recesses.
 - 5. Grind down porous welds to pinhole-free metal.
 - 6. Remove weld flux from surface.
- C. Ensure surfaces are dry.
- D. Immersion or Below Grade Surfaces: Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 10/NACE 2. Create a surface profile as specified in Part 2 or as required by the coating manufacturer.
- E. Exterior Exposed or Interior Exposed Surfaces: Remove visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter in accordance with SSPC-SP 6/NACE 3. Create a surface profile as specified in Part 2 or as required by the coating manufacturer.
- F. Abrasive Blast-Cleaned Surfaces: Coat abrasive blast-cleaned surfaces with primer before visible rust forms on surface. Do not leave blast-cleaned surfaces uncoated for more than 8 hours.
- G. Shop Primer: Shop primed steel shall receive a field sweep blast prior to the application of subsequent coats. Prepare shop primer to receive field coat in accordance with manufacturer's instructions. Remove all unknown shop primers and re-prime in accordance with this specification.

3.04 SURFACE PREPARATION OF GALVANIZED STEEL AND NONFERROUS METAL

- A. Prepare galvanized steel and nonferrous metal surfaces in accordance with SSPC-SP 16 and the coating manufacturer's instructions.
- B. Test galvanized surfaces for chromate treatments and remove as required by SSPC-SP 16, or other Engineer approved method.
- C. Ensure surfaces are dry.

3.05 SURFACE PREPARATION OF DUCTILE OR CAST IRON

- A. Prepare ductile or cast iron surfaces in accordance with NAPF 500-03-04 Abrasive Blast Cleaning with the exception that ALL rust and mold coating be removed. Only tightly adhered annealing oxide may remain.

- B. Bituminous coated pipe shall NOT be allowed if field painting is required.
- C. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.

3.06 SURFACE PREPARATION OF PVC

- A. Prepare PVC surfaces in accordance with manufacturer's instructions.
- B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
- C. Scarify PVC surfaces.

3.07 SURFACE PREPARATION OF INSULATED PIPE

- A. Prepare insulated pipe surfaces in accordance with manufacturer's instructions.
- B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.

3.08 SURFACE PREPARATION OF CONCRETE

- A. Interior, Wet Substrate:
 - 1. Prepare concrete surfaces in accordance with manufacturer's instructions, SSPC-SP 13/NACE 6, and ICRI 310.2.
 - 2. Allow concrete to cure for a minimum of 28 days.
 - 3. Test concrete for moisture in accordance with ASTM D 4263 and, if necessary, F 1869.
 - 4. Abrasive blast surface to remove laitance and solid contaminants and to provide clean, sound substrate with uniform anchor profile.
 - 5. Verify that the pH of the cleaned concrete surfaces to be coated is within the range of to 8 to 11. Application of coating materials outside this range will not be permitted without written approval from the Engineer.
 - 6. Fill holes, pits, voids, and cracks with manufacturer approved surfacer.
 - 7. Ensure surfaces are clean, dry, and free of oil, grease, chalk, form release agents, and other contaminants.
- B. Exterior and Interior Dry:
 - 1. Prepare concrete surfaces in accordance with manufacturer's instructions, SSPC-SP 13/NACE 6, and ICRI 310.2.
 - 2. Allow concrete to cure for a minimum of 28 days.
 - 3. Test concrete for moisture in accordance with ASTM D 4263 and, if necessary, F 1869.
 - 4. Level concrete protrusions and mortar spatter.

5. Verify that the pH of the cleaned concrete surfaces to be coated is within the range of to 8 to 11. Application of coating materials outside this range will not be permitted without written approval from the Engineer.
6. Fill hairline cracks less than 1/64 inch (0.4 mm) in accordance with manufacturer's instructions.
7. Prepare cracks wider than 1/64 inch (0.4 mm), moving cracks, gaps, and expansion joints in accordance with manufacturer's instructions.
8. Ensure surfaces are clean, dry, and free of oil, grease, chalk, form release agents, and other contaminants.

3.09 SURFACE PREPARATION OF CONCRETE FLOORS

- A. Prepare concrete surfaces in accordance with manufacturer's instructions, SSPC-SP 13/NACE 6, and ICRI 310.2.
- B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
- C. Allow concrete to cure for a minimum of 28 days before coating.
- D. Test concrete for moisture in accordance with ASTM D 4263 and, if necessary, F 1869.
- E. Verify that the pH of the cleaned concrete surfaces to be coated is within the range of to 8 to 11. Application of coating materials outside this range will not be permitted without written approval from the Engineer.

3.10 SURFACE PREPARATION OF SECONDARY CONTAINMENT

- A. Prepare secondary containment surfaces in accordance with manufacturer's instructions.
- B. Prepare concrete surfaces in accordance with manufacturer's instructions, SSPC-SP 13/NACE 6, and ICRI 310.2.
- C. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
- D. Allow concrete to cure for a minimum of 28 days before coating.
- E. Test concrete for moisture in accordance with ASTM D 4263 and, if necessary, F 1869.
- F. Verify that the pH of the cleaned concrete surfaces to be coated is within the range of to 8 to 11. Application of coating materials outside this range will not be permitted without written approval from the Engineer.

3.11 SURFACE PREPARATION OF POROUS CONCRETE MASONRY UNITS

- A. Prepare porous concrete masonry unit surfaces in accordance with manufacturer's instructions and SSPC-SP 13/NACE 6.
- B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
- C. Allow mortar to cure for a minimum of 28 days before coating.

- D. Level protrusions and mortar spatter.

3.12 SURFACE PREPARATION OF PLASTER

- A. Prepare plaster surfaces in accordance with manufacturer's instructions.
- B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
- C. Allow plaster to cure and dry out for a minimum of 28 days before coating.
- D. Do not coat over plaster containing free water, lime, or other soluble alkaline salts.
- E. Remove plaster nibs and other protrusions.
- F. Patch voids and cracks with approved materials and after dry, sand flush with surface.

3.13 SURFACE PREPARATION OF GYPSUM BOARD

- A. Prepare gypsum board surfaces in accordance with manufacturer's instructions.
- B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, and other contaminants.
- C. Sand joint compound smooth and feather edge.
- D. Avoid heavy sanding of adjacent gypsum board surfaces, which will raise nap of paper covering.
- E. Do not apply putty, patching pencils, caulking, or masking tape to drywall surfaces to be painted.
- F. Lightly scuff-sand tape joints after priming to remove raised paper nap. Do not sand through primer.

3.14 SURFACE PREPARATION OF WOOD

- A. Prepare wood surfaces in accordance with manufacturer's instructions.
- B. Ensure surfaces are clean, dry, and free of oil, grease, dirt, dust, surface deposits of sap or pitch, and other contaminants.
- C. Seal knots and pitch pockets.
- D. Sand rough spots with the grain.
- E. Fill cracks and holes with approved materials after primer is dry. Sand flush with surface when filler is hard.
- F. Lightly sand between coats.

3.15 APPLICATION

- A. Apply coatings in accordance with manufacturer's instructions.
- B. Mix and thin coatings, including multi-component materials, in accordance with

manufacturer's instructions.

- C. Keep containers closed when not in use to avoid contamination.
- D. Do not use mixed coatings beyond pot life limits.
- E. Use application equipment, tools, pressure settings, and techniques in accordance with manufacturer's instructions.
- F. Uniformly apply coatings at spreading rate required to achieve specified DFT.
- G. Apply coatings to be free of film characteristics or defects that would adversely affect performance or appearance of coating systems.
- H. Stripe paint with brush critical locations on steel such as welds, corners, and edges using specified primer. Apply an additional strip coat of the intermediate coating material in immersion areas.
- I. Roll or backroll the first coat of epoxy or block filler applied to concrete or interior block substrates to work the material into the substrate.

3.16 REPAIR

- A. **Materials and Surfaces Not Scheduled To Be Coated:** Repair or replace damaged materials and surfaces not scheduled to be coated.
- B. **Damaged Coatings:** Touch-up or repair damaged coatings. Touch-up of minor damage shall be acceptable where result is not visibly different from adjacent surfaces. Recoat entire surface where touch-up result is visibly different, either in sheen, texture, or color.
- C. **Coating Defects:** Repair in accordance with manufacturer's instructions coatings that exhibit film characteristics or defects that would adversely affect performance or appearance of coating systems.

3.17 FIELD QUALITY CONTROL

- A. **Required Inspections and Documentation:**
 - 1. Verify coatings and other materials are as specified.
 - 2. Verify environmental conditions are as specified.
 - 3. Verify surface preparation and application are as specified.
 - 4. Verify DFT of each coat and total DFT of each coating system are as specified using wet film and dry film gauges. DFT's shall be measured in accordance with SSPC-PA2.
 - 5. **Coating Defects:** Check coatings for film characteristics or defects that would adversely affect performance or appearance of coating systems.
 - a. Check for holidays on interior steel immersion surfaces using holiday detector in accordance with NACE SP0188.

6. Report:
 - a. Prepare inspection reports daily.
 - b. Submit written reports describing inspections made and actions taken to correct nonconforming work.
 - c. Report nonconforming work not corrected.
 - d. Submit copies of report to Engineer and Contractor.
- B. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for surface preparation and application of coating systems.

3.18 CLEANING

- A. Remove temporary coverings and protection of surrounding areas and surfaces.

3.19 PROTECTION OF COATING SYSTEMS

- A. Protect surfaces of coating systems from damage during construction.

3.20 ONE-YEAR INSPECTION

- A. Owner will set date for one-year inspection of coating systems.
- B. Inspection shall be attended by Owner, Contractor, Engineer, and manufacturer's representative.
- C. Repair deficiencies in coating systems as determined by Engineer in accordance with manufacturer's instructions.

END OF SECTION 099000

SECTION 260100 - GENERAL ELECTRICAL REQUIREMENTS

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 shall apply to this Section.

1.2 SPECIFICATION FORM AND DEFINITIONS

- A. These Specifications are abbreviated form and contain incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "shall be", "as noted on the drawings", "according to the drawings", "a", "an", "the" and "all" are intentional. Omitted words and phrases shall be supplied by inference.
- B. When a word such as "proper", "satisfactory", "equivalent", and "as directed" is used, it requires Engineer's review.
- C. "Provide" means furnish and install.
- D. "Working Day" wherever used in these specifications shall mean the normal working days, Monday through Friday, exclusive of Saturday, Sunday and federally observed holidays.
- E. Architect-Engineer hereinafter abbreviated A/E shall mean both the Design Architects and Design Engineers.
- F. Design Engineer, hereinafter abbreviated D/E shall mean the Engineering firm, CJD Engineering, LLC, 2225 West Chesterfield Boulevard, Suite 200, Springfield, Missouri 65807, Telephone (417) 877-1700. Contact person: Allen Davis, adavis@cjd-eng.com.
- G. Equipment and/or materials manufacturer hereinafter abbreviated E/M shall mean the manufacturer of equipment or materials specified or referred to.

1.3 GENERAL EXTENT OF WORK

- A. Provide electrical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of electrical systems. In no case will claims for "Extra Work" be allowed for work about which contractor could have informed himself before bids were taken.
- B. Contractor shall familiarize himself with equipment provided by other Contractors which require electrical connections and controls.
- C. Make required electrical connections to equipment provided under Architectural and Mechanical divisions of this project, except where shown or specified otherwise. All temperature control electrical wiring and connections shall be by Electrical Contractor. Make required internal field wiring modifications indicated on wiring diagrams of factory installed control systems for control sequence specified. These field modifications shall be limited to jumper connections and connection of internal wiring to alternate terminal block lugs. Cost for field modifications requiring re-wiring of factory installed control systems for equipment provided by contractor or contractor shall be included in base bid of each respective Contractor.

- D. Check electrical data and wiring diagrams received from contractor for compliance with project voltages, wiring, controls and protective devices shown on electrical drawings. Promptly bring discrepancies found to attention of A/E for a decision.
- E. To maximum extent possible electrical controls in boiler rooms, equipment rooms, and control rooms shall be grouped in accessible locations and arranged according to function. Where possible use group control panels and combination starters in lieu of individually enclosed devices.

1.4 LOCAL CONDITIONS

- A. Visit site and determine existing local conditions affecting work in contract.
- B. Failure to determine site conditions or nature of existing or new construction will not be considered basis for granting additional compensation.

1.5 CODES, ORDINANCES, RULES AND REGULATIONS

- A. Provide work in accordance with applicable rules, codes, ordinances and regulations of Local, State, and Federal Governments, and other authorities having lawful jurisdiction.
- B. Conform to latest editions and supplements of following codes, standards or recommended practices.
 - 1. Safety Codes
 - a. National Electric Safety Code Handbook H30 - National Bureau of Standards.
 - b. Occupational Safety and Health Standards - Department of Labor.
 - c. Specifications for Making Buildings and Facilities Accessible To, and Usable By, the Physically Handicapped - American National Standards Institute ANSI A117.1.
 - 2. National Fire Codes:
 - a. NFPA No. 70 - National Electric Code, 2014 Edition.
 - b. NFPA No. 76A - Essential Electric Systems, latest edition.
 - c. NFPA No. 101 - Life Safety Code, latest edition.
 - 3. Underwriters Laboratories Inc.:
 - a. UL-508 - Standards for Industrial Control Equipment.
 - b. UL-1 008- Standard for Automatic Transfer Switches.

1.6 ALL MATERIALS, EQUIPMENT AND COMPONENT PARTS OF EQUIPMENT SHALL BEAR UL LABELS WHENEVER SUCH DEVICES ARE LISTED BY UL.

- A. Drawings and specifications indicate minimum construction standard, should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, contractor shall promptly notify A/E in writing before proceeding with work so that necessary changes can be made. However, if contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.
- B. Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to A/E with request for final inspection.

1.7 CONTRACT CHANGES

- A. Changes or deviations from contract, including those for extra or additional work must be submitted in writing for review of A/E. No verbal orders will be recognized.
- B. Changes in the work shall be submitted in accordance with AIA Document A201. General Conditions of the Contract for Construction.
- C. All change proposals shall be itemized indicating separately the costs for materials, labor, restocking charges, freight, bonds, insurance, overhead and profit. All materials shall be listed separately with quantities and individual unit prices. Labor factors shall be from a nationally recognized source with appropriate adjustments.

1.8 LOCATIONS AND INTERFERENCES

- A. Locations of equipment, conduit and other electrical work is indicated diagrammatically by electrical drawings. Layout work from dimensions on Architectural and Structural Drawings. Verify equipment size from manufacturers shop drawings.
- B. Study and become familiar with contract drawings of other trades and in particular general construction drawings and details to obtain necessary information for figuring installation. Cooperate with other workmen and install work to avoid interference with their work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed by A/E prior to installation.
- C. Any conduit, apparatus, appliance or other electrical item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed and if so shown relocated and reconnected without extra cost. Damage to other work caused by contractor, his Sub- Contractor, his workmen or by any cause whatsoever, shall be restored as specified for new work.

1.9 SYSTEMS PERFORMANCE

- A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliance operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.

1.10 WARRANTY

- A. CONTRACTOR warrants to Owner and Architect the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after date of substantial completion of building and acceptance of electrical systems by Owner.
- B. Where manufacturers' warranties expire during the one year warranty period, contractor shall include provisions for extending warranty for the full one year period and shall include cost for warranty extension in his base bid. Where warranty extensions are not available from manufacturer, supplier or installer, contractor shall provide labor, parts and material warranty services equal to the requirements of these specifications and the terms of the manufacturer, supplier and installer warranties.
- C. Contractor warrants to Owner and Architect that on receipt of written notice from either of them within one year warranty period following date of acceptance all defects that have appeared in

materials and/or workmanship, shall be promptly corrected to condition required by contract documents at contractor's expense.

- D. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.
- E. Keep an itemized list of all equipment warranties listing equipment by name, mark, and type along with length and expiration date of each warranty. Submit two copies to A/E with request for final inspection.
- F. If the Architect's specification includes a warranty that exceeds the above warranty requirements the Architect's warranty shall take precedence.

1.11 MATERIALS EQUIPMENT AND SUBSTITUTIONS

- A. The intent of these specifications is to allow ample opportunity for contractor to use his ingenuity and abilities to perform the work to his and Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
- B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
- C. In general these specifications identify required materials and equipment by naming first the manufacturer whose product was used as the basis for the project design and specifications. The manufacturer's product, series, model, catalog and/or identification numbers shall set quality and capacity requirements for comparing the equivalency of other manufacturer's products. Where other manufacturer's names are listed they are considered an approved manufacturer for the product specified, however; the listing of their names implies no prior approval of any product unless specific model or catalog numbers are listed in these specifications or in subsequent addenda. Where other than first named products are used for contractor base bid proposal it shall be his responsibility to determine prior to bid time that his proposed materials and equipment selections are products of approved manufacturers which meet or exceed the specifications and are acceptable to the D/E.
- D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to A/E for review prior to procurement.
- E. Prior to receipt of bids, if contractor wishes to incorporate products other than those named in Specifications in his bid, he shall submit a written request for review of substitutions to D/E not less than seven working days prior to bid date. D/E will review requests and acceptable items will be listed in an addendum issued to principal bidders.
- F. Materials and equipment proposed for substitution shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by A/E whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including E/M's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
- G. In proposing a substitution prior to or subsequent to receipt of bids, include in such proposal cost of altering other elements of Project, including adjustments in mechanical/electrical service

requirements necessary to accommodate such substitution; whether such affected elements be under this contract or under separate contracts.

- H. Within 7 working days after bids are received, apparent low bidder shall submit to A/E for approval three copies of a list of all major items of equipment he intends to provide. As soon as practicable and within 30 working days after award of Contract, contractor shall submit shop drawings for equipment and materials to be incorporated in work for A/E's review. Where 30 working day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.
- I. After execution of Contract, substitution of product brands for those named in Specifications will be considered, only if:
- J. Request is received within thirty days after Contract date and request includes statement showing credit due Owner, if any, if substitution product is used, or
- K. Owner requests consideration be given to substitute brands.

1.12 SHOP DRAWINGS, OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Contractor shall furnish a minimum eight sets of shop drawings of all materials and equipment. A/E will retain four sets.
- B. Where catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fittings, sizes, etc. that are to be provided. Mark each submitted item with applicable section and paragraph numbers of these specifications, or plan sheet number when item does not appear in specifications. Where equipment submitted does not appear in base specifications or specified equivalent, submittals shall be marked with applicable alternate numbers, change order number or letters of authorization. Each submittal shall contain at least two sets of original catalog cuts. Each catalog sheet shall bear E/M's name and address. All shop drawings on materials and equipment listed by UL shall indicate UL approval on submittal.
- C. Contractor shall check all shop drawings to verify that they meet specifications and/or drawings requirements before forwarding submittals to the A/E for their review. All shop drawings submitted to A/E shall bear contractor approval stamp which shall indicate that contractor has reviewed submittals and that they meet specification and/or drawing requirements. contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities physical size in relation to space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All shop drawings not meeting contractor's approval shall be returned to his supplier for resubmittal.
- D. No shop drawing submittals will be considered for review by the A/E without contractor's approval stamp, or that have extensive changes made on the original submittal as a result of contractor's review.
- E. A/E will not be responsible for the cost of returning shop drawing submittals that are submitted to them without contractor's review and approval stamp. A letter will be sent to contractor by either the Architect or Engineer indicating receipt of an improper submittal, contractor shall acknowledge receipt of letter and indicate his plans for pick-up or resubmitting. A/E will hold improper submittals for pick-up by contractor or supplier for 15 working days after date of receipt. If not picked up by the 16th working day, submittals will be disposed of by A/E.

- F. A/E's review of shop drawings will not relieve contractor of responsibility for deviations from drawings and specifications unless such deviations have been specifically approved in writing by Owner of his representative, nor shall it relieve contractor of responsibility for errors in shop drawings. No work shall be fabricated until the A/E's review has been obtained. Any time delay caused by correcting and resubmitting shop drawings will be contractor's responsibility.
- G. Operating and Maintenance Instructions:
1. Submit with shop drawings of equipment, one set of operating and maintenance instructions and parts lists for all items of equipment provided. Instructions shall be prepared by E/M.
 2. Keep in safe place, keys and wrenches furnished with equipment under this contract. Present to Owner and obtain receipt for same upon completion of project.
 3. Prepare complete brochure covering electrical systems and equipment provided under this contract. Submit brochures to A/E for review before delivery to Owner. Contractor at his option may prepare brochure or retain an individual to prepare it for him. Include cost of this service in base bid. Brochures shall contain following:
 4. Certified equipment drawings and/or catalog data with equipment provided clearly marked as outlined under this specification.
 5. One copy each of balance and test reports required and as outlined under this specification.
 6. Complete operating and maintenance instructions for each item of equipment.
 7. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of electrical system.
 8. Provide brochures bound in Wilson Jones No. B3-367-49R or National No. 82-87-684 3" capacity red vinyl guarded three ring binder with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on front cover label of each brochure the following:
 9. Project name and address.
 10. Section of work covered by brochure, i.e. "Electrical".

1.13 RECORD DOCUMENTS

- A. Record Drawings: Maintain a reproducible set of contract drawings and shop drawings in clean, undamaged condition, with mark-up of actual installations which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at corresponding location on working drawings. Mark with red erasable red pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Mark-up new information which is recognized to be of importance to Owner, but was for some reason not shown on either contract drawings or shop drawings. Give particular attention to concealed work, which would be difficult to measure and record at a later

date. Note related change-order numbers where applicable. Organize record drawing sheers into manageable sets, bind with durable paper cover sheets, and prints suitable titles, dates and other identification on cover of each sheet.

- B. Record Specifications: Maintain one copy of specifications, including addenda, change orders, and similar modifications issued in printed form during construction, and mark-up variations (of substance) in actual work in comparison with text of specifications and modifications as issued. Give particular attention to substitutions, selection of option, and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable. upon completion of mark-up submit to Architect/Engineer for Owner's records.
- C. The Contractor shall provide a full set of photographs showing the entire underground equipment. The photographs shall be taken prior to any concrete being poured. The underground equipment shall consist of, but not be limited to, the following:
 - Piping
 - Conduits
 - Ductwork
- D. The Contractor shall provide the photographs in an 8.5" x 11" format for record keeping purposes with the maintenance manuals. The photos shall all be digital and a disk or C.D. shall be provided to the Owner as a permanent record.
- E. As-built documents shall be submitted for approval prior to final payment. Copies of "In-Progress" as-built drawings shall be submitted at each pay request.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

PART 4 - EXHIBITS

4.1 EXHIBIT A

- A. SUBSTITUTION REQUEST FORM following the end of this section.

END OF SECTION 260100

SECTION 260500 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections and section 260100 - General Electrical Requirements shall apply to this Section.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 CIRCUITING

- A. Follow circuiting shown on drawings for lighting, power and equipment connections.

3.2 CUTTING AND PATCHING

- A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Cut no structural members without Architect's approval and in a manner approved by him.
- B. Patching shall be by mechanics of particular trade involved and shall meet approval of Architect.
- C. Drilling and cutting of openings through building materials require Architect's review and approval. Make openings in concrete with concrete hole saw or concrete drill. Do not use star drill or air hammer for this work.

3.3 SLEEVES

- A. Provide proper type and size sleeves for electrical ducts, busses, conduits, etc. passing through building construction. Where sleeves are installed by Others, supervise installation to insure proper sleeve location. Unless indicated or approved, install no sleeves in structural members. Sleeves shall be installed in concrete or masonry walls or floors and where otherwise noted.
- B. Each sleeve shall be continuous through wall floor or roof and shall be cut flush on each side except where indicated otherwise. Sleeves shall not be installed in structural member except where indicated or approved. Sleeves shall be required through floors subject to flooding such as toilet rooms, equipment rooms and kitchens. The contractor shall have the option of:
- C. Providing a cast iron sleeve with integral flanges extending 1 inch above finished floor. Sleeve shall be cast in concrete when floor is poured. Annular space between sleeve and pipe shall be filled with Kaowool.

or
- D. Provide core-drilled opening in concrete with Thunderline Unk-Seal or Calpico Sealing Linx between piping and opening.

- E. Sleeves passing through floors and exterior walls with waterproof membranes shall be core-drilled (floors only) and sealed with Thunderline Link-Seal or Calpico Sealing Linx.
- F. Where electrical ducts, busses, conduits, wiring, etc. passed through fire walls, floors, and smoke partitions seal annular space between sleeve and item passing thru with Kawool Fire Master Bulk Packing. Packing thickness shall be sized per manufacturer's recommendation for maintaining the integrity of the fire wall/floor or smoke partition. Fire protection system shall be rated per ASTM E 119. Equivalents to Kaowool are 3M, Flame Stop, or Flame Safe.
- G. Where piping passes through walls serving as supply or exhaust air plenums or chases, seal annular space between pipe and sleeve air tight with Thunderline Link-Seal or Calpico Sealing Linx.

3.4 MUTILATION

- A. Mutilation of building finishes, caused by installation of electrical equipment, fixtures, outlets and other electrical devices shall be repaired at contractor's expense to approval of Architect.

3.5 EXCAVATION AND BACKFILL

- A. Perform necessary excavating to receive work, provide necessary sheathing, shoring, cribbing, tarpaulins, etc. as required and remove same at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
- B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation of work.
- C. Conduct excavations so no walls or footings are disturbed or injured. Backfill excavations made under or adjacent to footings with selected earth or sand and tamp to compaction required by A/E. Mechanically tamp backfill under concrete and pavings in 6 inch layers to 95% standard density.
- D. Backfill trenches and excavations to required heights with allowance made for settlement. Tamp fill material thoroughly and moistened as required for specified compaction density. Dispose of excess earth, rubble and debris as directed by Architect.
- E. When available refer to test hole information on Architectural drawings or specifications for types of soil to be encountered in excavations. Where rock is indicated, list unit cost for rock excavation in base bid.

3.6 SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

- A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundations and provide proper anchor bolts and isolation as shown or specified. Level, shim, and grout equipment bases as recommended by E/M. Mount motors, align and adjust drive shafts and belts according to E/M's instructions. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by contractor at no cost to Owner.
- B. Provide concrete bases for all floor and slab mounted equipment. Refer to drawings for required base type and size. Provide 3 1/2" high base where base is not shown on drawings.

- C. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best recognized practice. Contractor shall arrange for attachment to building structure, unless otherwise indicated on drawings or specified. Provide hangers with vibration eliminators where required. Contractor shall verify that structural members of building are adequate to support equipment. Submit details of hangers, platforms and supports together with total weights of mounted equipment to A/E for review before proceeding with fabrication or installation.

3.7 PAINTING OF MATERIALS AND EQUIPMENT

- A. Equipment and materials exposed to interior dry environment shall have a minimum of one primer and one finish coat. Equipment and materials mounted in exterior location shall have a minimum of one primer and two coat colors in finish areas shall be selected by A/E.
- B. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
- C. Where extensive refinishing of factory applied finishes are required equipment shall be completely repainted. A/E will make final determination on extent of refinishing required.

3.8 MAINTENANCE OF SYSTEMS

- A. Contractor shall be responsible for operation, maintenance and lubrication of equipment installed under his contract through substantial completion.

3.9 PROTECTION AND CLEANING OF SYSTEMS AND EQUIPMENT

- A. It shall be contractor's responsibility to protect and prevent damage to all electrical materials and equipment stored and/or installed under this contract. All work, materials and equipment shall be adequately protected by any and all means necessary to prevent damage by weather, flooding, condensation, construction debris, fire, and construction equipment and vehicles.
- B. Where job conditions, or work of other contractors produce the potential for damage to electrical systems and equipment, contractor shall immediately notify the G/C so that corrective action can be taken.
- C. Contractor shall take extra precautions to protect electrical equipment containing solid state electronics, open relays, and contacts from damage by water, dust, dirt, construction debris and the formation of condensate. All equipment so damaged shall be replaced by contractor with new equipment at no cost to Owner.
- D. Contractor shall periodically inspect and clean all systems and equipment to insure all systems and equipment remain in like new condition during construction. All cleaning shall be done in accordance with E/M's recommendation where available and applicable.
- E. Before request for final inspection all systems and equipment shall be properly cleaned, vacuumed, polished, painted, etc. as required to return equipment to like new appearance.
- F. All equipment requiring painting or touch-up shall be properly prepared and painted in accordance with this specification.
- G. Contractor shall keep a written record listing systems and equipment cleaned. Where special procedures or chemicals were used or where partial or complete disassembly of factory

assembled equipment was necessary, contractor shall list special procedures and/or disassembly required and equipment components affected. Prior to final inspection contractor shall submit two copies of cleaning record to A/E for their records.

3.10 START-UP, CHANGE-OVER, TRAINING AND OPERATING CHECK

- A. Contractor shall perform initial start-up of systems and equipment. Personnel qualified to start-up and service this equipment, including manufacturers technicians, when specified, and Owner's operating personnel shall be present during these operations.
- B. Contractor shall be responsible for training Owner's operating personnel to operate and maintain systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructor's name, names of Owner's personnel attending and total hours of instruction given each individual.
- C. Contractor shall report in person to Owner's operating Engineer at end of first month of operation and thereafter at end of first month of operation and thereafter at end of sixth and twelfth months after date of substantial completion of building to check operation of equipment that was installed under contract. Contractor shall answer operating personnel's questions regarding system operation and shall ascertain that systems are operating normally and are being properly maintained by Owner. If contractor finds that systems are not being operated and maintained as designed, he shall inform the Building Engineer/Owner and A/E in writing.
- D. After each inspection, contractor shall submit written report to A/E indicating condition of equipment and including any recommended changes in operation of system or other information which will be helpful to Owner.

3.11 PRE-FINAL AND FINAL CONSTRUCTION REVIEW

- A. At contractor's request, A/E will make pre-final construction review to determine if to the best of their knowledge project is completed in accordance with plans and specifications. Items found by A/E as not complete or not in accordance with requirements of contract will be outlined in report to contractor. After completion and/or correction of these items, contractor shall notify Architect he is ready for final review.
- B. At same time of final construction review, contractor and his major sub-contractors shall be present or be represented by a person of authority. Each Contractor shall demonstrate, as directed by A/E, that his work complies with purpose and intent of plans and specifications. Each Contractor shall provide labor, services, instruments, and tools necessary for such demonstrations and tests.

3.12 RECORDING AND REPORTING TESTS AND DATA

- A. Record nameplate horsepower, amperes, volts, phase service factor and other necessary data on motors and other electrical equipment furnished and/or connected under this contract.
- B. Record motor starter catalog number, size and rating and/or catalog number of thermal-overload units installed in all motor starters furnished and/or connected under this contract. See motor starter specification for instructions for proper sizing of thermal-overload units.
- C. Record amperes-per-phase at normal or near-normal loading of each item of equipment furnished and/or connected.

- D. Record correct readings of each feeder conductor after energized and normally loaded, and again after balancing of feeder loads as required by current readings.
- E. Record voltage and amperes-per-phase readings taken at service entrance equipment after completion of project with building operating at normal electrical load. This reading shall be taken continuously for a 24 hour period and recorded on permanent tape and submitted to A/E.
- F. Record voltage and amperes at transformer secondary and primary stations, at normal loading. Record transformer percentage "taps" finally selected. Transformers shall be connected to produce voltage at building service entrance equipment as follows:

Nominal System Voltage	Service Entrance Voltage
460	480
200	208

- G. Submit at least two (2) copies of data noted above to A/E for review prior to final inspection.
- H. Keep a record of all deviations made from routes, locations, circuiting, etc. shown on contract drawings. Prior to final inspection submit one new set of project drawings with all deviations and changes clearly indicated.

END OF SECTION 260500

SECTION 260600 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, section 260100 - General Electrical Requirements, and section 260500 - Basic Electrical Materials and Methods shall apply to this Section.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

- A. Supplement grounded neutral of secondary distribution system with equipment grounding system, installed so that metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items operate continuously at ground potential and provide low impedance path for ground fault currents. System shall comply with National Electrical Code, modified as indicated on drawings as specified.
- B. Provide equipment ground bus in base of low voltage switchgear or switchboard. Braze or otherwise adequately connect ground system to at least three 3/4" diameter by 10'-0" long ground rods. Where extra rods are necessary to meet requirements of specified tests, E/C shall be reimbursed for additional cost. Rods shall be located a minimum of six feet from each other of any other electrode and shall be interconnected by a minimum 3/0 bare copper conductor brazed to each ground rod below grade.
- C. Ground metallic water piping system to electrical service ground with a minimum 3/0 or as required green insulated copper ground conductor, in conduit. Where a dielectric main water fitting is installed, connect ground conductor to building side of dielectric water fittings. Do not install jumper around dielectric water fitting. Bond conduit to ground conductor at each end. Provide 3/0 jumper with ground clamps around water meter.
- D. Provide grounding electrode system as required by the Latest National Electrical Code, Section 250-81 -H.
- E. Connect system neutral ground and equipment ground system to common ground bus.
- F. Ground secondary services at supply side of each individual secondary disconnecting means and at related transformers in accordance with National Electric Code. Provide each service disconnect enclosure with neutral disconnecting means which interconnect with insulated neutral and uninsulated equipment ground sub to establish system common ground point. Neutral disconnecting links shall be located so that low voltage neutral bar with interior secondary neutrals can be isolated from common ground bus and service entrance conductors.
- G. Required equipment grounding conductors and straps shall be sized in compliance with N.E.C. Table 250-95. Equipment grounding conductors shall be provided with green type TW 600 volt insulation. Related feeder and branch circuit grounding conductors shall be connected to ground bus with approved pressure connectors. Provide feeder servicing several panelboards with a continuous grounding conductor connected to each related panelboard ground bus.
- H. Provide low voltage distribution system with a separate green insulated equipment grounding conductor for each single or three-phase feeder, and each branch circuit except as specified

herein. Where more than one branch circuit is installed in a common raceway only one grounding conductor is required. Grounding conductor shall be sized for largest branch circuit overcurrent device serving common raceway.

- I. Single phase 120 volt branch circuits for lighting shall consist of phase, neutral and grounding conductors installed in common metallic conduit. Provide flexible metallic conduit utilized in conjunction with above single phase branch circuits with suitable green insulated grounding conductors. Feeders and branch circuits in non-metallic conduits shall be provided with separate grounding conductor. Install grounding conductor in common conduit with related phase and/or neutral conductors. Where parallel feeders are installed in more than one raceway, each raceway shall have a green insulated equipment grounding conductor.
- J. E/C shall provide equipment grounding bars for termination of equipment grounding conductors in panelboards and other electrical equipment. In addition to active circuits, provide pressure connectors for panel spares and blank spaces.
- K. Provide electrical expansion fitting with an external flexible copper ground securely bonded by approved grounding straps on each end of fitting except where UL approved built-in copper grounding device is provided.
- L. Provide non-metallic conduits or ducts with equipment grounding conductors except for conditions as follows:
 - 1. Where ducts are for telephone or communication uses only.
- M. Connect each cable rack system to equipment grounding system with insulated conductor with size determined by largest power conductor in rack. Minimum size shall be No. 6 and maximum size shall not exceed equivalent capacity of number 4/0 copper conductor. Ground conductor shall be bonded to rack system, enclosed in conduit, and connected to common ground bus.
- N. Provide electric devices such as air cleaners or heaters control switch, etc., installed in air ducts, with insulated equipment ground conductor sized on rating of overcurrent device supplying unit. Bond conductor to each unit, air duct, and to ground in panelboard.
- O. Provide electric immersion type water heater or surface heating cables with insulated equipment ground conductor sized on rating of overall device supplying unit. Bond conductor to water piping at unit and to ground bar in panelboard.
- P. Provide steel and aluminum conduits which terminate without mechanical connection to metallic housing of electrical equipment with ground bushing and connect each bushing with bare copper conductor to ground bus in electrical equipment. Electrically non-continuous metallic conduits containing ground wiring only shall be bonded to ground wire at both conduit entrance and exit.
- Q. Ground and bond exterior mounted light poles, radio and television masts and flag poles with No. 6 or larger bare copper wire connected to 96" long, 3/4" copper clad ground rod driven in ground.
- R. Test complete equipment grounding system to each service disconnect enclosure ground bar with Vibroground test unit manufactured by Associated Research Inc. Resistance, without chemical treatment or other artificial means shall not exceed five (5) ohms to ground. Submit certified test reports of compliance with five (5) ohm value.

END OF SECTION 260600

SECTION 260720 - ELECTRICAL SUPPORTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, section 260100- General Electrical Requirements, and section 260500 - Basic Electrical Materials and Methods shall apply to this Section.

PART 2 - PRODUCTS

2.1 INDIVIDUAL CONDUITS SUSPENDED FROM CEILING SHALL BE SUPPORTED BY STEEL CITY NO. C-1 49 HANGERS.

- A. Provide inserts, hangers and accessories with finish as follows:
- B. Galvanized: Concrete inserts and pipe straps.
- C. Galvanized or Cadmium Plated: Steel bolts, nuts, washers, and screws.
- D. Painted with Prime Coat: Individual hangers, trapeze hangers and rods.
- E. Equivalent hanger and support systems by Binkley, Fee and Mason, Kin-Line or Unistrut.
- F. Inserts shall be Grinnel Figure 279, 281, 282, or 285 or equivalent as required by load and concrete thickness.
- G. Provide beam clamps suitable for structural members and conditions.
- H. Provide 3/8" minimum diameter steel hanger rods galvanized or cadmium-plated finish.
- I. Trapeze hangers shall be Kindorf Series 90 channel with fittings and accessories as required.
- J. Attach each conduit to trapeze hanger with Steel City No. C-1 05 clamps for rigid conduit and Steel City No. C-1 06 clamps for electrical metallic tubing (EMT).

PART 3 - EXECUTION

3.1 ELECTRICAL SUPPORTS:

- A. Support vertical and horizontal conduit runs at intervals not greater than 10 feet, within 3 feet of any bend and at every outlet or junction box. Where plastic conduit is used follow E/M's recommended hanger spacing.
- B. Install multiple runs of conduits as follows:
- C. Where a number of conduits are to be run exposed and parallel, group and support with trapeze hangers.
- D. Fasten hanger rods to structural steel members with suitable beam clamps and to concrete structures with inserts set flush with surface. Install concrete inserts with reinforced rod through opening provided in inserts.

- E. Install clamps for single conduit runs as follows:
- F. Support individual runs by approved pipe straps, secured by toggle bolts on hollow masonry; expansion shields and machine screws or standard preset inserts on concrete or solid masonry; machine screws or bolts on metal surfaces; and wood screws on wood construction. Use of perforated strap not permitted.
- G. Install exposed conduits in damp locations with clamp backs under each conduit clamp to prevent accumulation of moisture around conduits.

END OF SECTION 260720

SECTION 260750 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, section 260100 - General Electrical Requirements, and section 260500 - Basic Electrical Materials and Methods shall apply to this Section.

PART 2 - PRODUCTS

2.1 ELECTRICAL IDENTIFICATION:

- A. Provide identification and warning signs to wiring and equipment as listed in schedule. Signs and tags shall be as follows:
 - TYPE 1: Laminated phenolic plastic with black Gothic-condensed lettering by Seaton or Wilco.
 - TYPE 2: Self-sticking 1/2" wide plastic tape with high gloss surface and embossed lettering by Brady or Dymo.
 - TYPE 3: Self-sticking polyester sign with wording and size conforming to ANSI Standard Z35.1 - 1964 and OSHA 19.0.144iii(2) Specifications, by Brady or as approved.
 - TYPE 4: Self-sticking flexible vinyl with oil resistant adhesive for -20 degrees to 300 degrees F. temperatures by Brady or as approved.
- B. Provide switchboards with Type 1 signs 2-1/2" x 12" indicating switchboards designation and electrical characteristics as noted on drawings. Provide switchboards sections operating at different voltages with Type I sign 2" x 8" indicating electrical characteristics of section. Provide each switchboard device with Type 1 sign 1-1/4" x 5" indicating load served.
- C. Provide distribution panelboards with Type 1 signs 2" x 8" indicating panel designation and electrical characteristics. Provide branch devices with Type 1 sign 1" x 4" indicating load served.
- D. Provide lighting and power panelboards with Type 1 sign 1-1/4" x 6" indicating panel designation, electrical characteristics, and source of power. Source of power indication shall indicate source panel designation and switch or breaker number. Mount inside of panel door on circuit breaker trim flange just below breakers.
- E. Provide disconnect switches, time switches, lighting contactors, motor starters and controllers with Type 1 sign 1-1/4" x 6" indicating equipment served, electrical characteristics, and source of power,
- F. Provide electrical equipment and accessible wiring enclosures operating at voltage above 240 volts with Type 3 Brady No. AE-461 25 warning sign and Brady Style B, 1-1/8" x 4-1/2" voltage marker applied to front door or cover of device or enclosure. Provide large equipment such as transformers and main distribution equipment with Type 3 sign Brady No. AE-46639.
- G. Provide feeders and branch circuit home runs with Type 4 wire marker indicating circuit number and power source. Provide feeders phase identification letter at each terminal point in addition to its circuit number.
- H. Provide Type 2 tape at feeder terminal lugs to switchboards and panelboards. Tape shall indicate conduit size, conductor type and AWG size. Tape shall be located to be easily read with conductors installed.

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 260750

SECTION 261200 - CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, section 260100 - General Electrical Requirements, and section 260500 - Basic Electrical Materials and Methods shall apply to this Section.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Unless noted otherwise conductors referred to are wires and cable. Provide code grade soft annealed copper conductors with specified insulation type in proper colors to conform with color coding specified. Provide conductors No. 8 gauge and larger stranded and conductors No. 10 gauge and smaller may be solid or stranded.
- B. Use no conductors smaller than No. 12 gauge unless specifically called for or approved by D/E. Size wire for 120 volt branch Circuits for 3% maximum voltage drop. Size feeder circuits for 2% maximum voltage drop. Combined voltage drop of feeders and branch circuits shall not exceed 5% maximum.
- C. Provide conductors for listed applications as follows:
 - 1. Lighting and Receptacle Circuits: Type THHN, 600 volt, 90 degree C (194 degrees F) thermoplastic insulated building conductor.
 - 2. Power Circuits and Feeders: Type THHN, 600 volt, 90 degree C (194 degrees F) thermoplastic insulated building conductor.
 - 3. Low Voltage and Line Voltage Conductors Sizes No. 16 and No. 18 AWG: Type TFFN, 600 volt 90 degrees C (194 degrees F) thermoplastic insulated building conductor.
 - 4. Underground Power Circuits and Feeders: Type THHN / TWHN, 600 volt, 75 degree C (167 degrees F) wet rating and 90 degree C (194 degrees F) dry rated thermosetting filled insulating cable.
- D. Provide conductors by Anaconda, General Cable, General Electric, Phelps Dodge, or equivalent.

2.2 CONDUCTOR COLOR CODING

- A. Provide continuous color coding for feeder, branch and control circuits. Insulation or identification tape color shall be same color for like circuits throughout. Where specified insulation colors are not available in larger wire sizes color code conductor at all accessible locations with Scotch 35 all-weather color code tape.
- B. Identify the same phase conductor with same color throughout.

- C. Provide conductors with color coding indicated. Where more than one standard voltage system is installed provide same colored conductors with indicated tape or stripe to indicate system voltage.

SYSTEM VOLTAGE	CIRCUIT	INSULATION COLOR	STRIPE COLOR
277/480	Neutral	White	Orange
277/480	Phase A	Brown	--
277/480	Phase B	Orange	--
277/480	Phase C	Yellow	--
120/208	Neutral	White	--
120/208	Phase A	Black	--
120/208	Phase B	Blue	--
120/208	Phase C	Red	--
277/480	Switch	Same as Ph. Color	White
120/208	Switch	Same as Ph. Color	White
277/480	3-Way Sw Runner	Purple	Orange
120/208	3-Way Sw Runner	Purple	--
120/208	Control	Pink	--
277/480	Equip. Ground	Green	Yellow
120/208	Equip. Ground	Green	--

PART 3 - EXECUTION

3.1 CONDUCTOR INSTALLATION

- A. Run conductors in conduit continuous between outlets and junction boxes with no splices or taps pulled into conduits.
- B. Neatly route, tie and support conductors terminating at switchboards, motor control centers, panelboards, sound equipment, etc. with Thomas & Betts Ty-Rap cable ties and clamps or equivalent by Electrovert or Panduit.
- C. Make circuit conductor splices with Buchanan B-Cap nylon insulated connectors or equivalent by Ideal or 3M.
- D. Make fixture and device taps with Scotchlock self- stripping electrical tap connectors.
- E. Terminate solid conductors at equipment terminal strips and other similar terminal point with insulated solderless terminal connectors. Terminate all stranded conductor terminal points with insulated solderless terminal connectors. Provide Thomas & Betts Sta-Kon insulated terminals and connectors or equivalent by API/AMP Blackburn, Buchanan or Scotchlock.
- F. Where a total of six or more control and feeder conductors terminates in a multiple device panel or enclosure that has no built-in terminal blocks provide mounting channel and see-thru covers. Equivalent terminal blocks by General Electric, Square "D" or Westinghouse.
- G. Wrap conductor taps and connections requiring additional insulation with a minimum of three overlapped layers of 3 M Scotch vinyl plastic electrical tape No. 88 or equivalent,

END OF SECTION 261200

SECTION 261300 - RACEWAYS AND BOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, section 260100 - General Electrical Requirements, and section 260500 - Basic Electrical Materials and Methods shall apply to this Section.

PART 2 - PRODUCTS

2.1 STEEL CONDUIT

- A. Rigid Conduit: Provide steel conduit meeting current ANSI Standard Specification C80.1 with hot-dipped galvanized and clear lacquer finish.
- B. Electrical Metallic Tubing (EMT): Provide thinwall conduit meeting current ANSI Standard Specification C80.3 with electro-galvanized and clear lacquer finish.
- C. Rigid Conduit and EMT Fittings: Provide Appleton Form 35 non-thread malleable iron unilets. Equivalent by CrouseHinds or Pyle National.
- D. Rigid Conduit Connectors and Couplings: Provide Appleton steel NO-THREAD TYPE, rain and concrete tight. Equivalent by Thomas and Betts or Steel City.
- E. EMT Connectors and Couplings: Provide Appleton steel COMPRESSION THINWALL TYPE, rain and concrete tight. Equivalent by Thomas and Betts or Steel City.
- F. Liquid-Tight Flexible Conduit Fittings: Appleton "STB" series insulated connectors. Equivalent by Pyle-National or Thomas and Betts.
- G. Provide insulated throat fittings when type THHN/THWN conductors are installed.
- H. All wiring shall be in steel conduit unless otherwise noted.
- I. Short runs of flexible galvanized steel conduit may be used where permitted by code. Lengths greater than 6 feet require review by Engineer.
- J. Make conduit connections to motors and equipment mounted on resilient mounts or vibration isolators with Type U.A. liquid-tight flexible conduit manufactured by Anaconda, or "Liquatite" by Electric-Flex Company.
- K. Where conduits cross building expansion joints provide O-Z expansion fitting type "AX", "TE", "EX" or "EXE" as required.
- L. Provide low voltage control systems and sound systems in conduit unless noted otherwise.
- M. Set screw type conduit fittings will not be allowed.

2.2 PLASTIC CONDUIT

- A. Normal duty applications in concrete slabs or underground without concrete encasement. Provide rigid polyvinyl chloride (PVC) type EPC 40 heavy wall plastic conduit meeting current NEMA Standard TC-2. Conduit shall be listed UL 651 for underground and exposed use.
- B. Normal duty exterior underground application direct burial: Provide semi-rigid polyvinyl chloride (PVC) type DB plastic duct meeting current NEMA Standard TC-6 and Western Underground Committee Specifications.
- C. Normal exterior underground application encased burial: Provide semi-rigid polyvinyl chloride (PVC) type A plastic conduit meeting current NEMA and Western Underground Committee Specifications.
- D. Provide matching plastic conduit fittings by E/M. Fittings shall meet the same Standards and specifications as the conduit on which it is installed.
- E. Joining and bending of conduit and installation of fittings shall be done only by methods recommended by E/M.
- F. Provide conduit support spacing as recommended by E/M for the highest ambient temperature expected,
- G. Provide interlocking conduit spacers by E/M or multiple runs of underground conduits installed in same trench.
- H. Ends of feeder conduit terminating at transformers, switchgear, manholes, etc. shall be terminated with bell ends to protect conductor insulation.
- I. Install no plastic conduit in areas where ambient temperature may exceed 150 degrees under normal conditions nor on heat producing equipment such as boilers, incinerators, etc. Install no plastic conduit in a return air or supply air plenum for the HVAC systems.
- J. Provide expansion couplings on conduits located in areas where ambient temperatures are constantly changing and on long runs regardless of ambient temperatures. Determine amount of conduit expansion and contraction from E/M's published charts or tables.
- K. Plastic conduit and fittings shall be by Carlon Products Division of Continental Oil Company.
- L. Plastic conduit shall not be used above grade for any purpose. All transitions from PVC to steel shall be made below grade.

2.3 BUSHINGS AND LOCKNUTS

- A. Enter outlet boxes squarely and securely clamp conduit to outlet box with bushing on inside and locknut on outside. Provide Thomas and Betts #3800 Efcor 56 series or equivalent threaded malleable iron insulated throat grounding bushings.
- B. Terminate metallic conduits at switchboards, panelboards, control cabinet, etc. with O-Z Electrical Manufacturing Company Type "BL" or "IGB" grounding type insulation bushings. Ground bushings to equipment grounding buss.

2.4 OUTLET BOXES

- A. Provide electrical service outlets, including plug receptacles, lamp receptacles, lighting fixtures and switches with Steel City, Raco, or equivalent 4 inch code gauge steel knockout boxes galvanized or sheradized of required depth for service or device.
- B. Provide code gauge galvanized steel raised covers on outlet boxes installed in plaster finish. Set to plaster grounds with outside edge of cover flush with plaster finish.
- C. Provide 3/8" or larger fixture stud in each outlet box scheduled to receive lighting fixture. Select covers with proper opening for device installed in outlet box.
- D. Use of utility or "Handy" boxes acceptable only where single gang flush outlet box in masonry is "dead-end" with only one conduit entering box from end or back.
- E. Use no sectional outlet boxes.
- F. Provide Appleton FS or FD unilets for surface mounted exterior work. Provide complete with proper device cover and gasket. Provide blank cover and gasket when used as junction box.

2.5 PULL BOXES, WIREWAYS AND GUTTERS

- A. Provide Alwalt, Keystone, Universal or equivalent code gauge pull boxes, wireways, and gutters indicated or required for installation, sized to conform with NEC rules. Provide complete with necessary fittings, interconnecting nipples, insulating bushings, conductor supports, covers, gaskets, partitions, etc. as required,
- B. Special items may be fabricated locally, to same general design and specifications as those listed in specified manufacturers catalogs. Provide free of burrs, sharp edges, unreamed holes, sharp pointed screws or bolts, and finished with one coat of suitable enamel inside and out, prior to mounting.
- C. Provide sectional covers for easy removal.

2.6 FLOOR BOXES

- A. On-grade applications: Unless noted otherwise, provide Hubbell System One type S1PFB with sub plates as required for devices and connections required. Provide universal cover finish as selected by architect or owner's representative. Provide furniture feeds if necessary for connection to furniture provided by others. Provide multiple floor boxes if necessary for quantity of devices, conduits or connection types shown on power plan.
- B. Where poke-through floor outlets are shown (above grade applications): unless noted otherwise, provide Hubbell System One S1PT series in exact model to accommodate installation, sub plates as required and cover plate materials as selected by architect.
- C. Prior to ordering, verify compatibility of floor box dimensions and configurations with overall construction.

PART 3 - EXECUTION

3.1 CONDUIT INSTALLATION

- A. Conduit materials, by application, shall be as follows:

1. Exterior above grade feeders service entrances and feeders: Rigid steel. Transition below grade from schedule 40 PVC.
 2. Interior branch circuits and feeders: EMT. Exception: Concealed branch circuits (#8 AWG and smaller) may be Type MC cable.
 3. Underground feeder conduits, service entrance conduits and branch circuit conduits: Schedule 40 PVC. Burial depth shall meet cover requirements of NEC. [Refer to N.E.C. Table 300.5]. PVC conduits shall have 24" burial depth under parking lots, driveways and areas with vehicular traffic.
 4. Feeder and service entrance conduit elbows/bends shall be galvanized steel.
 5. All above grade or above slab conduits shall be metallic.
- B. In general conceal conduit within walls, floors, roof construction or furred spaces. Expose only feeders and short connections to equipment in equipment rooms unless noted otherwise. Install exposed conduit parallel or at right angles to building lines.
- C. Install conduit to requirements of structure, other work on project and clear of openings, depressions, pipes, ducts, reinforcing steel, etc. Install conduit in concrete forms so that strength of structure will not be affected.
- D. Align conduit terminations at panelboard, switchboards, motor control equipment, junction boxes, etc. and install true and plumb. Provide supports or templates to hold conduit alignment during rough-in stage of work.
- E. Install conduit continuous between outlet boxes, cabinets and equipment. Make bends smooth and even without flattening or flaking conduits. Radius of bends shall not be shorter than radius listed in table 346-1 0(b) of NEC. Long radius elbows may be used where necessary.
- F. Ream and clean conduit before installation, and plug or cover openings and boxes to keep conduit clean during construction.
- G. Install no conduits or other raceways sized smaller than permitted in applicable NEC tables. Where conduit sizes shown on drawings are smaller than permitted by code, E/C shall include cost for proper size conduit in his base bid. In no case reduce conduit sizes indicated on drawings or specified without written approval of A/E. Fasten conduit securely in place with approved straps, hangers and steel supports. Provide O-Z cable support to support conductors in vertical raceways as required by NEC Table 300-1 9(a) of NEC. Where special hangers are required, submit hanger details to A/E for review before installation.

3.2 LOCATION OF OUTLET BOXES

- A. Locate outlet boxes generally from column centers and finished wall lines. Install ceiling outlet boxes at suspended ceiling elevations.
- B. Accurately locate lighting fixtures and appliance outlet boxes mounted in concrete or in plaster finish on concrete. Install outlet boxes in forms to dimensions taken from bench marks, columns, walls, or floors. Rough-in lighting fixtures and appliance outlet boxes to general locations before installation of walls and furring and reset to exact dimensions as walls and furring are constructed. Set outlet boxes true to horizontal and vertical finish lines of building. If outlet is shown to be installed in or on a column, outlet shall be centered on column.
- C. Install outlet boxes accessible. Provide outlet boxes above piping or ductwork with extension stems or offsets as required to clear piping and ductwork.

- D. Install centerline of switch outlet boxes 48" above floor unless otherwise called for or required by Wainscot, counter, etc. All electrical light switches shall be located as close to door frame as possible. Under no circumstances should switch be located more than 12' from edge of door frame. Install centerline of receptacle outlet boxes 18" above floor unless otherwise called for on drawings. Adjust mounting heights to nearest masonry joint for minimum cutting in case of flush outlets. All thermostats shall be centered above light switches wherever possible. If switch outlet is shown to be installed in or on a column, switch outlet shall be centered on column.
- E. Install clock and other outlet boxes at elevations indicated on drawings or as directed by A/E. Center bracket lights over mirrors with 2" clearance above mirror.

END OF SECTION 261300

SECTION 26 2500 – EMERGENCY STANDBY GENERATOR

PART I - GENERAL

I.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.

I.2 WORK INCLUDES

- A. Provide Emergency/Standby Electric Generating System, including generator, accessories, and transfer switches.
- B. Generator enclosure, etc. shall be provided with dimensions to accommodate installation location specified within required clearances

I.3 SUBMITTALS

- A. As a minimum for all equipment specified:
 - 1. Specification and data sheets.
 - 2. Manufacturer's certification of prototype testing.
 - 3. Manufacturer's published warranty documents.
 - 4. Shop drawings showing plan and elevation views with certified overall and interconnection point dimensions.
 - 5. Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
 - 6. Manufacturer's installation instructions.

I.4 QUALITY ASSURANCE

- A. Regulatory requirements:
 - 1. NFPA - 70 (NEC, Latest Edition).
 - 2. NFPA - 37.
 - 3. NFPA - 99.
 - 4. NFPA - 101.

I.5 WARRANTY

- A. A warranty shall be provided for all products against defects in materials and workmanship, for two-year period from the start-up date, per the manufacturer's Base Coverage Limited Warranty.

I.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Materials shall be suitably packaged by manufacturer to prevent damage during shipment. Damaged materials will not be acceptable for use.
- B. Store materials on site in clean, dry storage area.
- C. Handle all materials carefully to preclude damage. Material with damaged insulation shall not be acceptable for use.

I.7 PARTS AND SERVICE QUALIFICATIONS

- A. The engine-generator supplier shall maintain 24-hour parts and service capability within 100 miles of the project site. The distributor shall stock parts as needed to support the generator set package for this specific project. The supplier must carry sufficient inventory to cover no less than 80% parts service within 24hrs and 95% within 48 hours.
- B. The engine-generator dealer shall maintain qualified factory trained service personnel.

PART 2 - PRODUCTS

2.1 RATINGS

- A. Refer to schedule on plans, for generator set standby power rating and system output voltage.
- B. Site Conditions: Altitude 815 FT. Temperatures up to 110°F. (43°C.). Retain this article for special warranties. Verify length of warranty period with manufacturers.

2.2 EMERGENCY/STANDBY ELECTRIC GENERATOR SET

- A. Single Supplier: The supplier shall be the manufacturer's authorized distributor, who shall provide initial start-up services, conduct field acceptance testing, and warranty service. The supplier shall have 24-hour service availability and factory-trained service technicians authorized to do warranty service on all warrantable products.
- B. 4-cycle, 1800 rpm, engine generator set with low reactance brushless generator, torque-matched excitation, automatic voltage regulator, set-mounted control panel, and high ambient cooling system (50°C.).
- C. Refer to schedule on electrical plans for generator fuel type.
- D. Prototype Tests and Evaluation: Prototype tests shall have been done on a complete and functional unit, component level type tests will not substitute for this requirement.
- E. Performance:
 1. Frequency regulation shall be isochronous from steady state no load to steady state rated load.
 2. The engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable de-rating factors, with the engine-generator set at operating temperature.
 3. Refer to schedule on plans for motor starting capability (minimum sKVA) with 30% voltage dip. The generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified kVA load at near zero power factor applied to the generator set.
 4. Maximum transient voltage dip shall be 24% below rated, and maximum frequency dip shall be 6% below rated, on application of the single largest surge load step.
- F. AC Generator:
 1. The AC generator shall be; synchronous, four pole, revolving field, drip-proof construction, single prelubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc(s).
 2. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 125°C.
 3. The generator shall be broad range, 12 lead reconnectable. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage within the broad range.
 4. A permanent magnet generator (PMG) or an auxiliary winding, regulator exciter principle (AREP) excitation system shall be provided. The system shall sustain excitation power for optimum mo-

tor starting and to sustain short circuit current at approximately 300% of rated current for not more than 10 seconds.

5. The automatic voltage regulator shall be a temperature compensated, solid-state design. The regulator shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The regulator shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58-59 HZ. The torque-matching characteristic shall use differential rate of frequency change compensation to use the maximum available engine torque and provide optimal transient load response. Regulators which use a straight-line fixed volts per hertz characteristic are not acceptable.

G. Engine-Generator Set Control:

1. The control shall have automatic remote start capability from a panel-mounted 3-position (Stop, Run, and Remote) switch.
2. Provide cycle cranking of 15 SEC (ON)/15 SEC (OFF) for three attempts (75 SEC). If engine fails to start lockout the engine and indicate overcrank on alarm status panel.
3. The control shall shut down and lock out upon: failing to start (overcrank), overspeed, low lubricating oil pressure, high engine temperature, or operation of a remote manual stop station. A panel mounted switch shall reset the engine monitor and test all the lamps. Lamp indications on the control panel shall include:
 - a. Overcrank shutdown - red
 - b. Overspeed shutdown - red
 - c. Low oil pressure shutdown - red
 - d. High engine temperature shutdown - red
 - e. High engine temperature prealarm - yellow
 - f. Low engine oil pressure prealarm - yellow
 - g. Low coolant temperature - yellow
 - h. Low fuel - yellow
 - i. Run - green
 - j. Not in automatic start - flashing red
 - k. Auxiliary (2 each)- red. (Customer identified)
4. The NEMA 3R enclosed control panel shall be mounted on the generator set with vibration isolators. A front control panel illumination lamp with ON/OFF switch shall be provided. Control panel mounted indicating meters and devices shall include:
 - a. Engine Oil Pressure Gauge, Coolant Temperature Gauge, DC Voltmeter, and Running Time Meter (hours);
 - b. Voltage adjusting rheostat, locking screwdriver type, to adjust voltage +/- 5% from rated value;
 - c. Analog AC Voltmeter, dual range, 90° scale, 2% accuracy;
 - d. Analog AC Ammeter, dual range, 90° scale, 2% accuracy;
 - e. Analog Frequency/RPM meter, 45-65 Hz, 1350-1950 RPM, 90° scale, +/- 0.6 Hz accuracy;
 - f. Seven position phase selector switch with OFF position to allow meter display of current and voltage in each phase. When supplied with reconnectable generators, the meter panel shall be reconnectable for the voltage specified.

H. Engine:

1. The engine shall be 4 cycle, radiator and fan cooled.
2. An electronic governor shall provide automatic frequency regulation adjustable from isochronous to 5% droop. The governor shall have provision for paralleling with the addition of load sharing controls.
3. The engine shall be cooled by a mounted closed loop radiator system rated for full load operation in 122°F. (50°C.) ambient as measured at the generator air inlet. Radiators shall be provided with a duct adaptor flange. The cooling system shall be filled with 50/50 ethylene glycol/water mixture by the equipment supplier. Rotating parts shall be guarded against accidental contact.

- I. Engine Accessory Equipment: The engine-generator set shall include the engine accessories as follows:
 - 1. An electric starter(s) capable of three complete cranking cycles without overheating, before overcrank shutdown (75 seconds).
 - 2. Positive displacement, mechanical, full pressure, lubrication oil pump. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
 - 3. An engine driven, mechanical, positive displacement fuel pump. Fuel filter with replaceable spin-on canister element. Replaceable dry element air cleaner with restriction indicator. Flexible supply and return fuel lines.
 - 4. Engine mounted battery charging alternator, 45-ampere minimum, and solid-state voltage regulator.

- J. Base: The engine-generator set shall be mounted on a heavy duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.

- K. Generator Set Auxiliary Equipment and Accessories:
 - 1. Provide output circuit breakers, as shown on schedule, set-mounted and wired, UL listed, molded case, electronic trip elements, thermal-magnetic type, rating as shown on the electrical bid documents, with adjustable trip settings of 50-100%.
 - 2. Engine mounted thermostatically controlled, water jacket heater for each engine. The heater(s) shall be sized as recommended by the equipment supplier. Heater voltage shall be as required.
 - 3. Vibration isolators shall be installed between frame and generator. Quantity shall as recommended by the generator set manufacturer.
 - 4. Starting and Control Batteries: Starting batteries, lead acid type, 24 volt DC, sized as recommended by the generator set manufacturer, shall be supplied for each generator set with battery cables and connectors.
 - 5. Remote Annunciator: Provide and install a remote alarm annunciator located as shown on the drawings. The remote annunciator shall provide all the indications and audible alarms called for by NFPA Standard 110 as provided on the engine generator set control panel; and in addition shall provide indications for high battery voltage, low battery voltage, normal battery voltage, battery charger malfunction. Alarm silence and lamp test switches shall be provided.
 - 6. Where applicable for fuel type and installation location and per schedule on electrical plans:
 - a. Sub-Base Fuel Storage Tank: Provide a double wall sub-base fuel storage. The tank shall be made of corrosion resistant steel. Provide an automatic leak detection system in the space between the walls. Tank shall be UL Listed. Provide a low fuel level contact, over fill alarm and a rupture basin alarm contact. Provide capacity for a minimum full load running time of 24 hours.
 - b. Outdoor weather and sound enclosure, factory-assembled to generator set base and radiator cowling. Housing shall provide ample airflow for generator set operation. The housing shall have hinged side-access doors and rear control door. All doors shall be lockable. All sheetmetal shall be primed for corrosion protection and finish painted with the manufacturer's standard color.

2.3 TRANSFER SWITCH EQUIPMENT

- A. Complete factory assembled transfer equipment with electronic control designed for surge voltage isolation, voltage sensors on all phases of sources, linear operator, permanently attached manual handles, positive mechanical and electrical interlocking, and mechanically held contacts. Equipment rated 1000 amps and less shall include quick-make, quick-break contact mechanisms for manual transfer under load.

- B. Refer to the project drawings and the specifications herein for type of transfer switch equipment, withstand and closing ratings, number of poles, voltage and ampere ratings, enclosures, and accessories.

- C. All transfer switches and accessories shall be UL listed and labeled, tested per UL Standard 1008, and CSA Approved.
1. Ratings: Main contacts shall be rated for 600 Volts AC minimum on transfer switches 40 - 1000 amps; and 480 Volts AC minimum on transfer switches 1200 - 3000 amps.
 2. Transfer switch shall be rated to carry 100% of rated current continuously in the enclosure. Circuit breaker type transfer switches do not meet this specification.
 3. Transfer switch shall be continuously rated in ambient temperatures of -40 to +50°C., relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet.
 4. Transfer switch equipment shall have a with stand and closing rating (WCR) in RMS symmetrical amperes greater than the available fault currents shown on the drawings.
- D. Construction: Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in both positions.
1. Transfer switches rated through 1000 amperes shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms suitable for safe manual operation under load. Transfer switches over 1000 amperes shall be equipped with manual operators for service use only under de-energized conditions.
 2. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishment. Arc chutes shall have insulating covers to prevent interphase flashover.
 3. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amp 250 VAC.
 4. Enclosures shall be UL listed. The enclosure shall provide NEC wire bend space. The cabinet door shall be key-locking. Controls on cabinet door shall be key-operated. Provide switch position indicator lamps and power available lamps for both sources on the outside cabinet door.
- E. Automatic Controls: Control shall be solid-state and designed for a high level of immunity to power line surges and transients, demonstrated by test to IEEE Standard 587-1980. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs.
1. Solid-state undervoltage sensors shall simultaneously monitor all phases of both sources. Pick-up and drop-out settings shall be adjustable. Voltage sensors shall allow for adjustment to sense partial loss of voltage on any phase. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage.
 2. Automatic controls shall signal the engine-generator set to start upon signal from normal source sensors. Solid-state time delay start, adjustable from 0 to 15 seconds (factory set at 2 seconds) shall avoid nuisance start-ups. Battery voltage starting contacts shall be gold, dry type contacts factory wired to a field wiring terminal block.
 3. The switch shall transfer when the emergency source reaches the set point voltage and frequency. Provide a solid-state time delay on transfer, adjustable from 0 to 120 seconds.
 4. The switch shall retransfer the load to the normal source after a time delay retransfer, adjustable from 0 to 30 minutes. Retransfer time delay shall be immediately bypassed if the emergency power source fails.
 5. Controls shall signal the engine-generator set to stop after a time delay, adjustable from 0 to 10 minutes, beginning on return to the normal source.
 6. Power for transfer operation shall be from the source to which the load is being transferred.
 7. The control shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time, as follows:
 - a. Source 1 OK
 - b. Start Gen Set Source 2 OK
 - c. Transfer Timing
 - d. Transfer Complete
 - e. Retransfer Timing
 - f. Retransfer Complete

- g. Timing for Stop
 - 8. The control shall include provisions for remote transfer inhibit and area protection.
 - 9. Transfer switches as designated in the schedule herein, shall be equipped with a field adjustable time delay during switching in both directions, during which time the load is isolated from both power sources, to allow load residual voltage to decay before closure to the opposite source. The delay feature shall have an adjustable range of 0 to 7.5 seconds. Phase angle monitor is not acceptable.
- F. Front Panel Devices: Provide devices mounted on cabinet front consisting of:
- 1. A key-operated selector switch to provide the following positions and functions:
 - a. Test - Simulates normal power loss to control for testing of generator set. Controls shall provide for a test with or without load transfer.
 - 1) Normal - Normal operating position.
 - b. Retransfer - Momentary position to override retransfer time delay and cause immediate return to normal source, if available.
- G. Transfer switches shall be provided with the following accessory item;
- 1. 5 Amp Battery Charger
 - 2. Exerciser Clock
 - 3. AC Meters
 - 4. Adjustable Time Delay

2.4 ACCEPTABLE MANUFACTURERS

- A. Caterpillar
- B. Cummins/Onan
- C. Kohler
- D. MTU Onsite Energy
- E. Generac

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.
- B. The generator set shall be set on a reinforced concrete pad no less than 6" thick. Reinforcement shall be with #4 bars space 12" on center each way. The set shall be anchored to the pad with a minimum of (6) 3/8" anchor bolts.
- C. Provide generator with full tank of fuel after testing is completed.

3.2 FACTORY TESTS

- A. Generator set factory tests on the equipment to be shipped, shall be performed at rated load and 0.8 PF. Generator sets that have not been factory tested at 0.8 PF will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and safety shutdowns.
 - 1. Provide a factory certified record of the production testing.

- B. Transfer equipment factory tests: Each transfer switch supplied shall be factory tested before shipment. Factory tests shall include a complete functional test of the transfer switch controls, including calibration of the voltage sensors.

END OF SECTION 26 2500

SECTION 264410 - SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, section 260100 - General Electrical Requirements, and section 260500 - Basic Electrical Materials and Methods shall apply to this Section.

1.2 SECTION INCLUDES

- A. Main Switchboard - Furnish and install the Service Entrance switchboard(s) as herein specified and shown on the associated electrical drawings.
- B. Distribution Switchboard - Furnish and install the Distribution Switchboard(s) as herein specified and shown on the associated electrical drawings.

1.3 REFERENCES

- A. The switchboard(s) and overcurrent protection devices referenced herein are designed and manufactured according to the following appropriate specifications.
 1. ANSI/NFPA 70 - National Electrical Code (NEC).
 2. ANSI/IEEE C12.16 - Solid State Electricity Metering.
 3. ANSI C57.13 - Instrument Transformers.
 4. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
 5. NEMA PB 2 - Deadfront Distribution Switchboards, File E8681
 6. NEMA PB 2.1 - Proper Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.
 7. NEMA PB 2.2 - Application Guide for Ground Fault Protective Devices for Equipment.
 8. UL 50 - Cabinets and Boxes.
 9. UL 489 - Molded Case Circuit Breakers.
 10. UL 891 - Dead-Front Switchboards.
 11. UL 943 - Ground Fault Circuit Interrupters.
 12. Federal Specification W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit And Service.

1.4 SUBMITTALS

- A. Shop Drawings shall indicate front and side enclosure elevations with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; one-line diagrams; equipment schedule; and switchboard instrument details.

1.5 QUALIFICATIONS

- A. To be considered for approval, a manufacturer shall have specialized in the manufacturing and assembly of switchboards for at least fifty (50) years.
- B. Furnish products listed by Underwriters Laboratories Incorporated and in accordance with standards listed in Article 1.03 - References.

- C. The manufacturing facility shall be registered by Underwriters Laboratories Inc. to the International Organization for Standardization ISO 9002 Series Standards for quality.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.
- B. Each switchboard section shall be delivered in individual shipping splits for ease of handling. They shall be individually wrapped for protection and mounted on shipping skids.
- C. Inspect and report concealed damage to carrier within their required time period.
- D. Store in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect structure from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.
- E. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only by lifting means provided for this express purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Conform to NEMA PB 2 service conditions during and after installation of switchboards.

1.8 MAINTENANCE MATERIALS

- A. Provide one (1) set of installation and maintenance instructions with each switchboard. Instructions are to be easily identified and affixed within the incoming or main section of the line-up.

1.9 WARRANTY

- A. Manufacturer shall warrant equipment to be free from defects in materials and workmanship for the lesser of one (1) year from date of installation or eighteen (18) months from date of purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Shall be Square D Company.
- B. Equivalent by Eaton, General Electric and Seimens.

2.2 SWITCHBOARD - GENERAL

- A. Future Provisions: All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
- B. Enclosure:
 - 1. Sections shall be aligned front and rear.
 - 2. Removable steel base channels (1.5 inch floor sills) shall be bolted to the frame to rigidly support the entire shipping section for moving on rollers and floor mounting.
 - 3. The switchboard enclosure shall be painted on all exterior surfaces. The paint finish shall be a medium gray, ANSI #49, applied by the electro-deposition process over an iron phosphate pre-treatment.

4. All front covers shall be screw removable with a single tool and all doors shall be hinged with removable hinge pins.
 5. Top and bottom conduit areas shall be clearly indicated on shop drawings.
- C. Nameplates: Provide 1 inch high x 3 inches engraved laminated (Gravoply) nameplates for each device. Furnish black letters on a white background for all voltages.
- D. Bus Composition: Shall be tin-plated aluminum. Plating shall be applied continuously to all bus work. The switchboard bussing shall be of sufficient cross-sectional area to meet UL Standard 891 temperature rise requirements. The phase and neutral through-bus shall have an ampacity as shown in the plans. For 4-wire systems, the neutral shall be of equivalent ampacity as the phase bus bar. Tapered bus is not acceptable. Full provisions for the addition of future sections shall be provided. Bussing shall include all necessary hardware to accommodate splicing for future additions.
- E. Ground Bus: Sized per NFPA70 and UL 891 Tables 25.1 and 25.2 and shall extend the entire length of the switchboard. Provisions for the addition of future sections shall be provided.

2.3 SWITCHBOARD - INCOMING MAIN SECTION DEVICES

- A. Six (6) Service Disconnects
1. Incoming conductors shall terminate at lug landing pads.
 2. All lugs shall be UL Listed to accept solid and/or stranded copper and aluminum conductors. Lugs shall be suitable for 75° C rated wire, sized according to the 75° C temperature rating in the NEC.
 3. Provide mechanical type lugs to accommodate the conductor shown on the associated drawings.
- B. Group mounted circuit breakers through 1200A
1. Circuit breaker(s) shall be group mounted plug-on with mechanical restraint on a common pan or rail assembly.
 2. The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
 3. Circuit breaker(s) equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breaker(s) shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breaker(s) of different frame sizes shall be capable of being mounted across from each other.
 4. Line-side circuit breaker connections are to be jaw type.
 5. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
 6. Electronic trip molded case standard function 80% rated circuit breakers through 1200A
 - a. All electronic circuit breakers shall have the following time/current response adjustments: Long Time Pickup, Long Time Delay, Short Time Pickup, Short Time Delay, and Instantaneous settings. Each adjustment shall have discrete settings (fully adjustable) and shall be independent of all other adjustments.
 - b. Circuit breaker trip system shall be a microprocessor-based true rms sensing designed with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated [schedule] [drawing].
 - c. Long Time Pickup indication to signal when loading approaches or exceeds the adjustable ampere rating of the circuit breaker shall be provided.

- d. Furnish thermal magnetic molded case circuit breakers for 250A frames and below.
- 7. Thermal magnetic molded case circuit breakers through 250A
 - a. Molded case circuit breakers shall have integral thermal and instantaneous magnetic trip in each pole.
 - b. Circuit protective devices shall be Square D molded case circuit breaker(s). Ampere ratings shall be as shown on the drawings.
 - c. Manufacturer shall submit one set of published I_p and I^2t let-through curves (as required by UL) to the owner.
- C. Individually Mounted circuit breakers through 4000A
 - 1. Electronic trip molded/insulated case full function 100% rated circuit breaker(s) through 4000A
 - a. All electronic circuit breakers shall have the following time/current response adjustments: Long Time Pickup, Long Time Delay, Short Time Pickup, Short Time Delay, and Instantaneous settings. Each adjustment shall have discrete settings (fully adjustable) and shall be independent of all other adjustments.
 - b. Circuit breaker trip system shall be a microprocessor-based true rms sensing designed with sensing accuracy through the thirteenth (13th) harmonic.
 - c. Local visual trip indication for overload, short circuit and ground fault trip occurrences.
 - d. Long Time Pickup indication to signal when loading approaches or exceeds the adjustable ampere rating of the circuit breaker shall be provided.
 - e. Manufacturer shall submit one set of published I_p and I^2t let-through curves (as required by UL) to the owner.

2.4 ACCESSORIES

- A. For switchboards installed outdoor only, provide thermostatically-controlled electric heaters in each section. [Provide terminals for separate source connection of heater power circuit. Voltage Rating: 120 V. Provide control power transformer with the total VA rating of the electric heaters in the switchboard.
- B. Provide integral PowerLogic ION6200 meter.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine area to receive switchboard to provide adequate clearance for switchboard installation.
- B. Check that concrete pads are level and free of irregularities.
- C. Start work only after unsatisfactory conditions are corrected.

3.2 INSTALLATION

- A. Install switchboard in accordance with manufacturer's written guidelines, the NEC, and local codes.

3.3 FIELD QUALITY CONTROL

- A. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

- B. Measure, using a Megger, the insulation resistance of each bus section phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1000 VDC; minimum acceptable value for insulation resistance is 1 megohms. NOTE: Refer to manufacturer's literature for specific testing procedures.
- C. Check tightness of accessible bolted bus joints using calibrated torque wrench per manufacturer's recommended torque values.
- D. Physically test key interlock systems to check for proper functionality.
- E. Test ground fault systems by operating push-to-test button.

3.4 ADJUSTING

- A. Adjust all operating mechanisms for free mechanical movement per manufacturers specifications.
- B. Tighten bolted bus connections in accordance with manufacturer's instructions.
- C. Adjust circuit breaker trip and time delay settings to values indicated.
- D. Provide selective coordination study of complete electrical distribution system and submit to engineer for review and approval.

3.5 CLEANING

- A. Touch up scratched or marred surfaces to match original finish.

END OF SECTION 264410

SECTION 264420 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 1 Specification Sections, section 260100 - General Electrical Requirements, and section 260500 - Basic Electrical Materials and Methods shall apply to this Section.

1.2 SECTION INCLUDES

- A. Lighting and Appliance Panelboard - Furnish and install lighting and appliance panelboard(s) as specified herein and where shown on the associated schedules on the construction drawings.

1.3 REFERENCES

- A. The panelboard(s) and circuit breaker(s) referenced herein are designed and manufactured according to the latest revision of the following specifications.
 1. NEMA PB 1 - Panelboards
 2. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
 3. NEMA AB 1 - Molded Case Circuit Breakers
 4. UL 50 - Enclosures for Electrical Equipment
 5. UL 67 - Panelboards
 6. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures
 7. CSA Standard C22.2 No. 29-M1989 - Panelboards and Enclosed Panelboards
 8. CSA Standard C22.2 No. 5-M91 - Molded Case Circuit Breakers
 9. Federal Specification W-P-115C - Type I Class 1
 10. Federal Specification W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit And Service.
 11. NFPA 70 - National Electrical Code (NEC)
 12. ASTM - American Society of Testing Materials

1.4 SUBMITTAL AND RECORD DOCUMENTATION

- A. Approval documents shall include drawings. Drawings shall contain overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. In addition, the drawing shall illustrate one line diagrams with applicable voltage systems.

1.5 QUALIFICATIONS

- A. Company specializing in manufacturing of panelboard products with a minimum of fifty (50) years documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Inspect and report concealed damage to carrier within their required time period.
- B. Handle carefully to avoid damage to panelboard internal components, enclosure, and finish.

- C. Store in a clean, dry environment. Maintain factory packaging and, if required, provide an additional heavy canvas or heavy plastic cover to protect enclosure(s) from dirt, water, construction debris, and traffic.

1.7 OPERATIONS AND MAINTENANCE MATERIALS

- A. Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.8 WARRANTY

- A. Manufacturer shall warrant specified equipment free from defects in materials and workmanship for the lesser of one (1) year from the date of installation or eighteen (18) months from the date of purchase.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Shall be Square D Company
- B. Equivalent by Eaton, General Electric and Seimens.

2.2 POWER DISTRIBUTION PANELBOARDS

- A. I-LINE Circuit Breaker Distribution Panelboard
 - 1. Interior
 - a. Shall be Square D I-LINE type rated 600 Vac or 250 Vdc maximum. Continuous main current ratings as indicated on associated schedules on the construction drawings not to exceed 1200 amperes maximum. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.
 - b. Provide UL Listed short circuit current ratings (SCCR) as indicated on the associated schedules on the construction drawings not to exceed the lowest interrupting capacity rating of any circuit breaker installed with a maximum of 200,000 RMS symmetrical amperes. Main lug and main breaker panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230.VI and VII.
 - c. The panelboard interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
 - d. The bussing shall be fully rated with sequentially phased branch distribution. Panelboard bussing rated 100 through 600 amperes shall be plated copper. Bussing rated 800 amperes and above shall be plated copper. Bus bar plating shall run the entire length of the bus bar. The entire interleaved assembly shall be contained between two (2) U-shaped steel channels, permanently secured to a galvanized steel-mounting pan by fasteners.
 - e. Interior trim shall be of dead-front construction to shield user from all energized parts. Main circuit breakers through 800 amperes shall be vertically mounted. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.
 - f. A solidly bonded copper equipment ground bar shall be provided.

- g. Solid neutral shall be equipped with a full capacity bonding strap for service entrance applications. Gutter-mounted neutral will not be acceptable.
- h. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label, and Short Circuit Current Rating shall be displayed on the interior or in a booklet format. Leveling provisions shall be provided for flush mounted applications.
- 2. Group mounted circuit breakers through 1200A
 - a. Circuit breaker(s) shall be group mounted plug-on with mechanical restraint on a common pan or rail assembly.
 - b. The interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
 - c. Circuit breakers equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.
 - d. Line-side circuit breaker connections are to be jaw type.
 - e. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
- 3. Thermal magnetic molded case circuit breakers
 - a. Molded case circuit breakers shall have integral thermal and instantaneous magnetic trip in each pole.
 - b. Circuit protective devices shall be Square D molded case circuit breakers. Circuit breakers shall be standard interrupting. Ampere ratings shall be as shown on the drawings. Manufacturer shall submit one set of published I_p and I^2t let-through curves (as required by UL) to the owner.
- 4. Enclosures
 - a. Type 1 Boxes
 - 1) Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Zinc-coated galvanized steel will not be acceptable.
 - 2) Boxes shall have removable blank end walls and interior mounting studs. Interior support bracket shall be provided for ease of interior installation.
 - 3) Maximum enclosure dimensions shall be 44" wide and 9.5" deep.
 - b. Type 1 Trim Fronts
 - 1) Trim front steel shall meet strength and rigidity requirements per UL 50 standards. Shall have an ANSI 49 medium gray enamel electrodeposited over cleaned phosphatized steel.
 - 2) Trim front shall be hinged 1-piece with door available in surface mount. Trim front door shall have rounded corners and edges free of burrs. A clear plastic directory cardholder shall be mounted on the inside of the door.
 - 3) Locks shall be cylindrical tumbler type with larger enclosures requiring sliding vault locks with 3-point latching. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock.

2.3 LIGHTING AND APPLIANCE PANELBOARD TYPE

- A. NQ
 - 1. Interior
 - a. Shall be type NQ panelboard rated for 240 Vac/48 Vdc maximum. Continuous main current ratings, as indicated on associated schedules on the construction drawings. not to exceed 600 amperes maximum.
 - b. Minimum short circuit current rating: as indicated in schedules on the construction drawings.

- c. Short circuit current rating: [5,000] at 48 Vdc.
 - d. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-400 amperes shall be plated copper. Bussing rated for 600 amperes shall be plated copper as standard construction. Bus bar plating shall run the entire length of the bus bar. Panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and -G.
 - e. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
 - f. A solidly bonded copper equipment ground bar shall be provided.
 - g. Split solid neutral shall be plated and located in the mains compartment up to 225 amperes so all incoming neutral cable may be of the same length.
 - h. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused mounting space.
 - i. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.
 - j. Interiors shall be field convertible for top or bottom incoming feed. Main circuit breakers in 100A interiors shall be vertically mounted. Main circuit breakers over 100A shall be vertically mounted. Sub-feed circuit breakers shall be vertically mounted. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.
2. Main Circuit Breaker
- a. Shall be Square D type circuit breakers.
 - b. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40° C ambient environment. Thermal elements shall be ambient compensating above 40° C.
 - c. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.
 - d. Breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.
 - e. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position.
 - f. Lugs shall be UL Listed to accept solid or stranded copper conductors only. Lugs shall be suitable for 75° C rated wire sized according to the 75° C temperature rating per NEC Table 310-16. Lug body shall be bolted in place; snap-in designs are not acceptable.
 - g. The circuit breakers shall be UL Listed for use with the following accessories: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.
3. Branch Circuit Breakers

- a. Shall be Square D type circuit breakers. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the associated schedules on the construction drawings.
 - b. Molded case branch circuit breakers shall have bolt-on type bus connectors.
 - c. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.
 - d. There shall be two forms of visible trip indication. The breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red VISI-TRIP® indicator appearing in the clear window of the circuit breaker housing.
 - e. The exposed faceplates of all branch circuit breakers shall be flush with one another.
 - f. Lugs shall be UL Listed to accept solid or stranded copper copper conductors only. Lugs shall be suitable for 75° C rated wire, sized according to the 75° C temperature rating per NEC Table 310-16. Branch circuit breakers rated 30 amperes and below shall be UL Listed to accept 60° C rated wire.
 - g. Breakers shall be UL Listed for use with the following factory installed accessories: Shunt Trip, Auxiliary Switch, and Alarm Switch.
4. Enclosures
- a. Type 1 Boxes
 - 1) Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvannealed steel will not be acceptable.
 - 2) Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
 - 3) Box width shall be 26" wide maximum wide.
 - b. Type 1 Fronts
 - 1) Front shall meet strength and rigidity requirements per UL 50 standards. Front shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
 - 2) Fronts shall be hinged 1-piece with door. Mounting shall be as indicated on drawings and associated schedules.
 - 3) Panelboards shall have MONO-FLAT fronts with concealed door hinges and mounted with trim screws. Front shall not be removable with the door locked. Doors on front shall have rounded corners and edges shall be free of burrs.
 - 4) Front shall have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of door.
 - c. Type 3R, 5, and 12
 - 1) Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
 - 2) All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners on enclosures 59 inches or more in height. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of door.
 - 3) Maximum enclosure dimensions shall not exceed 21" wide and 6.5" deep.
- B. NF
- 1. Interior

- a. Shall be type NF panelboard for 480Y/277 Vac maximum. Continuous main current ratings, as indicated on associated schedules and drawings, not to exceed 600 amperes maximum for main breaker panelboards and not to exceed 800 amperes for main lug panelboards.
 - b. Minimum Short Circuit Rating as listed on schedule at 480Y/277 Vac.
 - c. Provide one (1) continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors limited to bolt-on branch circuit breakers. The bussing shall be fully rated. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing rated 100-400 amperes shall be plated [copper] [aluminum]. Bussing rated for 600 and 800 amperes shall be plated copper as standard construction. Bus bar plating shall run the entire length of the bus bar. Panelboards shall be suitable for use as Service Equipment when application requirements comply with UL 67 and NEC Articles 230-F and -G.
 - d. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
 - e. A solidly bonded copper equipment ground bar shall be provided.
 - f. Split solid neutral shall be plated and located in the mains compartment up to 250 amperes so all incoming neutral cable may be of the same length.
 - g. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twistouts covering unused mounting space.
 - h. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.
 - i. Interiors shall be field convertible for top or bottom incoming feed. Main circuit breakers in 125A interiors shall be vertically mounted. Main circuit breakers over 125A shall be vertically mounted. Sub-feed circuit breakers shall be vertically mounted. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.
 - j. Interior phase bus shall be pre-drilled to accommodate field installable options. (i.e., Sub-Feed Lugs, Sub-Feed Breakers, Thru-Feed Lugs)
 - k. Interiors shall accept 125 ampere breakers in group mounted branch construction.
2. Main Circuit Breaker
- a. Shall be Square D type circuit breakers.
 - b. Main circuit breakers shall have an overcenter, trip-free, toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have a permanent trip unit with thermal and magnetic trip elements in each pole. Each thermal element shall be true rms sensing and be factory calibrated to operate in a 40° C ambient environment. Thermal elements shall be ambient compensating above 40° C.
 - c. Two- and three-pole circuit breakers shall have common tripping of all poles. Circuit breakers frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the breaker that allows the user to simultaneously select the desired trip level of all poles. Circuit breakers shall have a push-to-trip button for maintenance and testing purposes.
 - d. Circuit breaker handle and faceplate shall indicate rated ampacity. Standard construction circuit breakers shall be UL Listed for reverse connection without restrictive line or load markings.
 - e. Circuit breaker escutcheon shall have international I/O markings, in addition to standard ON/OFF markings. Circuit breaker handle accessories shall provide provisions for locking handle in the ON or OFF position.

- f. Lugs shall be UL Listed to accept solid or stranded copper conductors only. Lugs shall be suitable for 75° C rated wire. Lug body shall be bolted in place; snap-in designs are not acceptable.
 - g. The circuit breakers shall be UL Listed for use with the following accessories: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits.
3. Branch Circuit Breakers
- a. Shall be Square D type circuit breakers. Circuit breakers shall be UL Listed with amperage ratings, interrupting ratings, and number of poles as indicated on the panelboard schedules.
 - b. Molded case branch circuit breakers shall have bolt-on type bus connectors.
 - c. Circuit breakers shall have an overcenter toggle mechanism which will provide quick-make, quick-break contact action. Circuit breakers shall have thermal and magnetic trip elements in each pole. Two- and three-pole circuit breakers shall have common tripping of all poles.
 - d. There shall be two forms of visible trip indication. The circuit breaker handle shall reside in a position between ON and OFF. In addition, there shall be a red VISI-TRIP® indicator appearing in the clear window of the circuit breaker housing.
 - e. The exposed faceplates of all branch circuit breakers shall be flush with one another.
 - f. Lugs shall be UL Listed to accept solid or stranded copper conductors only. Lugs shall be suitable for 75° C rated wire.
 - g. Breakers shall be UL Listed for use with the following factory installed accessories: Shunt Trip, Auxiliary Switch, and Alarm Switch.
 - h. Breaker shall be UL Listed with the following ratings: (15-125A) Heating, Air Conditioning, and Refrigeration (HACR), (15-30A) High Intensity Discharge (HID), and (15-20A) Switch Duty (SWD)
4. Enclosures
- a. Type 1 Boxes
 - 1) Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Galvannealed steel will not be acceptable.
 - 2) Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
 - 3) Box width shall not exceed 26" wide.
 - b. Type 1 Fronts
 - 1) Front shall meet strength and rigidity requirements per UL 50 standards. Shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
 - 2) Fronts shall be 1-piece with door. Mounting shall be as indicated on associated schedules/drawings.
 - 3) Panelboards rated 250 amperes and below shall have MONO-FLAT fronts with concealed door hinges and trim screws. Front shall not be removable with the door locked. Panelboards rated above 250 amperes shall have vented fronts with concealed door hinges. Doors on front shall have rounded corners; edges shall be free of burrs.
 - 4) Front shall have flat latch type lock with catch and spring loaded stainless steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
 - c. Type 3R, 5, and 12
 - 1) Enclosures shall be constructed in accordance with UL 50 requirements. Enclosures shall be painted with ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.

- 2) All doors shall be gasketed and equipped with a tumbler type vault lock and two (2) additional quarter turn fasteners on enclosures 59 inches or more in height. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory card holder shall be mounted on the inside of door.
- 3) Maximum enclosure dimensions shall not exceed 21" wide and 9.5" deep.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards in accordance with manufacturer's written instructions, NEMA PB 1.1 and NEC standards.
- B. Mounting height shall be in accordance of NEC standards.

3.2 FIELD QUALITY CONTROL

- A. Inspect complete installation for physical damage, proper alignment, anchorage, and grounding.
- B. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads within 20% of each other. Maintain proper phasing for multi-wire branch circuits.
- C. Check tightness of bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written specifications.

END OF SECTION 264420

SECTION 310000 - EARTHWORK

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
 2. Excavating and backfilling for buildings and structures.
 3. Drainage course for slabs-on-grade.
 4. Subbase course for concrete walks and pavements.
 5. Base course for asphalt paving.
 6. Subsurface drainage backfill for walls and trenches.
 7. Excavating and backfilling trenches within building lines.
 8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

1.02 DEFINITIONS

- A. Backfill: Soil materials 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: Layer placed between the subbase course and asphalt paving.
- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations.
1. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- 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: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.
- J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- K. Utilities include on-site underground pipes, conduits, ducts, and cables.

1.03 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - 2. Drainage fabric.
 - 3. Separation fabric.
- B. Samples: For the following:
 - 1. 30-lb samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources.
 - 2. 12-by-12-inch sample of drainage fabric.
 - 3. 12-by-12-inch sample of separation fabric.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.04 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

1.05 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Engineer not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Engineer's written permission.
 3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Includes suitable approved materials from excavations and borrow areas(s). Shall be friable sandy or silty clay containing fine material sufficient to provide dense mass free of voids and capable of satisfactory compaction. Shall be free of roots or other organic matter, refuse, cinders, ice, snow, frozen earth, or other unsuitable matter. Do not use material containing gravel, stones, or shale particles greater in dimension than one-half the depth of the layer to be compacted. No rock greater than one (1) foot, measured along its longest axis, shall be placed within two (2) feet of the top of a pipe in any backfill. No rocks greater than one (1) foot will be allowed in the backfill above service line terminations, tees and wyes. No rock greater than one (1) foot, measured along its longest axis, shall be placed within two (2) feet of a structure.
- C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
 2. Creek gravel shall not be used to backfill or fill.
- D. Backfill and Fill: Satisfactory soil materials.
- E. Subbase: 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 sieve and not more than 12 percent passing a No. 200 sieve.
- F. Base: 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 sieve and not more than 8 percent passing a No. 200 sieve.
- G. 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 sieve and not more than 12 percent passing a No. 200 sieve.
- H. Bedding: Embedment for ordinary trench conditions for eight-inch (8") nominal diameter through fifteen-inch (15") nominal diameter PVC gravity sewer line is compacted ASTM D2487 Class IB dense graded, clean, manufactured and processed aggregates described as angular crushed stone, crushed rock, crushed gravel, or crushed stone/sand mixtures containing little or no fines with gradations selected to minimize migration of adjacent soils with amounts finer than each square opening laboratory sieve

as mass percent of 100 percent passing a 3/4-inch sieve, 30-55 percent passing a 1/2-inch sieve, 0-15 percent passing a No. 4 sieve, and 0-5 percent passing a No. 8 sieve compacted to 85% or greater standard proctor density and tested to ensure proper compaction.

Sieve	% Passing
¾”	100
½”	30-55
No. 4	0-15
No. 8	0-5

Onsite material wished to be used as a bedding material will need to consist of a dolomitic or limestone rock and meet the bedding material gradation shown above. Contractor will be required to provide analytical testing results verifying that the material to be used meets the specifications prior to being used in construction of the project. Creek type gravel will not be approved for use as bedding material.

Bedding for pipe sizes other than 8” – 15” shall be as stated above unless stated otherwise on Construction Plans or in Technical Specifications.

- I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch sieve and 0 to 5 percent passing a No. 8 sieve.
- J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- L. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 3 percent organic material content; free of subsoil, clay lumps, gravel, stones, and other objects more than 1 inch in diameter in any dimension; and free of weeds, roots, and other deleterious materials harmful to plant growth. Topsoil shall contain less than 5% by volume of stones, rocks, and gravel.
 - 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.
 - a. Where surface soils do not meet the requirements of this section and/or where quantities of surface soils that do meet this section of this specification are insufficient, use imported or manufactured soils from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

2.02 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
1. Red: Electric.
 2. Yellow: Gas, oil, steam, and dangerous materials.
 3. Orange: Telephone and other communications.
 4. Blue: Water systems.
 5. Green: Sewer systems.
- B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
1. Grab Tensile Strength: 110 lbf; ASTM D 4632.
 2. Tear Strength: 40 lbf; ASTM D 4533.
 3. Puncture Resistance: 50 lbf; ASTM D 4833.
 4. Water Flow Rate: 150 gpm per sq. ft.; ASTM D 4491.
 5. Apparent Opening Size: No. 50; ASTM D 4751.
- C. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
1. Grab Tensile Strength: 200 lbf; ASTM D 4632.
 2. Tear Strength: 75 lbf; ASTM D 4533.
 3. Puncture Resistance: 90 lbf; ASTM D 4833.
 4. Water Flow Rate: 4 gpm per sq. ft.; ASTM D 4491.
 5. Apparent Opening Size: No. 30; ASTM D 4751.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created

by earthwork operations.

- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. 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.

3.02 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.03 BLASTING

- A. Blasting will not be allowed on this project.

3.04 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.05 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete form work, 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.
 - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated. Do not disturb bottom of excavations intended for bearing surface.

3.06 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and

grades.

3.07 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. One block or 400 feet (whichever is the shorter) shall be the maximum length of open trench permitted on any line under construction.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
- C. Trench Bottoms: Excavate trenches 6 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.08 APPROVAL OF SUBGRADE

- A. Notify Engineer when excavations have reached required subgrade.
- B. If Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
 - 1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- C. Proof roll subgrade for pavements and foundations with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer.

3.09 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 may be used when approved by Engineer.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile 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.

3.11 BACKFILL – GENERAL

- A. Place and compact backfill in excavations promptly in accordance with ASTM D 2321, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for record documents.
 - 3. Inspecting and testing underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Contractor must backfill trench at the end of each day to within a reasonable distance of stopping point. Open trenches must be covered with drive plates or other means of preventing access by livestock or the public.

3.12 UTILITY TRENCH BACKFILL

- A. All utility lines shall be bedded and backfilled per ASTM D2321 and as indicated in Construction Drawings and Specifications. This shall include all mains and service laterals.
- B. Place bedding course on trench bottoms and where indicated by construction drawings. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.
- D. Place initial backfill of bedding material, to a maximum of the spring line of the utility pipe or conduit but no greater than 12 inches above bottom bedding course.
 - 1. Carefully work bedding material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
 - 2. Continue backfill of bedding in lifts of 12 inches to maximum level of bedding material required to bed specified pipe or conduit.
- E. All backfill material whether it is bedding material or trench backfill material shall extend from undisturbed trench sidewall to undisturbed trench sidewall.
- F. Compact backfill material with hand held or walk behind compactors in accordance with

ASTM D 2321.

- G. Coordinate backfilling with utilities testing.
- H. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.
- I. For areas not under pavement, place and compact final backfill of satisfactory soil material to final subgrade in maximum of 18-inch lifts.
- J. For areas under pavement, place final backfill using bedding material to final subgrade.
- K. Install warning tape directly above utilities, 18" – 24" inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- L. The Contractor is responsible for trench settlement per Section 3.25 of this specification.

3.13 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. 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, use satisfactory soil material.
 - 3. Under pavements, use satisfactory bedding material.
 - 4. Under steps and ramps, use engineered fill.
 - 5. Under building slabs, use engineered fill.
 - 6. Under footings and foundations, use engineered fill.

3.14 MOISTURE CONTROL

- A. Under walks, footings, foundations, building slabs, steps and ramps uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill 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.
- B. Under pavements uniformly moisten or aerate subgrade (base course) for paving section before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill 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.

3.15 COMPACTION OF BACKFILLS AND FILLS – UNDER WALKS, FOOTINGS, FOUNDATIONS, BUILDING SLABS, STEPS AND RAMPS

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure. No rock greater than one (1) foot, measured along its longest axis, shall be placed within two (2) feet of any structure.
- C. Compact soil 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 of existing subgrade and each layer of backfill or fill material at 95 percent.
 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 92 percent.

3.16 COMPACTION OF BACKFILLS AND FILLS – UNDER PAVEMENTS

- A. Place bedding material backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure or along the full length of the trench.
- B. Compact subgrade (base course) for paving section to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 1. 95 percent.

3.17 COMPACTION OF BACKFILLS AND FILLS – UNDER LAWNS AND UNPAVED AREAS

- A. Place backfill and fill materials in layers no deeper than can be compacted with conventional heavy construction equipment.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure. No rock greater than one (1) foot, measured along its longest axis, shall be placed within two (2) feet of any structure.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 1. Under lawn or unpaved areas, compact each layer of backfill or fill material at 85 percent.

3.18 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1 inch.
 - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.19 SUBSURFACE DRAINAGE

- A. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.
 - 1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 698.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 6 inches.
 - 1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 698.
 - 2. Place and compact impervious fill material over drainage backfill to final subgrade.

3.20 SUBBASE AND BASE COURSES

- A. Under pavements and walks, place subbase course on prepared subgrade and as follows:
 - 1. Place base course material over subbase.
 - 2. Compact subbase and base courses 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 1557.
 - 3. Shape subbase and base to required crown elevations and cross-slope grades.

4. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
 5. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.
- B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.

3.21 DRAINAGE COURSE

- A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
1. Compact drainage course to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
 2. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.
 3. When compacted thickness of drainage course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.22 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer as requested by Engineer and/or Owner. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. 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 Engineer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
1. Building Slab Areas and Footings: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of building slab area, but in no case fewer than three tests.
 2. Pavement Areas: At subgrade (aggregate base course, asphalt base course, and asphalt driving course), at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than two tests per trench section.
 3. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.

- E. 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 to depth required; recompact and retest until specified compaction is obtained.

3.23 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.
 - 1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.
- C. Where settling occurs before Project correction period elapses (1 year), 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 the greatest extent possible.

3.24 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Unless otherwise indicated on plans, remove surplus spoils and waste material, including satisfactory and unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property. The cost for removal and proper disposal of said materials will be incidental and not paid for separately.
- B. Contractor to coordinate with Property Owner for spoil or waste material staging locations for material that is to remain onsite.

3.25 TRENCH SETTLEMENT

- A. Any settlement of the trench within the warranty period for the project will be corrected by the contractor at his own expense.

END OF SECTION 310000

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes the following:
1. Protecting existing trees and vegetation to remain.
 2. Protection of livestock.
 3. Removing trees and other vegetation.
 4. Clearing and grubbing.
 5. Topsoil stripping.
 6. Removing above-grade site improvements.
 7. Disconnecting, capping or sealing, and abandoning site utilities in place.
 8. Disconnecting, capping or sealing, and removing site utilities.

1.02 DEFINITIONS

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 3 percent organic material content; free of subsoil, clay lumps, gravel, stones, and other objects more than 1 inch in diameter in any dimension; and free of weeds, roots, and other deleterious materials harmful to plant growth. Topsoil shall contain less than 5% by volume of stones, rocks, and gravel.
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.
 - a. Where surface soils do not meet the requirements of section 1.02.A of this specification and/or where quantities of surface soils that do meet section 1.02.A of this specification are insufficient use imported or manufactured soils from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

1.03 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain on Owner's property, cleared materials shall become Contractor's property and shall be removed from the site. Contractor shall coordinate with property owner to determine if any cleared materials are to remain the Owner's property.

1.04 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as

damage caused by site clearing.

- B. Record drawings according to Division 1.
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.05 PROJECT 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 notifying and obtaining permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 TREE PROTECTION

- A. Trees within permanent easements may be removed unless noted otherwise. Trees within temporary easements shall be removed only with approval of engineer and Property Owner as required for construction. **No trees shall be removed unless noted for removal on the site demolition plan without permission of the Engineer and Property Owner.**
- B. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- C. Do not excavate within drip line of trees, unless otherwise indicated.
- D. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
1. Cover exposed roots with burlap and water regularly.
 2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.
- E. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Engineer.
1. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.03 LIVESTOCK PROTECTION

- A. Contractor is responsible for protecting livestock in and around construction areas. Contractor to coordinate with Property Owner for movement of livestock and/or areas that need to be fenced to protect livestock.
- B. Erect and maintain a temporary electric fence around construction areas as required to keep livestock from entering work areas and/or trenches. Remove fence when construction is complete.
- C. Do not permit vehicles or equipment to come into contact with livestock.

3.03 MISCELLANEOUS AREAS PROTECTION

- A. These areas may include springs, homesteads, cemeteries and any other areas as shown on construction plans.
- B. Erect and maintain a temporary fence around miscellaneous areas shown on construction plans to be protected. Remove fence when construction is complete.
- C. Do not store construction materials, debris, or excavated material within area being protected.
- D. Do not permit vehicles, equipment, or foot traffic within area being protected.

3.04 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange to shut off indicated utilities with utility companies.
- B. 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 Engineer not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.

3.05 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
 - 4. Use only hand methods for grubbing within drip line of remaining trees.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding 8-inch loose depth, and compact each layer to a density equal to adjacent original ground.

3.06 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within drip line of remaining trees.
3. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.07 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as 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 length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.08 DISPOSAL

- A. Disposal: 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.

END OF SECTION 311000

SECTION 321123 – AGGREGATE BASE COURSES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes crushed rock base and surface course.

1.02 SUBMITTALS

- A. Compliance submittals:
 - 1. Submit as specified in Division 1.
 - 2. Includes, but not limited to, the following:
 - a. Test results from testing laboratory indicating compliance with the specifications.
 - b. Certification of conformance with the specifications.

1.03 QUALITY ASSURANCE

- A. Applicable Standards:
 - 1. American Society for Testing and Materials (ASTM):
 - C117 - Material Finer than 76-um (No. 200) Sieve in Mineral Aggregates by Washing.
 - C131 - Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - C136 - Sieve or Screen Analysis of Fine and Coarse Aggregates.
 - D423 - Liquid Limit of Soils.
 - D424 - Plastic Limit and Plasticity Index of Soils.
 - 2. American Association of State Highway and Transportation Officials (AASHTO):
 - T99 - The Moisture Density Relations of Soils Using a 5.5-Pound (2.5 kg) Rammer and a 12-Inch (305 mm) Drop.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Crushed rock base and surface course shall consist of aggregate specified.

2.02 AGGREGATE:

- A. Aggregate shall be crushed stone or crushed gravel, free from lumps or balls of clay or other objectionable matter, and reasonably free from thin and elongated pieces of dirt. Aggregates shall consist of angular fragments, durable and sound, and shall be reasonably

uniform in density and quality.

- B. Percentage of wear shall not exceed 50 after 500 revolutions as determined by ASTM C131.
- C. Aggregate shall contain 75 percent by weight of pieces with two or more fractured surfaces if material is crushed gravel.
- D. Portion of aggregate passing No. 40 sieve shall be as follows:
 - 1. Liquid Limit: Not more than 25 determined by ASTM D423.
 - 2. Plastic Index: Not more than 6 determined by ASTM D424.
- E. Gradation shall not vary from low limit on one sieve to high limit on adjacent sieve or vice versa. Test by ASTM C136 and C117, and conform to the following table:

Sieve Designation	Percent by Weight Passing Square-Mesh Sieve	
	Surface Course	Base Course
1-inch	100	100
1/2-inch	--	60-90
3/8-inch	65*	--
No. 4	--	40-60
No. 10	5-25	--
No. 40	--	15-35

*Indicates Maximum

2.03 EQUIPMENT:

- A. General Requirements:
 - 1. Maintain all equipment, tools, machines used in the performance of the work required by this Section in a satisfactory working condition at all times.
 - 2. Equipment shall be subject to the approval of the Engineer.
- B. Power Rollers:
 - 1. Rollers shall be self-propelled, three wheel, or tandem-type with wheels equipped with adjustable scrapers.
 - 2. Weight shall not be less than eight tons.
- C. Tamping Rollers:
 - 1. Rollers shall consist of one or more units arranged to adapt to uneven ground surfaces.

2. Rolling units of multiple type shall be pivoted on the main frame.
 3. When fully loaded, rollers shall exert at least 300 psi on the combined areas of tamping feet in contact with the ground.
 4. Each unit shall be equipped with a watertight cylindrical drum with length 48 inches or greater.
 5. Tamping feet shall project not less than 7 inches from drum surface, with feet spaced not less than 10 inches, nor more than 10 inches measured diagonally from center to center.
- D. Rubber-Tired Rollers:
1. Rollers shall consist of two axles on which are mounted not less than nine pneumatic-tired wheels, mounted so the rear group of tires do not follow in the tracks of the forward wheels but will be centered between the forward wheels.
 2. The axles shall be mounted in a rigid frame provided with a loading platform or body suitable for ballast loading.
 3. Inflate tires uniformly.
 4. May be self-propelled.
 5. Tow with pneumatic-tired tractors or other pneumatic-tired equipment.
- E. Blade Graders shall be self-propelled with a wheelbase of not less than 15 feet, and a blade of not less than 10 feet.
- F. Sprinkling equipment shall consist of tank trucks, pressure distributors, or other similar equipment designed to apply water uniformly and in controlled quantities to variable width of surface.
- G. Hauling equipment shall consist of pneumatic-tired vehicles and dump bodies suitable for dumping materials in windrows or layers on the subgrade.
- H. Tampers shall be mechanical (of an approved type) and hand-operated, weight not less than 50 pounds, and have a face area of not more than 100 square inches.
- I. Miscellaneous equipment shall consist of scarifiers, tractors, spring-tooth or spike-tooth harrows, windrow equalizers, spreaders, and other equipment suitable for construction of select material.

PART 3 - EXECUTION

3.01 GENERAL REQUIREMENTS:

- A. Stockpiles:
1. Clear and level storage sites prior to stockpiling.
 2. Place in the manner and at locations designated by Engineer, providing separate

stockpiles for materials from separate sources.

B. Cold-Weather Limitations:

1. Construction shall be prohibited when atmospheric temperature is below 35 degrees F.
2. Do not place base course on frozen subgrade, or surface course on frozen base.
3. Protect base course, surface course and subgrade in freezing weather and repair areas damaged by freezing by reshaping and recompacting.

C. Preparation of Subgrade:

1. Clear all vegetable matter such as trees, brush, down timber and other objectionable materials found on or above the surface.
2. Scalp all excavation and embankment areas removing material such as sod, grass, residue or agricultural crops and decayed vegetable matter from the surface of the ground.
3. Grub and dispose of all vegetable matter such as stumps, roots, buried trees and brush encountered below the surface of the ground or subgrade to a minimum depth of 6 inches.
4. When deleterious materials are encountered below ground line which may be detrimental to the proposed improvement, these shall be removed to a depth necessary to provide adequate support for the proposed improvement.
5. The subgrade surface shall be brought to the specified lines, grades and cross-section by repeatedly adding or removing material and compacting to the specified density.
6. The top 6 inches of subgrade for pavements shall be compacted to 95 percent of the maximum density for the material used as determined by ASTM D-698 and within a tolerance of plus 2 percent and minus 3 percent of the optimum moisture at maximum density as determined by the moisture density curve obtained.
7. The newly finished subgrade shall be repaired from action of the elements or others. Any settlement or erosion that occurs prior to placing the pavement thereon, shall be repaired and the specific lines, grades and cross-section reestablished.
8. Any subgrade that has become unacceptable shall be reworked as necessary to restore the subgrade to shape, tolerance, density, and moisture content range for such density, immediately prior to the placing of the pavement.

D. Grade Control:

1. Establish and maintain by means of grade stakes placed in lanes parallel to the centerline of the area to be paved and spaced so string lines may be stretched between stakes.

3.02 MIXING AND PLACING OF MATERIALS:

- A. Deposit and spread material in a uniform layer and compact to the thickness indicated on the plans and as specified below. Spread material uniformly on the prepared subgrade from moving vehicles or spreader boxes.
 - 1. Level material to the required contour and grades with blade graders.
 - 2. Remove those portions of the layer which become segregated in spreading and replace with satisfactory mixture or remix as requested by Engineer.
 - 3. Add water to the extent necessary to prevent segregation during mixing operations.
 - 4. Add material to the mixture in such amounts and sizes as requested by the Engineer.

- B. Shaping and Compacting Mixed Materials:
 - 1. Compact in layers no less than three nor more than seven inches thick.
 - 2. Roll to specified compaction requirements throughout full depth of layer with tamping rollers, power rollers, rubber-tired rollers or combination.
 - 3. Shape and smooth by blading and rolling with power roller or rubber-tired roller, or both.
 - 4. Hand-tamp in places not accessible to rolling equipment.
 - 5. Aerate by blade graders, harrows, or other approved equipment when mixture is moistened by rain.

- C. Degree of Compaction:
 - 1. Base compaction on weight per cubic foot of material passing 3/4-inch sieve and compact to at least 100 percent of density at optimum moisture.
 - 2. Determine and control compaction in accordance with AASHTO T99.

- D. Smoothness Test:
 - 1. Surface shall show no deviation in excess of 3/8-inch in any 10 feet when tested with a 10-foot straightedge applied parallel with and at right angles to the centerlines of the paved area.
 - 2. Correct any deviation in excess of this amount by loosening, adding or removing material, reshaping, watering, and compacting as requested by the Engineer.

3.03 MAINTENANCE:

- A. Maintain finished base course in a condition satisfactory to the Engineer until job completion or until surface is placed upon it.

3.04 WAYBILLS AND DELIVERY TICKETS:

- A. Submit daily to the Engineer during progress of work.

END OF SECTION 321123

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including Division 1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

- A. Extent of portland cement concrete paving is shown on drawings, including curbs, gutters, walkways and pavement.
- B. Prepared subbase is specified in "Earthwork" section.
- C. Concrete and related materials are specified in Division 3.
- D. Joint fillers and sealers are specified in Division 7.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with local governing regulations if more stringent than herein specified.

1.04 SUBMITTALS

- A. Furnish samples, manufacturer's product data, test reports, and materials' certifications as required in referenced sections for concrete and joint fillers and sealers.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.
 - 1. Use flexible spring steel forms or laminated boards to form radius bends as required.
 - 2. Coat with a non-staining form release agent that will not discolor or deface surface of concrete.
- B. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40 or Grade 60.
- C. Fabricated Bar Mats: Welded or clip-assembled steel bar or rod mats, ASTM A 184. Use ASTM A 615, Grade 40 steel bars, unless otherwise indicated.
- D. Concrete Materials: Comply with requirements of applicable Division 3 sections for concrete materials, admixtures, bonding materials, curing materials, and other required materials.
- E. Expansion Joint Materials: Comply with requirements of applicable Division 7 sections for preformed expansion joint fillers and sealers.

- F. Liquid Membrane Forming Curing Compound: Complying with ASTM C 309, Type I, Class A unless other type acceptable to Engineer. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.
1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to the following:
 - a. "Masterseal"; Master Builders.
 - b. "J-20 Acrylic Cure"; Dayton Superior.
 - c. "Kure-N-Seal"; Sonneborn-Contech.
 - d. "L&M Cure"; L & M Construction Chemicals.
 - e. "LR-152"; Protex Industries.
 - f. or approved equal.
- G. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. "J-40 Bonding Agent"; Dayton Superior Corp.
 - b. "Weldcrete"; Larsen Products.
 - c. "Everbond"; L & M Construction Chemicals.
 - d. "EucoWeld"; Euclid Chemical Co.
 - e. "Hornweld"; A. C. Horn.
 - f. "Sonocrete", Sonneborn-Contech.
 - g. "Acrylic Bondcrete"; The Burke Co.
 - h. or approved equal.
- H. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.
1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - a. "Epoxite", A. C. Horn.
 - b. "Edoco 2118 Epoxy Adhesive"; Edoco Technical Prod.
 - c. "Sikadur Hi-Mod"; Sika Chemical Corp.
 - d. "Euco Epoxy 463 or 615"; Euclid Chemical Co.
 - e. "Patch and Bond Epoxy"; The Burke Co.

- f. "Sure-Poxy"; Kaufman Products Inc.
- g. or approved equal.

2.02 CONCRETE MIX, DESIGN AND TESTING

- A. Comply with requirements of applicable Division 3 sections for concrete mix design, sampling and testing, and quality control.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

- A. Remove loose material from compacted subbase surfaces immediately before placing concrete.
- B. Proof-roll prepared subbase surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

3.02 FORM CONSTRUCTION

- A. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.
- B. Check completed form work for grade and alignment to following tolerances:
 - 1. Top of forms not more than 1/8" in 10'.
 - 2. Vertical face on longitudinal axis, not more than 1/4" in 10'.
- C. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.03 REINFORCEMENT

- A. Locate, place and support reinforcement as specified in Division 3 sections, unless otherwise indicated.

3.04 CONCRETE PLACEMENT

- A. General: Comply with requirements of Division 3 sections for mixing and placing concrete, and as herein specified.
- B. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required 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.
- C. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with 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 dislocation of reinforcing,

dowels, and joint devices.

1. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 2. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place a construction joint.
 3. When adjacent pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained sufficient strength to carry loads without injury.
- D. Fabricated Bar Mats: Keep mats clean and free from excessive rust, and handle units to keep them flat and free of distortions. Straighten bends, kinks, or other irregularities or replace units as required before placement. Set mats for a minimum 2" overlap to adjacent maps.
- E. Place concrete in 2 operations; strike-off initial pour for entire width of placement and to the required depth below finish surface. Lay fabricated bar mats immediately in final position. Place top layer of concrete, strike-off and screed.
1. Remove and replace portions of bottom layer of concrete which has been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Engineer.
- F. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.

3.05 JOINTS

- A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.
1. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Weakened Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness as follows:
1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.
 2. Sawed Joints: Form weakened-plane joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
 3. Inserts: Use embedded strips of metal or sealed wood to form weakened-plane joints. Set strips into plastic concrete and carefully remove strips after concrete has hardened.

- C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2 hour, except where such placements terminate at expansion joints.
 - 1. Construct joints as shown or, if not shown, use standard metal keyway-section forms.
- D. Expansion Joints: Provide premolded joint filler for expansion joints, putting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.
 - 1. Extend joint fillers full width and depth of joint, and not less than 1/2" or more than 1" below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surfaces.
 - 2. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
 - 3. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.
- E. Fillers and Sealants: Comply with requirements of applicable Division 7 sections for preparation of joints, materials, installation, and performance.

3.06 CONCRETE FINISHING

- A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.
- B. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.
- C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.
- D. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
 - 1. Broom finish, by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Engineer.
- E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Engineer.

3.07 CURING

- A. Protect and cure finished concrete paving, complying with applicable requirements of

Division 3 sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

3.08 REPAIRS AND PROTECTIONS

- A. Repair or replace broken or defective concrete, as directed by Engineer.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement unless specified otherwise. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- C. Sweep concrete pavement and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

END OF SECTION 321313

SECTION 329200 – TURF AND GRASSES

PART 1 – GENERAL

1.01 SUMMARY

- A. This Section includes the following:
 - 1. Soil Preparation
 - 2. Seeding
 - 3. Sodding
 - 4. Meadow grasses
 - 5. Lawn renovation
 - 6. Maintenance

1.02 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 or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.
- E. Lawns: Areas of grass that are currently manicured and maintained
- F. Meadows: Areas that are not manicured containing trees, brush, and native grasses left in natural condition.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of Grass Seed: 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 identifying source, including name and telephone number of supplier.
- C. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.
- D. Qualification Data: For landscape Installer.

- E. Material Test Reports: For existing surface soil and imported topsoil.
- F. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns during a calendar year. Submit before expiration of required maintenance periods.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in TPI's "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding."

1.05 SCHEDULING

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: March 1st to June 1st
 - 2. Fall Planting: August 15th to November 1st
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.06 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.
 - 2. Sodded Lawns: 30 days from date of Substantial Completion.
 - 3. Plugged Lawns: 30 days from date of Substantial Completion.
 - 4. Sprigged Lawns: 30 days from date of Substantial Completion.
- B. Maintain and establish lawn by watering, fertilizing, weeding, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and mulch 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.
- C. Watering: It is the Contractor's responsibility to provide and maintain temporary piping,

hoses, and lawn-watering equipment to convey water from approved sources and to keep lawn uniformly moist to a depth of 4 inches. This may require coordination with Property Owner.

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
2. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
3. Water lawn at a minimum rate of 1 inch per week until acceptance.

1.07 MEADOW MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established, but for not less than 40 days from date of Substantial Completion.
- B. Maintain and establish meadow by watering, weeding, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from approved sources and to keep meadow uniformly moist.
 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
 2. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 3. Water meadow at a minimum rate of 1/2 inch per week until acceptance.

1.08 MAINTENANCE – GENERAL

- A. Maintenance of lawns shall be ongoing during the project period and during fall and spring seeding seasons during the warranty period until a hardy stand of grass is established per section 3.09 of this specification.

PART 2 – PRODUCTS

2.01 LAWN GRASSES

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 1. Full Sun, High Traffic: Bermuda grass mix (warm season).
 2. Full Sun: Turf type fescue blend.
 3. Sun and Partial Shade: Proportioned by weight as follows:
 - a. 50 percent Turf Type Fescue Blend.

- b. 35 percent Chewings Red Fescue (*Festuca rubra* variety).
 - c. 15 percent Annual Rye Grass.
- C. Shade: Proportioned by weight as follows:
 - 1. 50 percent Chewings Red Fescue (*Festuca rubra* variety).
 - 2. 35 percent Turf Type Fescue Blend.
 - 3. 15 percent Annual Rye Grass.

2.02 MEADOW GRASSES

- A. Coordinate with individual Property Owners for type and mix of grass in livestock pastures. Otherwise see mix in 2.02B
- B. Native Grass Seed: Fresh clean, dry, new seed, mixed species as follows:
 - 1. 20 percent Buffalo Grass
 - 2. 15 percent Little Bluestem
 - 3. 15 percent Side Oats Gramma
 - 4. 15 percent Indian Grass
 - 5. 15 percent Switch Grass
 - 6. 10 percent Annual Rye Grass
 - 7. 10 percent Purple Coneflower
 - a. Native Grass Seed to be sown at a rate of 150 lbs/acre.
 - b. Pasture Grass Seed to be sown at rate indicated by Property Owner.
- C. Seed Carrier: Inert material, sharp clean sand or perlite, mixed with seed at a ratio of not less than two parts seed carrier to one part seed.

2.03 TURFGRASS SOD

- A. Turfgrass Sod: Approved Number 1 Quality/Premium, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with TPI's "Specifications for Turfgrass Sod Materials" in its "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Full Sun: Turf type fescue blend.
 - 2. Sun and Partial Shade: Proportioned by weight as follows:

- a. 50 percent Turf Type Fescue Blend.
 - b. 35 percent Chewings Red Fescue (*Festuca rubra* variety).
 - c. 15 percent Annual Rye Grass.
3. Shade: Proportioned by weight as follows:
- a. 50 percent Chewings Red Fescue (*Festuca rubra* variety).
 - b. 35 percent Turf Type Fescue Blend.
 - c. 15 percent Annual Rye Grass.

2.04 TOPSOIL

- A. Topsoil - Lawns: ASTM D 5268, pH range of 5.5 to 7, a minimum of 3 percent organic material content; free of subsoil, clay lumps, gravel, stones, and other objects more than 1 inch in diameter in any dimension; and free of weeds, roots, and other deleterious materials harmful to plant growth. Topsoil shall contain less than 5% by volume of stones, rocks, and gravel.
- 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.
 - a. Where surface soils do not meet the requirements of section 2.04.A of this specification and/or where quantities of surface soils that do meet section 2.04.A of this specification are insufficient use imported or manufactured soils from off-site sources. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.
- B. Topsoil - Meadows: Meadow areas are not located within the current project area limits. If the project area is modified, this section applies to meadow areas. Meadow topsoil shall be free of subsoil, clay lumps, gravel, stones, and other objects more than 3 inch in diameter in any dimension; and free of weeds, roots and other deleterious materials harmful to plant growth. Topsoil shall contain less than 10% by volume of stones, rocks, and gravel.
- 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.

2.05 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
- 1. Class: Class O, with a minimum 95 percent passing through No. 8 sieve and a minimum 55 percent passing through No. 60 sieve.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 sieve and a maximum 10 percent passing

through No. 40 sieve.

- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
- G. Sand: Clean, washed, natural or manufactured, free of toxic materials.
- H. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.06 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing 3/4 inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Peat: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Wood Derivatives: Decomposed, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
- D. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, or other bedding materials; free of toxic substances, stones, sticks, weed seed, and material harmful to plant growth.

2.07 PLANTING ACCESSORIES

- A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.08 FERTILIZER

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.

- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.09 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Peat Mulch: Sphagnum peat moss, partially decomposed, finely divided or granular texture, with a pH range of 3.4 to 4.8.
- C. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 50 to 60 percent of dry weight.
 - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- D. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- E. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- F. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.10 EROSION CONTROL MATERIALS

- A. Landlok® Erosion Control Blankets (ECB's) as manufactured by Propex, or approved equal, must be installed on all surfaces requiring seeding with slopes greater than or equal to 10% or in areas where grass cannot be established due to erosion. ECB's shall be selected and installed in accordance with manufacturer's recommendations.
- B. ECB's are not recommended in drainage channels. Rock riprap in accordance with details and specifications shall be used in drainage channels.
- C. Ground Anchoring Devices
 - 1. U-shaped wire staples or metal geotextile pins can be used to anchor blanket to the ground surface. Wire staples should be a minimum thickness of 8 gauge. Metal pins should be at least 0.20 in diameter steel with a 1-1/2 in steel washer at the head of the pin. Wire staples and metal pins should be driven flush to the soil surface. All anchors should be 6-18 in long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils. Heavier metal stakes may be required in rocky soils.

D. Anchor Pattern Guide

1. The shaded areas in the diagram shown in Propex's Installation Guidelines for ECB's provide anchor suggestions based on slope gradient and/or anticipated flow conditions. When the correct number of anchors has been evaluated, refer to the three illustrations in Propex's Installation Guidelines for ECB's to establish anchor pattern. Increased anchoring may be required depending upon site conditions.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Verify the existence or non-existence of irrigation systems. Damaged systems shall be repaired with equipment to match existing and system tested for operation in an efficient and satisfactory manner. If damages to existing irrigation systems are incurred, the contractor shall be responsible for irrigation system repairs at the expense of the contractor.

3.02 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, retaining walls, irrigation systems, and other facilities, trees, shrubs, and other plantings from damage caused by restoration operations.
 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.

3.03 LAWN AND MEADOW RESTORATION

- A. Renovate existing lawns and meadows damaged by Contractor's operations including excavating, grading, clearing and grubbing, storage of materials and equipment, and movement of vehicles. Limit lawn and meadow subgrade preparation to areas to be planted.
- B. Measurement and payment for lawn and meadow restoration i.e. topsoil, seeding, fertilizing and mulching will be limited to disturbed areas within the permanent and temporary easement areas. Areas disturbed by construction activities outside these areas must be restored in accordance with these specifications but will be considered incidental and not paid for separately.
- C. Unchanged Subgrades: If lawns or meadows are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, such as material or equipment storage areas or areas where vehicles and equipment were driven then lawn or meadow renovation to be as follows:
 1. Remove unsatisfactory existing rocks, grass, vegetation, or turf. Do not mix into surface soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil droppings, fuel spills, stone, gravel, and other construction materials.

2. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
 3. Raise subgrade to finish grade with topsoil.
 4. Loosen surface soil to a depth of at least of 6 inches. Remove stones larger than 1 inch in any dimension, sticks, roots, trash, and other extraneous matter.
 5. Apply soil amendments according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture. Remove any rock larger than 1 inch in any dimension, sticks, roots, trash, and other extraneous matter brought to the surface through tilling operations.
 6. 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.
 7. Apply fertilizer directly to surface soil per manufacturer's recommendations.
 8. Moisten prepared areas before planting if soil is dry. Do not create muddy soil.
 9. Apply seed per Section 3.04.
 10. Install erosion control materials per Section 3.05, as required, to begin establishment of renovated area.
 11. Water newly planted areas and keep moist until new lawn or meadow is established.
 12. Legally dispose of all waste materials, including grass, vegetation, and turf, off Owner's property.
- D. Disturbed Subgrades: If lawns or meadows are to be planted in areas altered or disturbed by excavating, grading, or surface soil stripping operations, then lawn renovation to be as follows:
1. Backfill disturbed areas per project construction plans and details to within 4 inches of finish grade elevations. Remove unsatisfactory existing rocks, grass, vegetation, weeds, or turf. Do not mix into surface soil.
 2. Bring disturbed areas to finish grade using a minimum of 4 inches of topsoil. Remove stones larger than 1 inch in any dimension, sticks, roots, trash, and other extraneous matter.
 3. Apply soil amendments according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture. Remove any rock larger than 1 inch in any dimension, sticks, roots, trash, and other extraneous matter brought to the surface through tilling operations.
 4. 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.

5. Apply fertilizer directly to surface soil per manufacturer's recommendations.
 6. Moisten prepared areas before planting if soil is dry. Do not create muddy soil.
 7. Apply seed per Section 3.04.
 8. Install erosion control materials per Section 3.05 as required to begin establishment of renovated area.
 9. Water newly planted areas and keep moist until new lawn or meadow is established.
 10. Legally dispose of all waste material, including grass, vegetation, and turf, off Owner's property.
- E. Meadow areas, while allowed to use onsite soils, will still be required to be seeded, fertilized and mulched in order to establish grass growth. A prepator or some other means or equipment shall be used to remove rocks larger than 4 inches and to clean areas where bedding material has been stored on the ground. If grass cannot be established by the end of the warranty period, Contractor will be required to bring in topsoil or other suitable soil approved by Engineer in order to facilitate grass growth.
- F. Restored areas are to be maintained for the duration of the project and during the one year maintenance period until a hardy stand of grass has been established. Areas eroded, washed out or otherwise disturbed during these periods must be reestablished.

3.04 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow lawn seed at the rate of 3 to 4 lb/1000 sq. ft. Meadow grasses to be sown at the rate noted in Section 2.02.
- C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes greater than or equal to 10% with Landlock erosion-control blankets, or approved equal, as outlined in Section 3.05 of this specification. Erosion-control blankets shall be installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with slopes not exceeding 10% by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches (38 mm) in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
1. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.
 2. Bond straw mulch by spraying with asphalt emulsion at the rate of 10 to 13 gal. /1000 sq. ft. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.

3.05 EROSION CONTROL BLANKETS

A. Site Preparation

1. Grade and compact area of ECB installation as directed and approved by Engineer. Subgrade shall be uniform and smooth. Remove all rocks, clods, vegetation or other objects so the installed blanket will have direct contact with soil surface. Prepare seedbed by loosening the top 2-3 in (50-75 mm) minimum of soil. Incorporate amendments such as lime and fertilizer and/or wet the soil, if needed. Do not mulch areas where blanket is to be placed.

B. Seeding

1. Apply seed to soil surface before installing blanket. Disturbed areas shall be reseeded.
2. Apply seed as specified in Section 3.04 of this specification.

C. Installation on Soil Slopes

1. Excavate a 12 x 6 in minimum longitudinal anchor trench 2-3 ft over crest of slope (see Figure 1 in Propex's Installation Guidelines for ECB's).
2. Install top end of blanket into trench and secure to bottom of trench using ground anchoring devices spaced every 12 in minimum. Backfill and compact soil into trench.
3. Verify correct side of ECB is facing ground. Unroll blanket down slope.
4. Overlaps of adjacent rolls shall be 3 in minimum and anchor every 18 in minimum along the overlap. Secure using ground anchoring devices at the appropriate frequency and pattern shown below. Overlaps are shingled away from prevailing winds (see Figure 2 in Propex's Installation Guidelines for ECB's).
5. Unroll blanket in a manner to maintain direct contact with soil. Do not pull blanket taut. Secure blanket to ground surface using anchoring devices.
6. Excavate a 12 x 6 in minimum anchor trench at toe of slope (see Figure 3 in Propex's Installation Guidelines for ECB's).
7. Install bottom end of blanket into trench and secure to bottom of trench using ground anchoring devices spaced every 12 in minimum. Backfill and compact soil in trench (see Figure 3 in Propex's Installation Guidelines for ECB's).
8. Anchor blanket to the ground using U-shaped wire staples or metal geotextile pins. Wire staples should be a minimum thickness of 8 gauge. Metal pins should be at least 0.20 in diameter steel with a 1-1/2 in steel washer at the head of the pin. Wire staples and metal pins should be driven flush to the soil surface. All anchors should be 6-18 in long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils. Heavier metal stakes may be required in rocky soils.
9. The shaded areas in the diagram shown in Propex's Installation Guidelines for ECB's provide anchor suggestions based on slope gradient and/or anticipated flow

conditions. When the correct number of anchors has been evaluated, refer to the three illustrations in Propex's Installation Guidelines for ECB's to establish anchor pattern. Increased anchoring may be required depending upon site conditions.

10. Irrigate as specified.

3.06 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 1. Mix slurry with asphalt-emulsion tackifier.
 2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply mulch at a minimum rate of 1500-lb/acre dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.07 SODDING

- A. Sod shall be placed in areas where sod was pre-existing.
- B. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- C. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 1. Lay sod across angle of slopes exceeding 1:3.
 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- D. Saturate sod with fine water spray within two hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 4 inches below sod. Sod which dries out will be rejected.

3.09 SATISFACTORY LAWNS AND MEADOWS

- A. Satisfactory Seeded Lawn or Meadow: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
- B. Satisfactory Sodded Lawn or Meadow: At end of maintenance period, a healthy, well-rooted, even-colored, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.
- C. Reestablish areas of lawns or meadows that do not comply with requirements and continue maintenance until areas are satisfactory.

3.10 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn or meadow renovation 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 grass is established.
- C. Remove erosion-control measures after grass establishment period.

END OF SECTION 329200

SECTION 330523 – TRENCHLESS UTILITY INSTALLATION

PART 1 – GENERAL

1.01 SCOPE OF WORK

The work specified in this section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation, also commonly referred to as directional boring or guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

1.02 DESCRIPTION OF THE SYSTEM

The HDD pipeline shall be installed to the lines, grades, and diameters shown on the construction drawings. Requests for alternative installations shall be submitted to the Engineer at least ten business days prior to the date fixed for the opening of bids.

1.03 QUALITY ASSURANCE

The requirements set forth in this document specify a wide range of procedural precautions necessary to insure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification or within any associated permit. Adherence to the specifications contained herein, or the Engineer's approval on any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract. The Contractor shall be responsible for the repair of all damage to private and/or public property at no additional expense to the Owner. Repair work shall meet all local and state rules and requirements.

1.04 WARRANTY

The contractor shall supply to Owner a two (2) year unconditional warranty. The warranty shall include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective materials or defective workmanship with new materials/workmanship conforming to the specifications. The warranty shall be for a period of two years from the date of acceptance of the project by the Owner.

1.05 SUBMITTALS

A. Work Plan:

At least 7 business days prior to beginning work, the Contractor must submit to the Engineer a work plan detailing the procedure and schedule to be used to execute the project. The work plan should include the following:

1. Description and specifications of all equipment to be used
2. Detailed description of the proposed method of installation
3. Method of monitoring and controlling line and grade
4. A list of personnel and their qualifications and experience (including back-up

personnel in the event that an individual is unavailable)

5. A list of sub-Contractors
6. A schedule of work activity
7. A safety plan (including MSDS of any potentially hazardous substances to be used)
8. A traffic control plan (if applicable)
9. An environmental protection plan and contingency plans for possible problems including a Frac-Out and Surface Spill Contingency Plan.
10. Identify the location for the pipe string (and rollers, if required)
11. Include a drilling fluid plan, which details types of drilling fluids to be used, cleaning and recycling equipment, estimated flow rates, procedures for minimizing drilling fluid escape, and the method/location for final disposal of waste drilling fluids
12. Identify the maximum allowable pulling load on the pipe string to avoid overstressing the pipe

Work plan should be comprehensive, realistic and based on actual working conditions for this particular project. Plan should document the thoughtful planning required to successfully complete the project.

B. Shop Drawing Submittals:

The Contractor shall submit shop drawings, working drawings, schedules and samples in accordance with Section 013300 of the technical specifications.

C. Record Drawings:

Submit for Owner and Engineer's approval the as-built records within thirty days (30) after completing the pull back. The as-built records shall include a plan, profile (data every 25 LF of main, at a minimum), and all information recorded during the progress of the work, including all subsurface anomalies identified by Ground Penetrating Radar or excavation. The HDD contractor shall certify the accuracy of all as-built record drawings. Contractor shall maintain a daily project log of drilling operations and a guidance system log with a copy given to Engineer at completion of project. As-built drawings shall be in accordance with Section 013300 of the technical specifications and certified as to accuracy by the Engineer.

1.06 ENVIRONMENTAL PROTECTION

The Contractor shall be fully responsible for the directional drilling operation. Contractor shall place silt fence or silt soxx between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Contractor shall place hay bales, or approved protection, to limit intrusion upon project area. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. The HDD operation is to be performed in a manner to eliminate the discharge of water, drilling

mud and cuttings to nearby waterways. All excavated pits used in the drilling operation shall be lined by Contractor with heavy duty plastic sheeting with sealed joints to prevent the migration of drilling fluids and/or ground water.

Contractor shall adhere to all applicable environmental regulations including environmental condition stated in local, state and federal permits. Fuel may not be stored in bulk containers (greater than 25 gallons) within 200' of any water-body or wetland.

1.07 SAFETY

The Contractor shall be solely responsible for the safety of all parties. Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.

1.08 PERSONNEL QUALIFICATIONS CERTIFICATION

The Contractor shall have equipment and expertise, appropriate for horizontal directional drilling installations. This includes the preparation and maintenance of the bore path using drilling fluids appropriate for the geology of the soils. The Contractor shall also have experience in safety and dependability installing, in similar geology, similar size and length of piping involved.

A. Directional Boring:

Directional drilling and pipe installation shall be done only by an experienced Contractor specializing in directional drilling and whose key personnel have at least five (5) years experience in this work. Furthermore, the Contractor shall have installed directionally drilled pipe at least as large as the pipe diameter specified for this project, have performed crossings at least 1,500 feet in length, and successfully installed at least 100,000 feet in length.

All personnel shall be fully trained in their respective duties as part of the directional drilling crew and in safety. (Each person must have been fully trained for over 1,000 hours on all facets of directional drilling, including, but not limited to machine operations, mud mixing, locating, and material fusion.) A responsible representative who is thoroughly familiar with the equipment and type of work to be performed, must be in direct charge and control of the operation at all times. In all cases the supervisor must be continually present at the job site during the actual Directional Bore operation. The Contractor shall have a sufficient number of competent workers on the job at all times to insure the Directional Bore is made in a timely and satisfactory manner.

B. Pipe and Fitting Jointing

1. Restrained Joint PVC

- a. The pipe material must meet AWWA C900, Class 200 or ASTM 2241 standards for PVC pressure pipe and fittings with a dimension ratio of DR21. PVC pipe that is intended for use as a casing pipe may have the dimension ratio of 18.
- b. Pipe and couplings shall be made from unplasticized PVC compounds having a minimum cell classification of 12454, as defined in ASTM D 1784. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4 degrees F, in accordance with the requirements of ASTM D 2837. Restrained joint water pipe shall carry

the UL1285 listing.

- c. Pipe shall be joined using non-metallic couplings to form an integral system for maximum reliability and interchangeability. High-strength, flexible thermoplastic splines shall be inserted into mating, precision machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading.
- d. Cut exposed splines 3/4" from coupling to reduce soil drag.
- e. Couplings shall be beveled as part of the manufacturing process on the leading edges so as to minimize soil friction.

2. Joints

- a. Pipe shall be joined using non-metallic couplings to form an integral system for maximum reliability and interchangeability. High-strength, flexible thermoplastic splines shall be inserted into mating, precision machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading.
- b. Couplings shall be designed for use at or above the pressure class of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F 477. Joints shall be designed to meet the zero leakage test requirements of ASTM D 3139 or the Owner's requirements which is more stringent.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

Pipe and fittings utilized for horizontal directional drilling shall be high density polyethylene in accordance with the 333000 - Sanitary Sewerage specification.

2.02 DRILLING FLUIDS

Drilling fluids shall consist of a bentonite slurry. The Contractor shall be responsible for making provisions for a clean water supply for mixing of drilling fluid.

2.03 DELIVERY, STORAGE AND HANDLING OF MATERIALS

- A. Care shall be taken during transportation of the pipe to ensure that it is not cut, kinked, or otherwise damaged. Inspect materials delivered to the site for damage. All materials found during inspection or during the progress of work to have cracks, flaws, cracked linings, or other defects shall be rejected and removed from the job site without delay.
- B. Unload and store opposite or near the place where the work will proceed with minimum handling. Store material under cover out of direct sun light. Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the polyethylene pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature condition. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such widths as not to allow deformation of the pipe at the point of contact with the sleeper or between supports. Keep all materials free of dirt and debris.

- C. The handling of the joined pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Ropes, fabric, or rubber protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped onto rocky or unprepared ground. Slings for handling the pipeline shall not be positioned at butt-fused joints. The open ends of all sections of joined and/or installed pipe (not in service) shall be plugged at night to prevent animals or foreign material from entering the pipe line or pipe section. Waterproof nightcaps of approved design may be used but they shall also be so constructed that they will prevent the entrance of any type of natural precipitation into the pipe and will be fastened to the pipe in such a manner that the wind cannot blow them loose. **The practice of stuffing cloth or paper in the open ends of the pipe will be considered unacceptable.**
- D. Contractor is responsible for obtaining, transporting and sorting any fluids, including water, to the work site.
- E. Disposal of fluids is the responsibility of the Contractor. Disposal of fluids shall be done in a manner that is in compliance with all permits and applicable federal, state, or local environmental regulations. The bentonite drilling slurry may be recycled for reuse in the hole opening operation, or shall be hauled by the Contractor to an approved location or landfill for proper disposal. Contractor shall thoroughly clean entire area of any fluid residue upon completion of installation, and replace any and all plants and sod damaged, discolored or stained by drilling fluids.

PART 3 – EXECUTION

3.01 EQUIPMENT REQUIREMENTS

A. General:

The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the specified bore and pullback the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the drill, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be re-used, a guidance system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safety operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

B. Drilling System:

1. Drilling Rig:

The directional drilling machine shall consist of a power system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The power system shall be self contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drilling string and an audible alarm which automatically sounds when an electrical current is detected.

2. Drill Head:

The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

3. Mud Motors (if required):

Mud motors shall be of adequate power to turn the required drilling tools.

4. Drill Pipe:

Shall be constructed of high quality 4130 seamless tubing, grade D or better with threaded box and pins. Tool joints should be hardened to 32-36 RC.

C. Guidance System:

A guidance system shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance shall be capable of tracking at the maximum depth required and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction) The guidance system shall be accurate to +/-2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 5 feet horizontally.

The Guidance System shall be of a proven type and shall be operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies on the surface of the drill path and shall consider such influences in the operation of the guidance system if using a magnetic system.

D. Bore Tracking and Monitoring:

At all times during the pilot bore the Contractor shall provide and maintain a bore tracking system that is capable of accurately locating the position of the drill head in the x, y, and z axes. The Contractor shall record these data at least once per drill pipe length or every twenty-five (25) feet, whichever is most frequent. Deviations between the recorded and design bore path shall be calculated and reported on the daily log.

E. Drilling Fluid (Mud) System:

1. Mixing System:

A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid. Mixing system shall continually agitate the drilling fluid during operations.

2. Drilling Fluids:

Drilling fluid shall be composed of clean water, appropriate additives and clay. Water shall be from an authorized source with a minimum pH of 6.0. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No potentially hazardous material may be used in drilling fluid.

3. Delivery System:

The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and conveyed to the drilling fluid recycling system. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid cycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage and recycling facilities.

4. Drilling Fluid Recycling System:

The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

5. Control of Drilling Fluids:

The Contractor shall follow all requirements of the Frac-Out and Surface Spill Contingency Plan as submitted and approved and shall control operational pressures, drilling mud weights, drilling speeds, and any other operational factors required to avoid hydrofracture fluid losses to formations, and control drilling fluid spillage. This includes any spillages or returns at entry and exit locations or at any intermediate point. All inadvertent returns or spills shall be promptly contained and cleaned up. The Contractor shall maintain on-site mobile spoil removal equipment during all drilling, pre-reaming, reaming and pullback operations and shall be capable of quickly removing spoils. The Contractor shall immediately notify the Owner of any inadvertent returns or spills and immediately contain and clean up the return or spill.

F. Other Equipment:

1. Pipe Roller:

Pipe rollers, if utilized, shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall used to prevent excess sagging of pipe.

2. Pipe Rammers:

Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of the Engineer.

3. Restrictions:

Other devices or utility placement systems for providing horizontal thrust other than those defined above in the preceding sections shall not be used unless approved by the Engineer prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue

stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the projects.

3.02 DRILLING PROCEDURES

A. Drill Path:

Prior to drilling Contractor shall utilize all verified locate information to determine drill pathway. Marked up drawings shall be on site at all times, and referred to during the drill operation.

B. Guidance System:

Contractor shall provide and maintain instrumentation necessary to accurately locate the pilot hole (both horizontal and vertical displacements), measure pilot string torsional and axial and measure drilling fluid discharge rate and pressure. The Owner's Onsite Representative and the Engineer shall have access to instrumentation and readings at all times during operation.

C. Pilot Hole:

The pilot hole shall be drilled along the path shown on the plans and profile drawings to the following tolerances:

1. No deviations greater than 5% of depth over a length of 100 feet; the Contractor will notify the Engineer and the Engineer may require the Contractor to pull-back and re-drill from the location along the bore path before the deviation.
2. The drilling contractor shall ensure that pipe joints do not deflect more than 50% of manufacturer's recommended maximum deflection.
3. Entry Point Location – The pilot hole shall initially penetrate the ground surface at the exact location intended. The angle of entry shall not exceed 75% of the allowable bending radius of the carrier pipe.
4. Exit Point Location – The pilot hole shall finally penetrate the ground surface within:
 - a. +/- 10 feet overall length tolerance and +/- 5 feet left/right alignment tolerance for directional drills of 1,000 linear feet.
 - b. +/- 40 feet of overall length and +/- 5 feet left/right alignment tolerance for directional drills greater than 1,000 linear feet.
 - c. Exit point shall be contained within the permanent easement. If exit point cannot be contained within the permanent easement or within the tolerances specified above, Contractor shall notify Engineer prior to continuing with work.

In the event of a drilling fluid fracture, inadvertent returns, or returns loss during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and wait another 30 minutes. If mud fracture or returns loss continues, Contractor will

discuss additional options with the Engineer and work will then proceed as agreed.

D. Reaming:

Upon successful completion of the Pilot Hole, the Contractor will ream the bore hole to a minimum of 1.25 greater than the outside diameter of the pipe and a maximum of 1.5 times the outside diameter of the pipe. The type of hole opener or back reamer to be utilized in this phase shall be determined by the types of subsurface conditions that were encountered during the pilot hole drilling operation. The Contractor will not attempt to ream at one time more than the drilling equipment and mud system are designed to safely handle.

E. Pull Back:

Upon successfully reaming the bore hole to the required diameter, Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel and reamer to compact bore hole walls. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull pressure at any time. Maximum allowable tensile force imposed on the pull section shall be equal to 80% of the pipe manufacturer's safety pull (or tensile) strength.

1. Torsional stress shall be minimized by using a swivel to connect a pull section to the reaming assembly.
2. The pullback section of the pipeline shall be supported during pullback operations so that it moves freely and the pipe is not damaged.
3. External pressure shall be minimized during installation of the pullback section in the reamed hole. Damaged pipe resulting from external pressure shall be replaced at no cost to the Owner.
4. Buoyancy modification shall be at the discretion of the Contractor and shall be approved by the Engineer. The Contractor shall be responsible for any damage to the pull section resulting from such modifications.
5. In the event that the pipe becomes stuck, the Contractor will cease pulling operations to allow any potential hydro-lock to subside and then commence pulling operations. If pipe remains stuck, the Contractor will notify the Engineer. The Engineer and the Contractor will discuss options and then work will proceed accordingly.
6. The pipe shall be sealed at both ends with a cap or a plug to prevent water, drilling fluids and other foreign materials from entering the pipe as it is pulled back.
7. Contractor shall provide a break-away link between the swivel and the pipe or a combination swivel and break link. Break-away link shall be rated at 80% of pipe manufacturer's safe pull (tensile) strength. Break pins shall be color coded for easy identification. Contractor shall provide rated break-away link for each material and pipe size(s) for the project.

F. Grouting Annular Space:

The annular space between the pipe and bore hole shall be filled with a cement or bentonite-cement grout mixture to support and stabilize the pipe. If pressure grouting is used, caution should be exercised to insure that excess grout pressure does not distort or collapse the pipe.

G. Casing Pipe Installation:

Where soil conditions make installation of the carrier pipe difficult, the Contractor may, at the approval of Owner and Engineer, install casing to aid in carrier pipe installation. Casing pipe shall be 16" steel with a minimum wall thickness of 0.250 inches and conforming to ASTM A-139.

3.03 PIPE ASSEMBLY

A. General:

Pipe shall be joined using non-metallic couplings to form an integral system for maximum reliability and interchangeability. High-strength, flexible thermoplastic splines shall be inserted into mating, precision machined grooves in the pipe and coupling to provide full 360° restraint with evenly distributed loading. Contractor is responsible for supplying necessary fittings to transition to and from restrained joint PVC to SCH 80 PVC.

B. Acceptability of Damaged Pipe:

Cuts or gouges that reduce the wall thickness by more than 10% is not acceptable and must be replaced.

3.04 TESTING

A. Pressure and Leakage Tests:

The Contractor shall test horizontal directional drilled pipelines installed under this Contract in accordance with these specifications prior to acceptance of the pipeline by the Owner. All other conventionally installed pipe shall be tested in accordance with Section 333000 of these specifications. All field tests shall be made in the presence of the Project Representative. Except as otherwise directed, all pipelines shall be tested. Unless approved otherwise by the Owner, all fusible or butt weld joints shall be tested. All piping to operate under liquid pressure shall be tested in sections of approved length.

For these tests, the Contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment, and all labor required. The Contractor will furnish suitable pressure gauges, calibrated by an approved testing laboratory, with increments no greater than 2 psi. Gauges used shall be of such size that pressures tested will not register less than 10% or more than 90% of the gauge capacity. All valved sections shall be hydrostatic tested to insure sealing (leak allowance) of all line valves.

1. Unless it has already been done, the section of pipe to be tested shall be filled with potable water and air shall be expelled from the pipe. Reclaimed water may be utilized for filling new reclaimed water or sewer force main installations. If blow offs or other outlets are not available at high points for releasing air, the Contractor shall provide 1 inch (minimum taps and blow-off valves (at the 12:00

position), as necessary. The cost of constructing blow-off valves and plugging them, after a successful pressure test, shall be included in the unit price bid amount for the HDPE pipe.

2. Hydrostatic testing shall consist of a 150 psig test pressures, based on the elevation of the highest point of the line or section under tests. Pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Project Representative. The pump, pipe connection and all necessary apparatus shall be furnished by the Contractor and shall be subject to the approval of the Project Representative.
3. Maximum duration for pressure test, including initial and final phase of the test, shall not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, and then allow it to “relax” for at least eight (8) hours before bringing the test section up to test pressure again.
4. Initial Phase of Pressure Testing:

First, all air must be removed from the test section. The pressure test shall be completed after the line is backfilled. Initially, the pressure within the test section should be raised to approximately 160 psi and then allowed to be idle (no additional make-up water/pressure to be injected), for approximately 3 hours. During this 3 hour period, the test section shall be allowed to stabilize and come to an equilibrium stage. No additional make-up water/pressure shall be applied to the test section during this 3 hour stabilization period unless the line pressure drops below 140 psi. In this case, make-up water/pressure shall only be applied to the test section to maintain a minimum of 140 psi (during the 3 hour stabilization period).
5. Final Phase of Pressure Testing:

The final phase of the pressure test shall involve applying make-up water/pressure to achieve an “initial test pressure” of 150 psi (minimum)/155 psi (maximum). The test section is then allowed to be idle (no make-up water/pressure is added) for a period of 2 hours. After this 2 hour period, make-up water/pressure is applied and measured to re-establish the “initial test pressure”. The quantity of water utilized to re-pump the line shall be measured and compared to the allowable quantities as determined by the table below. If the actual make-up water quantity is equal or less than the allowable amount, the pressure test passes. If the actual make-up water quantities are greater than the allowable amount, the pressure test fails.

Table 1: Allowable Make Up Amount
Nominal Pipe Size (inches) Make-up Water Allowance
(Gallons/Linear feet of
Pipe) 2-hour test

6	0.0030
8	0.0050
10	0.0065
12	0.0115
14	0.0140
16	0.0165
18	0.0215
20	0.0275
22	0.0350
24	0.0440
26	0.0500
28	0.0555
30	0.0635
32	0.0715
34	0.0810
36	0.0900
42	0.1155
48	0.1350
54	0.1570

6. In the event a section fails to pass the tests, the Contractor shall do everything necessary to locate, uncover (even to the extent of uncovering the entire section), and replace the defective pipe, valve, fitting or joint. Visible leaks shall be corrected regardless of total leakage. Lines which fail to meet these tests shall be retested as necessary until test requirements are complied with. All testing shall be performed at the Contractor's expense.
7. If, in the judgment of the Owner, it is impracticable to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made with approval; but, in any event, the Contractor shall be responsible for the ultimate tightness of the piping within the above requirement.

3.05 TRACE WIRE

- A. Trace wire in accordance with Sections 331122 and 333122 shall be installed along the horizontal directional drilled pipe.

END OF SECTION 330523

SECTION 330523.16 – UTILITY PIPE JACKING

PART 1 – GENERAL

1.01 SCOPE OF WORK

The work specified in this section consists of furnishing and installing underground utilities using the jack and bore method of installation. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

1.02 DESCRIPTION OF THE SYSTEM

The jack and bore pipeline shall be installed to the lines, grades, and diameters shown on the construction drawings. Requests for alternative installations shall be submitted to the Engineer at least ten business days prior to the date fixed for the opening of bids.

Boring and jacking operations shall be performed within the right-of-way and/or easements shown on the Construction Drawings.

1.03 QUALITY ASSURANCE

The requirements set forth in this document specify a wide range of procedural precautions necessary to insure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification or within any associated permit. Adherence to the specifications contained herein, or the Engineer's approval on any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract. The Contractor shall be responsible for the repair of all damage to private and/or public property at no additional expense to the Owner. Repair work shall meet all local and state rules and requirements.

The equipment used in boring and jacking casings shall be of adequate commercial size and satisfactory working condition for safe operation. Only workmen experienced in boring and jacking operations shall be used in performing the Work.

1.04 WARRANTY

The Contractor shall supply to Owner a two (2) year unconditional warranty. The warranty shall include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective materials or defective workmanship with new materials/workmanship conforming to the specifications. The warranty shall be for a period of two years from the date of acceptance of the project by the Owner.

1.05 SUBMITTALS

A. Work Plan:

At least 7 business days prior to beginning work, the Contractor must submit to the Engineer a work plan detailing the procedure and schedule to be used to execute the project. The work plan should at a minimum shall include the following:

1. Description and specifications of all equipment to be used
2. Detailed description of the proposed method of installation
3. Method of monitoring and controlling line and grade
4. A list of personnel and their qualifications and experience (including back-up personnel in the event that an individual is unavailable)
5. A list of sub-Contractors
6. A schedule of work activity
7. A safety plan (including MSDS of any potentially hazardous substances to be used)
8. A traffic control plan (if applicable)
9. An environmental protection plan and contingency plans for possible problems including a Frac-Out and Surface Spill Contingency Plan.
10. Identify the location for the pipe string (and rollers, if required)
11. Include a drilling fluid plan, which details types of drilling fluids to be used, cleaning and recycling equipment, estimated flow rates, procedures for minimizing drilling fluid escape, and the method/location for final disposal of waste drilling fluids
12. Identify the maximum allowable pulling load on the pipe string to avoid overstressing the pipe

Work plan should be comprehensive, realistic and based on actual working conditions for this particular project. Plan should document the thoughtful planning required to successfully complete the project. The requirements stated above are the minimum required. The work plan shall be approved by Engineer prior to beginning bore operation.

B. Shop Drawing Submittals:

The Contractor shall submit shop drawings, working drawings, schedules and samples in accordance with Section 013300 of the technical specifications.

C. Record Drawings:

Submit for Owner and Engineer's approval the as-built records within thirty days (30) after completing the pull back. The as-built records shall include a plan, profile (data every 25 LF of main, at a minimum), and all information recorded during the progress of the work, including all subsurface anomalies identified by Ground Penetrating Radar or excavation. The Jack and Bore Contractor shall certify the accuracy of all as-built record drawings. Contractor shall maintain a daily project log of drilling operations and a guidance system log with a copy given to Engineer at completion of project. As-built drawings shall be in accordance with Section 013300 of the technical specifications and certified as to accuracy by the Engineer.

1.06 ENVIRONMENTAL PROTECTION

The Contractor shall be fully responsible for the directional drilling operation. Contractor shall place silt fence or silt soxx between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Contractor shall place hay bales, or approved protection, to limit intrusion upon project area. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. The HDD operation is to be performed in a manner to eliminate the discharge of water, drilling mud and cuttings to nearby waterways. All excavated pits used in the drilling operation shall be lined by Contractor with heavy duty plastic sheeting with sealed joints to prevent the migration of drilling fluids and/or ground water.

Contractor shall adhere to all applicable environmental regulations including environmental condition stated in local, state and federal permits. Fuel may not be stored in bulk containers (greater than 25 gallons) within 200' of any water-body or wetland.

1.07 SAFETY

The Contractor shall be solely responsible for the safety of all parties. Contractor shall adhere to all applicable state, federal and local safety regulations. All operations shall be conducted in a safe manner.

Provide all structures, safety equipment, and professional services required to provide for the health and safety of the general public and of personnel involved in pipe boring and jacking work in accordance with the requirements of the regulatory agencies having jurisdiction.

1.08 PERSONNEL QUALIFICATIONS CERTIFICATION

The Contractor shall have equipment and expertise, appropriate for jack and bore installations. This includes the preparation and maintenance of the bore path using drilling fluids appropriate for the geology of the soils. The Contractor shall also have experience in safety and dependability installing, in similar geology, similar size and length of piping involved.

A. Jack and Bore:

Jack and Boring and pipe installation shall be done only by an experienced Contractor specializing in horizontal drilling and whose key personnel have at least five (5) years experience in this work. Furthermore, the Contractor shall have installed jack and bored pipe at least as large as the pipe diameter specified for this project, have performed crossings at least 300 feet in length, and successfully installed at least 100,000 feet in length.

All personnel shall be fully trained in their respective duties as part of the horizontal drilling crew and in safety. (Each person must have been fully trained for over 1,000 hours on all facets of horizontal drilling, including, but not limited to machine operations, mud mixing, locating, and material fusion.) A responsible representative who is thoroughly familiar with the equipment and type of work to be performed, must be in direct charge and control of the operation at all times. In all cases the supervisor must be continually present at the job site during the actual Jack and Bore operation. The Contractor shall have a sufficient number of competent workers on the job at all times to insure the Jack and Bore is made in a timely and satisfactory manner.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS:

A. Encasement Pipe:

1. Smooth welded steel encasement pipe shall conform to ASTM A139, Grade A Steel with a smooth wall.
2. Steel pipe casings shall conform to the requirements of AWWA C200 and ASTM A139 (straight seam pipe only), Grade "B" with a minimum yield strength of 35,000 psi and be of a thickness equal to or exceeding the minimum gauge indicated on the Contract Drawings, and equal to or exceeding the requirements of the applicable governing agency. Pipe casing to be placed by jacking methods shall be of sufficient thickness and axial strength to withstand the forces to be encountered during the jacking process. The pipe shall be coated externally with coal-tar primer followed by hot coal-tar enamel in accordance with ANSI/AWWA C203. The casing shall be shop cut with ends square with centerline, leveled and welded so that the entire length of the casing shall be straight and true.
3. Field and shop welds of the casing pipes shall conform to the American Welding Society (AWS) standard specifications and shall be performed by qualified welders. Field welds shall be complete penetration (butt welded), single-bevel groove type joints in accordance with the requirements of ANSI/AWWA C206. Welds shall be airtight, continuous over the entire circumference of the pipe, and shall not increase the outside pipe diameter by more than 3/4-inch. Nor shall there be intrusion of the weld metal into the bore of the casing. It shall be the Contractor's responsibility to provide stress transfer across the joints which is capable of resisting the jacking forces involved.
4. The minimum casing pipe size and wall thickness shall be as shown in the following table. The minimum wall thickness for steel encasement pipe shall conform to AREMA, "Specifications for Pipelines Conveying Nonflammable Substances".

Steel Encasement Pipe Nominal Diameter (Inches)	Steel Encasement Pipe Minimum Wall Thickness (Inches)
12	0.3750
20	0.3750
36	0.5625

5. A vent pipe shall be installed on the encasement pipe as shown and described on the Construction Drawings.

B. Carrier Pipe

1. The carrier pipe material shall be in accordance with the Construction Drawings and specifications and will be restrained with manufacturer's restrained joints.

- C. Casing Spacers
 - 1. Casing spacers by BWM Company, or approved equal shall be used. Stainless Steel nuts and bolts shall be used.
- D. Encasement Pipe End Seals
 - 1. Encasement end seals shall be rubber seals with stainless steel bands.
- E. Auguring Fluids
 - 1. Auguring fluids shall be a mixture of bentonite clay, or other approved stabilizing agent, mixed with potable water with a minimum pH of 6.0 to create a drilling fluid for lubrication and stabilization, as necessary. Vary the fluid viscosity to best fit the soil conditions encountered. Do not use other chemical or polymer surfactant in the drilling fluid without written consent of the Engineer. Certify in writing to the Engineer that any chemicals to be added are environmentally safe and not harmful or corrosive to the facility. Identify the source of water for mixing the drilling fluid. Approvals and permits are required for obtaining water from such sources as rivers, streams, ponds, and fire hydrants. Any water source used other than potable water shall require a pH test. Contractor is responsible for obtaining and paying for any approvals and permits for obtaining water. This cost will be considered incidental and not paid for separately.

2.02 DELIVERY, STORAGE AND HANDLING OF MATERIALS

- A. Care shall be taken during transportation of the pipe to ensure that it is not cut, kinked, or otherwise damaged. Inspect materials delivered to the site for damage. All materials found during inspection or during the progress of work to have cracks, flaws, cracked linings, or other defects shall be rejected and removed from the job site without delay.
- B. Unload and store opposite or near the place where the work will proceed with minimum handling. Store material under cover out of direct sun light. Pipes shall be stored on level ground, preferably turf or sand, free of sharp objects which could damage the pipe. Stacking of the polyethylene pipe shall be limited to a height that will not cause excessive deformation of the bottom layers of pipes under anticipated temperature condition. Where necessary due to ground conditions, the pipe shall be stored on wooden sleepers, spaced suitably and of such widths as not to allow deformation of the pipe at the point of contact with the sleeper or between supports. Keep all materials free of dirt and debris.
- C. Ropes, fabric, or rubber protected slings and straps shall be used when handling pipes. Chains, cables, or hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe or fittings shall not be dropped onto rocky or unprepared ground. The open ends of all sections of installed pipe (not in service) shall be plugged at night to prevent animals or foreign material from entering the pipe line or pipe section. Waterproof nightcaps of approved design may be used but they shall also be so constructed that they will prevent the entrance of any type of natural precipitation into the pipe and will be fastened to the pipe in such a manner that the wind cannot blow them loose. The practice of stuffing cloth or paper in the open ends of the pipe will be considered unacceptable.
- D. Contractor is responsible for obtaining, transporting and sorting any fluids, including water, to the work site. The use of water or slurry under pressure (jetting) or puddling

shall not be permitted to facilitate boring, pushing, or jacking operations. Water or slurry used to lubricate the cutter and pipe is acceptable.

- E. Disposal of fluids is the responsibility of the Contractor. Disposal of fluids shall be done in a manner that is in compliance with all permits and applicable federal, state, or local environmental regulations. Contractor shall thoroughly clean entire area of any fluid residue upon completion of installation, and replace any and all plants and sod damaged, discolored or stained by drilling fluids.

PART 3 – EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Steel casing pipe shall be jacked-bored in place to provide a casing for the carrier pipe.
- B. The Contractor shall comply with all appropriate regulatory agency requirements respectively as per the permits issued for this project.
- C. The installation of the pipeline casings shall be in accordance with all the requirements of the governing regulatory agency.
- D. The Contractor is responsible for verifying location of all utilities prior to beginning any work. Any conflicts with grades and alignments shown on the plans shall be brought to the Engineers attention.

3.02 CONSTRUCTION REQUIREMENTS

- A. Jack-bore pits shall be excavated and maintained to the minimum dimensions necessary to perform the operation. Said excavations shall be adequately barricaded, sheeted, braced, and dewatered, as required.
- B. A two-inch auger pilot hole shall first be attempted to determine if rock will prevent the installation of the casing. If the pilot hole is successfully made, the casing shall be installed.
- C. The leading section of casing shall be equipped with a jacking head securely anchored to prevent any wobble or variation in alignment during the jacking operation.
- D. Excavation shall be performed entirely within the jacking head and no excavation in advance thereof shall be permitted. Every effort shall be made to avoid any loss of earth outside the jacking head.
- E. Excavated material shall be removed from the casing as excavation progresses, and no accumulation of such material within the casing will be permitted.

3.03 BORING AND JACKING

- A. The jack-bore operations shall be done simultaneously, with continuous installation, until the casing pipe is in final position. Correct line and grade shall be carefully maintained. Add on sections of casing pipe shall be full-ring welded to the preceding length, developing watertight total pipe strength joints. The casing installation shall produce no upheaval, settlement, cracking, movement, or distortion of the existing facilities.

- B. Casing pipes shall be located at suitable approved alignments in order to eliminate possible conflicts with existing or future utilities and structures, with a minimum 36-inch depth of cover between the top of the casing pipe and the lowest point of finished ground surface. For casing pipe crossings under railroads or roadways, the Contractor shall comply with the regulations of said authority in regard to design, specifications, and construction.
- C. Casing pipe holes shall be mechanically bored through the soil by a cutting head on a continuous auger mounted inside the pipe. The auger shall extend a minimum distance beyond the end of the casing pipe to preclude formation of voids outside of the pipe shell.
- D. The invert elevation of the steel casing for the individual roadway crossings shall be set in the field by the Contractor and shall be based on the minimum vertical clearance between the top of the carrier pipe, unless otherwise indicated on the Construction Drawings, and the existing utilities on either side of the crossing site unless otherwise noted on the Construction Drawings.
- E. The casing pipe shall be adequately protected to prevent crushing or other damage under jacking pressures. Backstops shall be provided for adequately distributing the jack thrust without causing deformation of the soil or other damage. Should the casing pipe be damaged, such damaged portion, if not in the hole, shall be replaced; however, if inserted, the encasement pipe shall be abandoned in place, grouted full, and suitably plugged, and an alternate installation made at no additional expense to the Owner.
- F. The ends of the casing pipe shall extend on both sides a minimum distance of three feet beyond the edge of any existing right-of-way or as specified in the permit requirements or shown on the Construction Drawings, whichever is greater.

3.04 LOSS OF GROUND

- A. Should appreciable loss of ground occur during the jacking operation, the voids shall be backpacked promptly to the extent practicable with soil cement consisting of a slightly moistened mixture of one-part cement to five parts granular material. Where the soil is not suitable for this purpose, the Contractor shall provide suitable material at his expense.
- B. The soil cement shall be thoroughly mixed and rammed into place as soon as possible after the loss of ground.

3.05 TOLERANCES

- A. Extreme care shall be exercised by the Contractor to maintain line and grade during jacking operation, and the Contractor may be required to modify the manner in which he is conducting his jacking operation to correct any deviation when deemed necessary by the State or Inspector.

3.06 RESPONSIBILITY

- A. The Contractor shall be fully responsible for the placement of the casing. The details shown on the Construction Drawings are to be considered minimum only.

3.07 CARRIER PIPE

- A. Once the casing pipe is in place, the actual carrier pipe shall be installed inside the casing. All carrier pipes shall be installed with restrained joints per pipe manufacturers

specifications. The carrier pipe shall be installed within the casing pipe using approved manufacture casing spacers to center the carrier pipe within the casing pipe. The casing runner height shall be large enough so that it does not interfere with the pipe restrained joints. The spacers shall be spaced as shown on the Construction Drawings.

- B. The pressure of sliding carrier pipe into the casing shall not be applied directly to carrier pipe. A plank, timber, or other material acceptable to the Project Manager shall be placed over the pipe end, during pushing, to protect it from damage.
- C. Adjust the pipe grade as required by changing the thickness of the spacers to compensate for any grade variations of the casing.
- D. If the alignment of the casing is such that the pipe grade cannot be met, the grade of the pipe shall be adjusted, if required by the Project Manager or Inspector. If realignment is not deemed feasible, another casing meeting the required grade shall be installed. The abandoned casing shall be filled with sand and the ends plugged with 12-inch thick masonry plugs. Realignment or replacement work shall in no way result in extra cost to the State.
- E. The casing pipe shall be cut and trimmed. Once cut and trimmed the ends of the casing pipe shall be sealed to the carrier pipe using rubber casing end seals and mechanically fastened to both pipes per detail.

3.08 INSURANCE REQUIREMENTS, FLAGGING REQUIREMENTS AND FEES

- A. All work performed within the State of Missouri property limits shall be in accordance with the requirements of the State which are hereby made a part of these specifications. It is the responsibility of the Contractor to determine all requirements of the State and to comply with said requirements including any necessary bonds, cash deposit, or insurance.
- B. The Contractor will not be permitted to commence work until bonds, cash deposits, or insurance furnished pursuant to the above by the Contractor is to the satisfaction of the State.

3.09 TESTING

- A. All tests shall be performed as specified in Section 333000 – Sanitary Sewerage Utilities.

3.10 SUCCESSFUL COMPLETION

- A. The Contractor shall be considered as having completed the requirements of any one boring or jacking when he has successfully completed the work to the satisfaction of the Engineer of Record.

END OF SECTION 330523.16

SECTION 331000 – WATER UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes piping and specialties for water service.

1.02 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressures: The following are minimum pressure requirements for piping and specialties, unless otherwise indicated:
 - 1. Water Service: 160 psig.

1.03 SUBMITTALS

- A. Product Data for the following:
 - 1. Water meters.
 - 2. Water-meter bars.
 - 3. Backflow preventers.
 - 4. Pipe and fittings.
 - 5. Flexible pipe fittings.
 - 6. Valves.
 - 7. Fire hydrants.
 - 8. Flushing hydrants.
 - 9. Yard hydrants.
- B. Shop Drawings: For precast concrete structures. Include frames and covers and drains.
- C. Record Drawings: At Project closeout of installed water-service piping according to Division 1.
- D. Test Reports: As specified in "Field Quality Control" Article in Part 3.
- E. Purging and Disinfecting Reports: As specified in "Cleaning and Disinfection" Article in Part 3.
- F. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 33
 - 1. Include data for the following:
 - a. Water meters.
 - b. Backflow preventers.

- c. Valves.
- d. Fire hydrants.
- e. Flushing hydrants.
- f. Yard hydrants.

1.04 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered.
- B. Comply with requirements of utility supplying water. Include tapping of water mains and backflow prevention.
- C. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.
- D. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.
- E. Comply with standards of authorities having jurisdiction for fire-protection water-service piping. Include materials, hose threads, installation, and testing.
- F. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.

1.05 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.
- 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 whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve 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.

1.06 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Verify that water-service piping may be installed to comply with original design and referenced standards.
- C. 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 Engineer not less than two days in advance of proposed utility interruptions.

1.07 SEQUENCING AND SCHEDULING

- A. Coordinate connection to water main with utility company (Table Rock State Park).
- B. Coordinate with other utility work.

1.08 CONTROLLING SPECIFICATION

- A. The more restrictive specification or requirement between the information shown in this document or the referenced Standard shall control.

PART 2 - PRODUCTS

2.01 PIPE MATERIAL

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. Copper Tube: ASTM B 88 (ASTM B 88M), seamless water tube, annealed temper.
- C. Ductile-Iron, Push-on-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.
- D. Ductile-Iron, Mechanical-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.

- E. PVC Plastic, Pipe: Class 200, DR 21. Include elastomeric seal according to ASTM F 477.

2.02 PIPE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Cast-Copper-Alloy Flanges: ASME B16.24, Class 150 or 300, as required for system operating pressure.
- C. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111.
- D. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
- E. Ductile-Iron, Flanged Fittings: AWWA C110, with cement-mortar lining and seal coat according to AWWA C104 or epoxy, interior coating according to AWWA C550. Include gaskets and bolts and nuts. Pipe flanges shall be ductile iron conforming to ANSI B16.1 and shall be drilled Class 125.
- F. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Units have 2 gasketed ball-joint sections and 1 or more gasketed sleeve sections. Include 250-psig (1725-kPa) minimum working-pressure rating; epoxy, interior coating according to AWWA C550; length for offset and expansion indicated; and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
- G. Ductile-Iron, Deflection Fittings: Compound coupling fitting with sleeve and flexing sections, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include 250-psig minimum working-pressure rating; cement-mortar lining or epoxy, interior coating according to AWWA C550; deflection of at least 20 degrees; and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
- H. Ductile-Iron Expansion Joints: 3-piece assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include 250-psig minimum working-pressure rating; cement-mortar lining or epoxy, interior coating according to AWWA C550; length for expansion indicated; and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
- I. Ductile-Iron Fittings for PVC Pipe: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type; push-on- or mechanical-joint type. Include dimensions matching PVC pipe, cement-mortar lining and seal coat according to AWWA C104, and rubber compression gaskets according to AWWA C111.

2.03 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Ductile-Iron Piping: The following materials apply:

1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.
 2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
 3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.
 - a. Gaskets: 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. Brazing Filler Metals: AWS A5.8, BCuP Series.
- D. Pipe Couplings: Iron-body sleeve assembly, fabricated to match OD of pipes to be joined.
1. Sleeve: ASTM A 126, Class B, gray iron.
 2. Followers: ASTM A 47 (ASTM A 47M), malleable iron; or ASTM A 536, ductile iron.
 3. Gaskets: Rubber.
 4. Bolts and Nuts: AWWA C111.
 5. Finish: Enamel paint.
- E. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.04 PIPING SPECIALTIES

- A. Flexible Connectors for Ferrous Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1 threaded steel pipe nipples or ASME B16.5 steel pipe flanges; welded to hose.
- B. Dielectric Fittings: Assembly or fitting with insulating material isolating joined dissimilar metals to prevent galvanic action and corrosion.
1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
 2. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material isolating dissimilar metals and ends with inside threads according to ASME B1.20.1.
 3. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum pressure to suit system pressures.
 4. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

- a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.
5. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F.
6. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types and 300-psig working pressure at 225 deg F.

2.05 POLYETHYLENE PLASTIC ENCASUREMENT

- A. Polyethylene Plastic Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch minimum thickness, tube or sheet.

2.06 VALVES

- A. Nonrising-Stem, Resilient-Seated Gate Valves, 3-Inch NPS (DN80) and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig minimum working-pressure design, interior coating according to AWWA C550, and buried valves shall be mechanical-joint with a 2-inch operating nut, exposed or interior valves shall have flanged ends and have hand wheel operators. Valves shall open counter-clockwise. Valve stems shall use double "O" ring seals.
- B. Valve Boxes: For Traffic Areas - Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.
 1. Provide steel tee-handle operating wrench. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.
- C. Valve Boxes: For Non-Traffic Areas - Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 6 inches in diameter PVC and extend 4 inches above grade, and length required for depth of bury of valve.
- D. Curb Stops: Bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet to match service piping material.
- E. Tapping Sleeve and Tapping Valve: Complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. Use sleeve and valve compatible with tapping machine.
 1. Tapping Sleeve: Cast- or ductile-iron, 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical-joint ends with rubber gaskets or sealing rings in sleeve body. Include sleeve matching size and type of pipe material being tapped and of outlet flange required for branch connection.
- F. Service Clamps and Corporation Stops: Complete assembly, including service clamp, corporation stop, and bolts and nuts. Include service clamp and stop compatible with drilling machine.

1. Service Clamp: Cast iron or ductile iron with gasket and AWWA C800 threaded outlet for corporation stop, and threaded end straps.
 2. Corporation Stops: Bronze body and ground-key plug, with AWWA C800 threaded inlet and outlet matching service piping material.
- G. Ball Valves: AWWA C507, minimum operating pressure of 150 psig. Include interior coating according to AWWA C550, flanged valve ends. Bodies shall be ASTM 126, Class B cast iron for 2-1/2" and larger. Smaller valves shall be bronze body. Valve trim shall be bronze. Valves shall open counterclockwise. Exposed valves 3-inches and smaller shall be lever operated. Exposed valves 3-inches and larger shall be operated with a handwheel through an enclosed worm gear. Buried valves shall have a 2-inch operating nut operated by an enclosed worm gear operator.
- H. Butterfly Valves: AWWA C504, with 150-psig working-pressure rating. Include interior coating according to AWWA C550. Materials shall be: Body - Cast Iron ASTM A126, Class B; Shaft - Stainless Steel 18-8, Type 304; Disc - Iron for AWWA 150B service; and Seat - Buna-N rubber stainless steel trimmed. Valve shall be equipped with a suitable sized gear actuator and 2-inch operating nut. The body shall have mechanical joint ends. Retainer glands are to be used when installed on DIP.
- I. Check Valves: AWWA C508, with 175-psig working-pressure rating. Include interior coating according to AWWA C550. Valve hinge pins shall be stainless steel. Valve disc shall be full opening with a composition to metal seat. Valve shall be flanged unless noted otherwise on the Drawings. Valves shall be equipped with an external lever that is spring assisted. The spring tension shall be field adjustable by a hex nut. The lever arm shall be keyed to the valve hinge shaft.
- J. Check Valves - Cushioned: AWWA C508, with 175-psig working-pressure rating, with addition of exterior cushion chamber. Include interior coating according to AWWA C550. Swing disc type with stainless steel shaft and flanged body. Flanges shall be ANSI B16.1, Class 125. Valve disc shall have external lever and adjustable counterweight to initiate closure. Valves shall have a metal to composition seat.

2.07 SPECIALTY VALVES

- A. Pressure-Regulating Valves: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. Include 250-psig working-pressure design, bronze pressure-reducing pilot valve and tubing, and means for discharge pressure adjustment.
- B. Flow-Regulating Valves: Automatic, pilot-operated, cast-iron body with interior coating according to AWWA C550. Include 250-psig working-pressure design, bronze pressure-reducing pilot valve and tubing, and means for flow adjustment.
- C. Air-Release Valve: AWWA C512, hydromechanical device to automatically release accumulated air. Include 300-psig working-pressure design.
- D. Air/Vacuum Valve: AWWA C512, direct-acting, float-operated, hydromechanical device with large orifice to automatically release accumulated air or to admit air during filling of piping. Include 300-psig working-pressure design.
- E. Combination Air Valves: AWWA C512, float-operated, hydromechanical device to automatically release accumulated air or to admit air. Include 300-psig working-pressure design.

2.08 WATER METERS

- A. Description: AWWA C700, displacement type, bronze main case. Register flow in gallons, unless cubic feet are indicated.
- B. Description: AWWA C702, compound type, bronze case. Register flow in gallons, unless cubic feet are indicated.

2.09 WATER-METER BOXES

- A. Description: The meter box covers shall be of cast iron construction of a good quality cast iron (at least 50 percent new pig) cover for disc-type water meter. Include lettering "WATER METER" in cover. It shall be constructed to fit on the meter box with lugs extended into the bottom to prevent displacement of the cover. Cover shall be Clay & Bailey, D2210 with lifting lugs or approved equal. The box cover shall be not less than 4-inches high. PVC plastic base slotted, open-bottom base section of length to fit over service piping.

2.10 CONCRETE PITS

- A. Description: Precast, reinforced-concrete pit, designed for A-16 load designation according to ASTM C 857, and made according to ASTM C 858.
- B. Ladder: ASTM A 36, steel or polyethylene-encased steel steps.
- C. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron, 24-inch minimum-diameter traffic frame and cover.
 - 1. Weight and Dimensions: Not smaller than 24-inch diameter, unless otherwise indicated.
- D. Drain: ASME A112.21.1M, cast-iron area drain, of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.11 FIRE HYDRANTS

- A. Description: AWWA C502 except as amended. Cast-iron body, compression-type valve, opening against pressure and closing with pressure, 6-inch (DN150) inlet with standard flange connection for directly bolting to auxiliary gate valve inlet, and 150-psig minimum working-pressure design. Hydrants shall have replaceable "breakable" sections.
- B. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
- C. Operating and Cap Nuts: Pentagon 1-1/2 inch point to flat.
- D. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
- E. Exterior Finish: Alkyd-gloss enamel paint, **with color as designated by utility having jurisdiction.**
- F. Dry-Barrel Fire Hydrants: AWWA C502, two 2-1/2-inch NPS (DN65) and one 4-1/2-inch

NPS (DN115) outlets, 5-1/4-inch main valve, drain valve, and 6-inch NPS (DN150) mechanical-joint inlet. Include 250-psig minimum working-pressure design and interior coating according to AWWA C550.

2.12 FLUSHING HYDRANTS

- A. Description: Nonfreeze and drainable, with 150-psig minimum working-pressure rating and of length required for shutoff valve installation below frost line. Include one operating wrench for each unit.
- B. Post-Type Flushing Hydrants: With the following features:
 - 1. Outlet: One, with horizontal discharge.
 - 2. Hose Thread: 2-1/2-inch NPS (DN65), with NFPA 1963 external hose thread used by local fire department. Include cast-iron cap with brass chain.
 - 3. Barrel: Cast-iron or steel pipe with breakaway feature.
 - 4. Valve: Brass body with brass-ball or plunger closure, and automatic draining.
 - 5. Security: Locking device for padlock.
 - 6. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.
 - 7. Inlet: 2-inch NPS (DN50) minimum.
- C. Sampling Station: Post type with the following features:
 - 1. Sampling Outlet: One unthreaded nozzle with handle.
 - 2. Valve: Brass body with brass-ball or plunger closure. Include operating handle.
 - 3. Drain: Tubing with separate manual vacuum pump.
 - 4. Inlet: 3/4-inch NPS (DN20) minimum.
 - 5. Housing: Weatherproof material with locking device. Include anchor device.

2.13 BACKFLOW PREVENTERS

- A. General: Manufactured backflow preventers, of size indicated for maximum flow rate and maximum pressure loss indicated.
- B. Working Pressure: 150 psig minimum, unless otherwise indicated.
- C. 2-Inch NPS (DN50) and Smaller: Bronze body with threaded ends.
- D. 2-1/2-Inch NPS (DN65) and Larger: Bronze, cast-iron, steel, or stainless-steel body with flanged ends.
- E. Interior Lining: AWWA C550, epoxy coating for backflow preventers with cast-iron or steel body.
- F. Interior Components: Corrosion-resistant materials.

- G. Strainer on inlet if strainer is indicated.
- H. Hose-Connection Vacuum Breakers: ASSE 1011, nickel plated, with nonremovable and manual drain features, and ASME B1.20.7, 3/4-11.5NH threads for garden hose on outlet. Units attached to rough-bronze-finish hose connections may be rough bronze.
- I. Reduced-Pressure-Principle Backflow Preventer: AWWA C511, with OS gate valves on inlet and outlet, and strainer on inlet. Include test cocks and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between 2 positive-seating check valves for continuous-pressure application.
 - 1. Pressure Loss: 12 psig maximum through middle third of flow range.
- J. Double-Check-Valve Assembly: AWWA C510, with OS&Y gate valves on inlet and outlet, and strainer on inlet.
 - 1. Pressure Loss: 5 psig maximum through middle third of flow range.
- K. Antisiphon, Pressure-Type Vacuum Breakers: ASSE 1020, with valves, spring-loaded check valve, and spring-loaded floating disc. Include test cocks and atmospheric vent for continuous-pressure application.
 - 1. Pressure Loss: 5 psig maximum through middle third of flow range.

2.14 YARD HYDRANTS

- A. Yard Hydrants, Sanitary, Post Type: Nonfreeze, with nondraining chamber for storing water trapped downstream from inlet valve. Include 1-inch NPS (DN25) inlet, integral or field-installed vacuum breaker with outlet complying with ASME B1.20.7, 3/4-11.5NH threads for garden hose, brass or bronze casing, and other parts in contact with water, and are handle or key operated. Include body length required for installing storage chamber below frost line. Furnish 2 keys for each key-operated hydrant.

2.15 ANCHORAGES

- A. Clamps, Straps, and Washers: ASTM A 506, steel.
- B. Rods: ASTM A 575, steel.
- C. Rod Couplings: ASTM A 197, malleable iron.
- D. Bolts: ASTM A 307, steel.
- E. Cast-Iron Washers: ASTM A 126, gray iron.
- F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig.
 - 1. Cement: ASTM C 150, Type I.
 - 2. Fine Aggregate: ASTM C 33, sand.
 - 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 - 4. Water: Potable.

2.16 IDENTIFICATION

- A. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

PART 3 - EXECUTION

3.01 EARTHWORK

- A. Refer to Division 31 Section "Earthwork" for excavation, trenching, and backfilling.

3.02 PIPING APPLICATIONS

Use pipe, fittings, and joining methods for piping systems according to the following applications:

- A. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- B. Do not use flanges for underground piping.
 - 1. Exception: Piping in boxes and structures, but not buried, may be joined with flanges instead of joints indicated.
- C. Flanges and special fittings may be used on aboveground piping.
- D. Water Piping: As indicated on the Drawings:
 - 1. 3/4- to 2-Inch NPS (DN20 to DN50): Copper tube, Type K (Type A); copper fittings; and brazed joints.
 - 2. 3/4- to 2-Inch NPS (DN20 to DN50): PVC plastic, Schedule 40 pipe push-on joint pipe; PVC plastic, Schedule 40, with push-on joints fittings.
 - 3. 4-Inch NPS (DN100 to DN200): Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
 - 4. 4-Inch NPS (DN100 to DN200): Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
 - 5. 4-Inch NPS (DN100 to DN200): PVC plastic, Class 200, ductile-iron fittings for PVC plastic pipe; and gasketed joints.
 - 6. 6- to 12-Inch NPS (DN150 to DN300): Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed joints.
 - 7. 6- to 12-Inch NPS (DN150 to DN300): Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
 - 8. 6- to 12-Inch NPS (DN100 to DN200): PVC plastic, Class 200, ductile-iron fittings for PVC plastic pipe; and gasketed joints.

3.03 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used.

3.04 JOINT CONSTRUCTION

- A. Ductile-Iron Piping, Gasketed Joints: According to AWWA C600.
- B. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.
- C. Threaded Joints: Thread pipes with tapered pipe threads according to ASME B1.20.1, apply tape or joint compound, and apply wrench to fitting and valve ends into which pipes are being threaded.
- D. Copper Tubing, Brazed Joints: According to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
- E. 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.
- F. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, OD, and system working pressure. Refer to "Piping Systems - Common Requirements" Article below for joining piping of dissimilar metals.

3.05 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings 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.
- B. Install components with pressure rating equal to or greater than system operating pressure.
- C. Install piping free of sags and bends.
- D. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- E. Install fittings for changes in direction and branch connections.
- F. Piping Connections: Unless otherwise indicated, make piping connections as specified below:
 - 1. Install unions, in piping 2-inch NPS (DN50) and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS (DN50) or smaller threaded pipe connection.
 - 2. Install flanges, in piping 2-1/2-inch NPS (DN65) and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 - 3. Install dielectric fittings to connect piping of dissimilar metals.

- G. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the quantities stipulated in Tables 4 & 5 of ANSI/AWWA C600 for ductile iron pipe and/ or manufactures recommendations for other pipe material.

3.06 PIPING INSTALLATION

- A. Water-Main Connection: Tap water main with size and in location as indicated according to requirements of water utility.
- B. Make connections larger than 2-inch NPS (DN50) with tapping machine according to the following:
 - 1. Install tapping sleeve and tapping valve according to manufacturer's written instructions.
 - 2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
 - 3. Install gate valve onto tapping sleeve. Comply with AWWA C600. Install valve with stem pointing up and with cast-iron valve box.
 - 4. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
- C. Make connections, 2-inch NPS (DN50) and smaller, with drilling machine according to the following:
 - 1. Install service clamps and corporation stops in size, quantity, and arrangement required by utility company standards and according to manufacturer's written instructions.
 - 2. Install service clamps on pipe to be tapped. Position outlets for corporation stops.
 - 3. Install corporation stops into service clamps. Install with stem pointing up.
- D. Install ductile-iron piping according to AWWA C600.
- E. Install copper tube and fittings according to CDA's "Copper Tube Handbook."
- F. Install AWWA PVC plastic pipe according to AWWA M23 and ASTM F 645.
- G. Bury piping with depth of cover over top at least 42 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
 - 1. Under Driveways: With at least 42 inches cover over top.
 - 2. Under Railroad Tracks: With at least 48 inches cover over top.
 - 3. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.
- H. Install piping under streets and other obstructions that cannot be disturbed, by tunneling, jacking, or combination of both.

3.07 REACTION ANCHORAGE AND BLOCKING

- A. All unugged bell and spigot or all-bell tees, Y-branches and bends deflecting 11-1/4 degrees or more which are installed in piping subjected to internal hydrostatic heads in excess of 15 feet in exposed, or 30 feet in buried, piping shall be provided with suitable reaction blocking, struts, anchors, clamps, joint harness, or other adequate means for preventing any movement of the pipe caused by unbalanced internal liquid pressure.
- B. Trench installation: Where in trench, the foregoing designated fittings shall be provided with concrete thrust blocking between the fitting and solid, undisturbed ground in each case, except where solid ground blocking support is not available. At the tops of slopes vertical angle bends shall be anchored by means of steel strap or rod anchors securely embedded in or attached to a mass of concrete of sufficient weight to resist the hydraulic thrust at the maximum pressures to which the pipe will be subjected. All concrete blocking and anchors shall be installed in such a manner that all joints between pipe and fittings are accessible for repair.
- C. The bearing area of concrete reaction blocking against the ground or trench bank shall be as shown by the plans or as directed by the Engineer in each case. In the event that adequate support against undisturbed ground cannot be obtained, metal harness anchorages consisting of steel rods or bolts across the joint and securely anchored to pipe and fitting or other adequate anchorage facilities approved by the Engineer shall be installed to provide the necessary support. Should the lack of a solid vertical excavation face be due to careless or otherwise improper trench excavation, the entire cost of furnishing and installing metal harness anchorages in excess of the contract value of the concrete blocking replaced by such anchorages shall be borne by the Contractor.
- D. For other locations: Reaction blocking, struts, anchorages, or other supports for fittings installed in fills or other unstable ground, above grade, or exposed within structures, shall be provided as required by the plans or as directed by the Engineer.
- E. Protection of metal surfaces: All steel clamps, rods, bolts and other metal accessories used in reaction anchorages or joint harness subject to submergence or contact with earth or other fill material and not encased in concrete shall be adequately protected from corrosion with not less than two coats of Koppers "Bitumastic No. 50", or approved equal, heavy coal tar coating material, applied to clean, dry metal surfaces. The first coat shall be dry and hard before the second coat is applied. Metal surfaces exposed above grade or within structures shall be painted with two coats (in addition to a primer coat) of a paint approved by the Engineer.

3.08 LOCATION OF WATER MAINS WITH RESPECT TO SEWERS

- A. Horizontal Separation – water mains shall be laid at least ten feet (10') horizontally from any existing or proposed sewer line. The distance shall be measured edge-to-edge. In cases where it is not practical to maintain a ten-foot (10') separation, the Missouri Department of Natural Resources may allow deviation on a case-by-case basis, if supported by data from the design engineer. This deviation may allow installation of the water main closer to a sewer, provided that the water line is in a separate trench or on an undisturbed earth shelf located on one (1) side of the sewer at an elevation that the bottom of the water line is at least eighteen inches (18") above the top of the sewer.
- B. Crossings – Water lines crossing sewers shall be laid to provide a minimum vertical distance of eighteen inches (18") between the outside of the water line and the outside of the sewer. This shall be the case where the water line is either above or below the sewer.

The crossing shall be arranged so that the water line joints will be equidistant and as far as possible from the sewer joints. When a water line crosses under a sewer, adequate structural support shall be provided for the sewer to prevent damage to the water line.

- C. Special Conditions – When it is impossible to obtain proper horizontal and vertical separation as stipulated previously, the sewer shall be designed and constructed of slip-on or mechanical joint ductile iron pipe or PVC pressure pipe for a distance of ten feet (10') on each side of the water line and shall be pressure tested to assure watertightness prior to backfilling.
- D. Sewer Manholes – No water pipe shall pass through or come into contact with any part of a sewer manhole.

3.09 VALVE INSTALLATION

- A. General Application: Use mechanical-joint-end valves for 3-inch NPS (DN80) and larger underground installation. Use flanged-end valves for installation for exposed and interior valves. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch NPS (DN50) and smaller installation.
- B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.
- C. Bronze Corporation Stops and Curb Stops: Comply with manufacturer's written instructions. Install underground curb stops with head pointed up.

3.10 FIRE HYDRANT INSTALLATION

- A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.
- B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage. No wet-barrel fire hydrants are indicated for this project.
- C. Burial depths for hydrants may vary but shall not be less than 4 feet. The steamer connection shall not be less than 12 inches nor greater than 24 inches above finished grade. The Contractor shall furnish and install all spool pieces as may be necessary to adjust hydrants to proper height.
- D. AWWA-Type Fire Hydrants: Comply with AWWA M17.

3.11 FLUSHING HYDRANT INSTALLATION

- A. Install post-type flushing hydrants with valve below frost line and provide for drainage. Support in upright position. Include separate gate valve or curb stop and restrained joints in supply piping.
- B. Install sampling stations with valve below frost line and provide for drainage. Attach weather-resistant housing and support in upright position. Include separate curb stop in supply piping.

3.12 WATER-METER INSTALLATION

- A. Install water meters, piping, and specialties according to utility company requirements.

- B. Water Meter: Install displacement-type water meters, 2-inch NPS (DN50) and smaller, in meter boxes with shutoff valve on water-meter inlet. Include valve on water-meter outlet and valved bypass around meter, unless prohibited by authorities having jurisdiction.
- C. Water Meter: Install compound-type water meters, 3-inch NPS (DN80) and larger, in meter pits. Include shutoff valves on water-meter inlet and outlet and valved bypass around meter. Support meters, valves, and piping on brick or concrete piers.

3.13 METER BOX CONSTRUCTION AND INSTALLATION

- A. Meter Box: Install PVC plastic, 18-inch diameter and not less than 36-inches in length.
- B. Meter Box Cover: The meter box covers shall be of cast iron construction of a good quality cast iron at least 50 percent of which shall be new pig. It shall be constructed to fit on the meter box with lugs extended into the bottom to prevent displacement of the cover. Cover shall be Clay & Bailey, D2210 with lifting lugs or approved equal. The box cover shall be not less than 4-inches high.

3.14 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to plumbing and health department authorities having jurisdiction.
- B. Do not install reduced-pressure-principle type in pit.
- C. Do not install bypass around backflow preventer.
- D. Support backflow preventers, valves, and piping on brick or concrete piers.

3.15 YARD HYDRANT INSTALLATION

- A. Install sanitary-type yard hydrants in pavement or with concrete anchor as indicated.

3.16 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water-service piping. Locate 6 to 8 inches below finished grade, directly over piping.

3.17 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Pressure Test:
 - 1. Test connections shall be made and the pipe filled with water. Unless otherwise specified, a pressure of 1.50 times the normal operating pressure (for the lowest point on the pipe line) but not less than the greater of 1.25 times the normal operating pressure or 150 pounds per square inch (psi). In no case shall the test pressure be allowed to exceed the design pressure for the pipe, appurtenances, or thrust restraints.

2. After air removal, water shall be pumped in to bring the pipe to the specified pressure. The hydrostatic test shall be of at least a 2-hour duration. Test pressure shall not vary by more than ± 5 psi for the duration of the test. After two hours, additional water shall be drawn from a container of known volume. The amount of water required to return the system to the specified pressure shall not exceed the amount determined by the following formula:

$$L = ND(P)^{1/2}/7,400, \quad \text{(Equation 1, AWWA C605-94)}$$

Where

- L - Allowable leakage, in gallons per hour
- N - Number of joints in the length of pipeline tested
- D - Nominal pipe diameter, inches
- P - Average test pressure, psi (gauge)

The allowable leakage must not exceed the volumes specified below for 50 joints of the particular diameter of pipe being tested:

**Allowable Leakage per 50 joints of Pipe* - gph
(AWWA C-600)**

Avg. Test Pressure (psi)	Nominal Pipe Diameter (in)										
	1.5	2	3	4	6	8	10	12	14	16	18
300	0.18	0.23	0.35	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11
275	0.17	0.22	0.34	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02
250	0.16	0.21	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92
225	0.15	0.20	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82
200	0.14	0.19	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72
175	0.13	0.18	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61
150	0.12	0.17	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49

3. All exposed pipe, fittings, valves, hydrants and joints shall be inspected and all evidence of moisture appearing on the surface of the ground during the test shall be investigated by the Contractor by excavation where the pipe has been covered with backfill. Should the leakage test results exceed allowable leakage, the test pressure shall be maintained for an additional period of time as directed by the Engineer to facilitate location of leaks.
4. All pipe, fittings, valves, pipe joints, hydrants, and other materials which are found to be defective when the pipe line is tested shall be removed from the line immediately and replaced with new and acceptable material by and at the expense of the Contractor. The pressure test shall be repeated after repairing leaks and other defective work until the pipe line installation conforms to specified requirements and is accepted by the Engineer.

C. Prepare reports for testing activities.

3.18 INTERRUPTED OPERATIONS

- A. When laying operations are interrupted or terminated at the end of a day, pipe ends shall be sealed temporarily to prevent the entry of water, debris, small animals, and similar types of contamination. Precautions shall be taken to prevent flotation of the sealed pipe during work stoppages.

3.19 CLEANING AND DISINFECTION

- 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, use procedure described in AWWA C651-99 or as described below:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine. Isolate system or part thereof 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. Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.
 3. Bacteriological Tests
 - a. Standard conditions. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 h apart, shall be collected from the new main. (Note: The pipe, the water loaded into the pipe, and any debris all exert a chlorine demand that can interfere with disinfection.) At least one set of samples shall be collected from every 1,200 ft of the new water main, plus one set from the end of the line and at least one set from each branch. All samples shall be tested for bacteriological (chemical and physical) quality in accordance with *Standard Methods for the Examination of Water and Wastewater*; and shall show the absence of coliform organisms; and, if required, the presence of a chlorine residual. Turbidity, pH, and a standard heterotrophic plate count or test may be required at the option of the purchaser, because new material does not typically contain coliforms but does typically contain HPC bacteria.
 - b. Special conditions. If trench water has entered the new main during construction or, if in the opinion of the purchaser, excessive quantities of dirt or debris have entered the new main, bacteriological samples shall be taken at intervals of approximately 200 ft, and the location shall be identified. Samples shall be taken of water that has stood in the new main for at least 16 h after final flushing has been completed.
 - c. Sampling procedure. Samples for bacteriological analysis shall be collected in sterile bottles treated with sodium thiosulfate as required by *Standard Methods for the Examination of Water and Wastewater*. No hose or fire hydrant shall be used in the collection of samples. (Note: For pipe repairs, if no other sampling port is available, well-flushed fire hydrants may be used with the understanding that they do not represent optimum sampling conditions.) There should be no water in the trench up to the connection for sampling. The sampling pipe must be dedicated

clean, disinfected, and flushed prior to sampling. A corporation cock may be installed in the main with a copper-tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use.

- d. Record of compliance. The record of compliance shall be the bacteriological test results certifying that the water sampled from the new water main is free of coliform bacteria contamination and is equal to or better than the bacteriologic water quality in the distribution system.
- e. If the initial disinfection fails to produce satisfactory bacteriological results or if other water quality is affected, the new main may be reflushed and shall be resampled. If check samples also fail to produce acceptable results, the main shall be rechlorinated by the continuous-feed or slug method until satisfactory results are obtained. High velocities in the existing system, resulting from flushing the new main, may disturb sediment that has accumulated in the existing mains. When check samples are taken, it is advisable to sample water entering the new main to determine the source of turbidity.

- B. Prepare reports for purging and disinfecting activities.

END OF SECTION 331000

SECTION 331122 - INSTALLATION OF TRACE WIRE

PART 1 - GENERAL

1.01 SECTION INCLUDES

This section covers the requirements for the installation of a conductive trace wire during the installation of water distribution pipelines including service lines, it will be used for locating the pipelines, laterals, services and appurtenances with an electronic pipe locator after installation.

1.02 SUBMITTALS

The Contractor shall submit the manufacturer's data on materials furnished that indicate compliance with the specifications regarding materials used.

1.03 MEASUREMENTS AND PAYMENT

There is no separate payment for the supply and installation of tracer wire on any construction or installation of water main by the Contractor. The Contractor shall consider the supply and installation of the tracer wire incidental to all construction of water main.

PART 2 – PRODUCTS

2.01 TRACE WIRE

- A. Open-Trench Installation: direct burial #12 AWG Solid (0.0808" diameter), steel core soft drawn tracer wire, 250# average tensile break load, 30 mil high molecular-high density polyethylene jacket complying with ASTM-D-1248, 30-volt rating. Color shall be "blue" for water pipelines. Manufactured by Copperhead Industries part number 1230-SF or approved equal.
- B. Directional Bore or Jacked Installation: direct burial #12 AWG Solid (0.0808" diameter), steel core hard drawn extra high strength horizontal directional drill tracer wire, 1150# average tensile break load, 45 mil high molecular-high density polyethylene jacket complying with ASTM-D-1248, 30-volt rating. Color shall be "blue" for water pipelines. Manufactured by Copperhead Industries part number 1245-EHS, or approved equal.

2.02 CONNECTORS

- A. Splices along the continuous run of trace wire for repair of a wire break or replacement of failed segment of wire shall use 3M Brand DBR Direct Bury Splice Kit or approved equal. Approved alternatives must securely connect two or more wires, effectively moisture seal by means of a dielectric non-hardening silicone sealant, manufacturer approved for direct burial and rated for a minimum of 50V.
- B. Branch connections for laterals, turnouts, services and appurtenances shall use DryConn Direct Bury Lug Aqua, or approved equal. Approved alternatives must securely connect one or two wires to the main trace wire without cutting the main trace wire, effectively moisture seal by means of a dielectric non-hardening silicone sealant, manufacturer approved for direct burial and rated for a minimum of 50V.

2.03 EXTRA TRACE WIRE MATERIAL

- A. Green tri-view plastic markers by Rhino w/Test Screws
- B. 4 ft U-channel posts
- C. Valve Box Top Sections
- D. Plastic test box

PART 3 – EXECUTION

Trace wire shall be installed on all water mains, laterals and appurtenances. The wire shall be installed in such a manner as to be able to properly trace all pipelines and services without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire.

3.01 INSTALLATION

- A. Trace wire shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation. It shall be secured to the pipe as required to ensure that the wire remains adjacent to the pipe. The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all trace wire access points.
- B. Except for approved spliced-in repair or replacement connections, tracer wire shall be continuous and without splices from each trace wire access point.
- C. Trace wire access points shall be accessible at all new water valve boxes. Concentrations of multiple proposed valves near pipe intersections, i.e. tees or crosses, may require more than one access point assembly in each concrete valve box collar. Trace wire access points shall be within public right-of-way or public utility easements.
 - 1. Bring trace wire to surface at a maximum spacing of one thousand (1,000) feet. The trace wire shall be brought to the surface in a vault, green plastic marker, valve box top section, or in test box. Take care not to damage the wire coating.
- D. Tracer wire shall be laid flat and securely affixed to the top or side of the pipe at 10-foot intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted. **See Figure 1.**

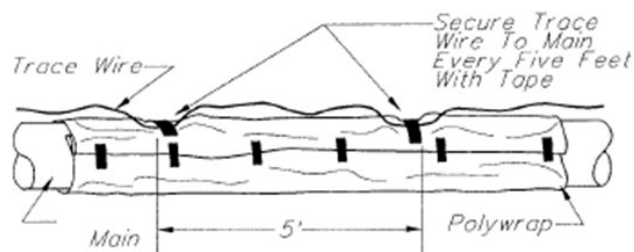


Figure 1

Trace Wire in Green Plastic Marker

When bringing the trace wire up in a green plastic marker, install the trace wire according to **Figure 2**. Bury a 4 foot u-channel post 2 feet in the ground. Run the trace wire up through the marker and slide the green plastic marker over the post. Bury the bottom six inches of the marker. Connect the trace wire to the brass connecting screws and label the screws with a permanent marker as shown in **Figure 2**. Note location of trace wire marker on as-built drawings.

Note: If a marker is used only to mark the main location and not bring up the trace wire, use the green markers without the test point connectors.

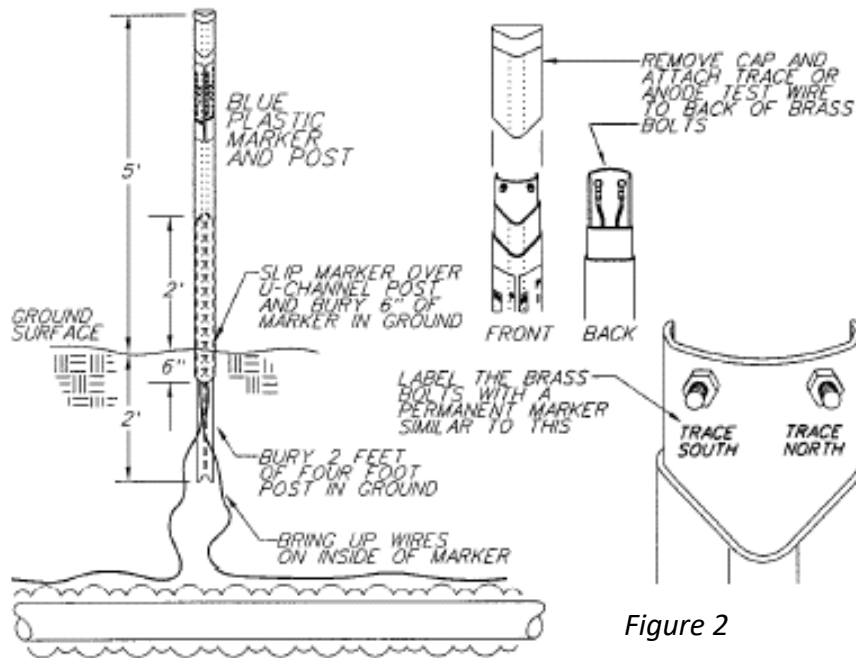


Figure 2

Trace Wire in a Test Box at a CC Valve Box

When bringing the trace wire at a valve box, install the trace wire in a test box about a foot from the valve box according to **Figure 3**. Make sure there is enough coiled wire to extend two foot above ground. Paint the lid green. Note location of test box on as-built drawing.

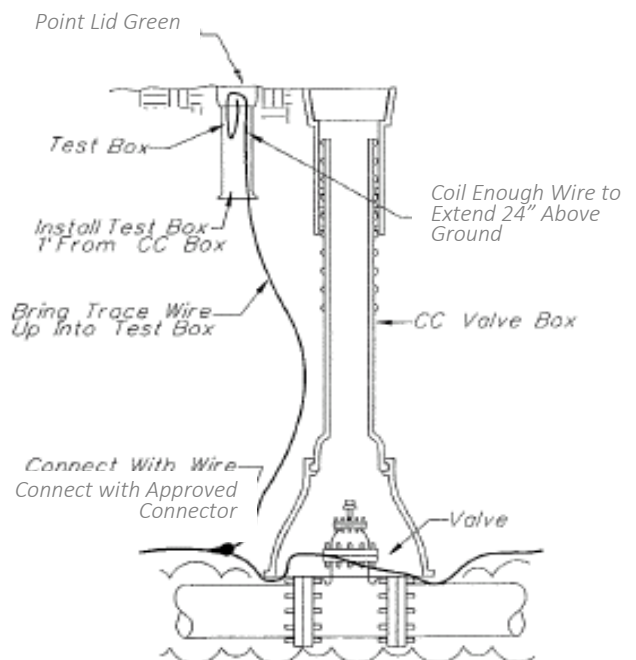


Figure 3

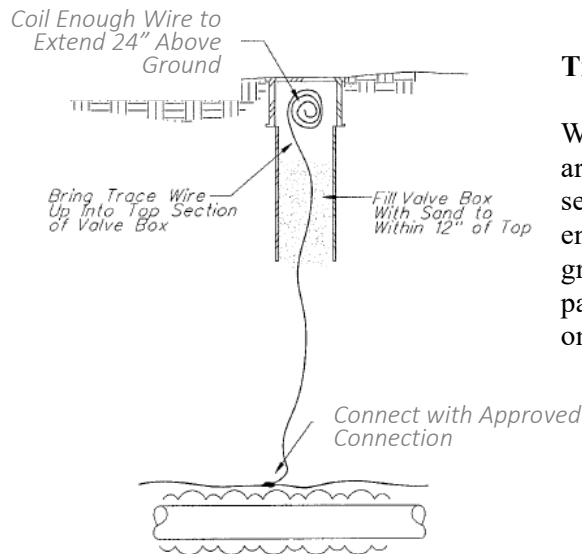


Figure 4

Trace Wire in a Valve Box Top Section

When trace wire is to be brought to the surface in an area where a marker is not practical, a valve box top section may be used as shown in **Figure 4**. Coil enough wire to extend a foot above the surface of the ground. Fill with sand to a foot from the top. Spray paint the lid green. Note location of trace wire box on as-built drawings.

3.02 BRANCHED CONNECTION

- A. Connections between the main line tracer wire and connection tracer wire shall only be allowed at service laterals and valve boxes.
- B. The branch connection tracer wire shall be a single tracer wire properly spliced to the main line tracer wire. DryConn Direct Bury Lug Aqua watertight connectors, or approved equal, shall be used to provide electrical continuity.

3.03 DIRECTIONAL BORING

- A. For directional boring installations, two #12 tracer wires, listed above, shall be installed with the pipe and connected to the tracer wire at both ends, or cad welded to the existing iron pipe at both ends.
- B. The tracer wires shall be laid flat and securely affixed to the top and side of the pipeline at five-foot (5') intervals to insure its placement during the boring operation.

3.04 TESTING REQUIREMENTS

Contractor shall perform a continuity test on all trace wire in the presence of the Engineer or the Engineers' representative. If the trace wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire.

3.05 REPAIR / RESTORATION

At all repair locations where there is existing tracer wire, the tracer wire shall be properly reconnected and spliced as outlined above.

END OF SECTION 331122

SECTION 333000 - SANITARY SEWERAGE UTILITIES

PART 1 - GENERAL

1.01 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene-monomer rubber.
- B. NPS: Nominal pipe size.
- C. PE: Polyethylene plastic.
- D. PVC: Polyvinyl chloride plastic.

1.02 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.
- B. Force-Main Pressure Ratings: At least equal to system operating pressure, but not less than 150 psig (1035 kPa).

1.03 SUBMITTALS

- A. Product Data: For the following:
 - 1. Valves and cleanouts.
 - 2. Manhole cover inserts.
 - 3. Pipe and fittings.
 - 4. Manhole Repair Materials
 - 5. Replacement Lift Out Rail System
- B. Shop Drawings: Include plans, elevations, details, and attachments for precast concrete manholes, including frames and covers. Include product data for the Lift Out Rail System.
- C. Record Drawings: At Project closeout of installed sanitary sewerage all record drawings shall be submitted to the Owner. The record drawings shall accurately record actual locations of pipe runs, connections, cleanouts, manhole top and invert elevations, air-relief valves and lift station data. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.
- D. Design Mix Reports and Calculations: For each class of cast-in-place concrete.
- E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves 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.
- B. During Storage: Use precautions for valves 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 whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve 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 piping to prevent sagging and bending.
- H. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.05 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. 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. Notify property owner not less than two days in advance of proposed utility interruptions.

PART 2 - PRODUCTS

2.01 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.02 PIPES AND FITTINGS

- A. Ductile-Iron Pressure Pipe: AWWA C151, C150, and C151 except as otherwise specified.
1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, buried or flooded pipe shall have mechanical joints, interior or exposed pipe shall have flanges unless otherwise indicated or specified. 90 degree bends are only allowed where shown on the construction plans.
 2. Gaskets: AWWA C111, Rubber
 3. Flanges: Ductile iron, conforming to ANSI B16.1 and shall be drilled class 125.
 4. Flange Bolts: Bolts shall conform to ASTM A307 Grade B. All exposed bolts shall be Type 304 stainless steel.
 5. Lining: All ductile iron pressure piping and fittings shall be lined with Protecto 401 lining conforming to ASTM E-96, ASTM G-95, ASTM B-117, ASTM G-14, ASTM D-714 ASTM D-1308 or equal, unless otherwise indicated. Lining shall extend from edge of plain end to the gasket seat in the bell socket. Lining to be applied in accordance with the specifications in the "Protecto 401 Ceramic Epoxy Standard for Lining Ductile Iron Pipe and Fittings for Sewer Service" Fifth Edition, March 2001.
 6. Polyethylene Plastic (PE) Film, Pipe Encasement: All buried ductile iron piping and fittings shall be encased in polyethylene as per Section 2.05.
 7. Painting: Interior and exposed pipe and fittings shall be primed and painted. See Specification 099000 Painting and Coating.
 8. Flange Gaskets: Shall be 1/8" thick, full-faced synthetic rubber.
- B. Ductile-Iron Gravity Sewer Pipe: ASTM A 746, for push-on joints.
1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
 2. Gaskets: AWWA C111, rubber.
 3. Lining: All ductile iron gravity piping and fittings shall be lined with 401 Protecto lining conforming to ASTM E-96, ASTM G-95, ASTM B-117, ASTM G-14, ASTM D-714 ASTM D-1308 or equal, unless otherwise indicated. Lining shall extend from edge of plain end to the gasket seat in the bell socket. Lining to be applied in accordance with the specifications in the "Protecto 401 Ceramic Epoxy Standard for Lining Ductile Iron Pipe and Fittings for Sewer Service" Fifth Edition, March 2001.
 4. Polyethylene Plastic (PE) Film, Pipe Encasement: All buried ductile iron piping and fittings shall be encased in polyethylene as per Section 2.05.
 5. Painting: Interior and exposed pipe and fittings shall be primed and painted. See

Specification 099000 Painting and Coating.

- C. PVC Pressure Pipe: AWWA C900, Sch 80 (3" and smaller) or ASTM 2241, 200 psi, SDR 21 (3" and larger and/or gasketed joints).
 - 1. Ductile-Iron, Compact Fittings: AWWA C153, for push-on joints. All ductile iron fittings shall be lined with 401 Protecto lining conforming to ASTM E-96, ASTM G-95, ASTM B-117, ASTM G-14, ASTM D-714 ASTM D-1308 or equal, unless otherwise indicated. 90 degree bends are only allowed where shown on the construction plans.
 - 2. Gaskets for Ductile-Iron Fittings: AWWA C111, rubber.
 - 3. Joint Restraints for PVC Pipe: Megalug or approved equal, AWWAC600, ASTM D 2774, ASTM F 1674.
- D. PVC Gravity Sewer Pipe and Fittings: According to the following:
 - 1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller:
 - a. Less than 12 feet of cover: ASTM D 3034, SDR 35, bell and spigot for gasketed joints. Gaskets are to conform to ASTM F 477, elastomeric seals.
 - b. 12 feet to 20 feet of cover: SDR 21, Class 200, bell and spigot for gasketed joints. Gaskets are to conform to ASTM F 477, elastomeric seals.
 - c. Over 20 feet of cover: Pipe material and classification for PVC sewer pipe 20 feet or greater in depth will be considered on a case by case basis by the Owner.
 - 2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, PS 46 pipe stiffness, bell and spigot for gasketed joints. Gaskets are to conform to ASTM F 477, elastomeric seals.
 - 3. PVC Sewer Lateral Pipe and Fittings, NPS 4 to 6: ASTM D2665 and ASTM D1785, Schedule 40, solvent-cemented joints, or gaskets and gasketed joints.
- E. Polyethylene Pressure Pipe and Fittings
 - 1. Polyethylene Pipe (4 inch and larger):
 - a. Polyethylene pipe shall be made from HDPE material having a material designation code of PE3608 or higher. The material shall meet the requirements of ASTM D 3350 and shall have a minimum cell classification of PE345464C. In addition, the material shall be listed as meeting NSF-61.
 - b. The pipe and fittings shall meet the requirements of AWWA C906.
 - c. HDPE pipe shall be rated for use at a pressure class of 200 psi, DR-9. The outside diameter of the pipe shall be based upon the IPS or DIPS sizing system.

- d. The pipe shall be marked in accordance with the standards to which it is manufactured.
 - e. Color identification by the use of stripes on pipe to identify pipe service shall be required. Stripes or colored exterior pipe product shall be blue for potable water, green for wastewater/sewage, purple for reclaimed water, or black for raw water.
 - f. Pipe manufacturer shall be listed in Manufacturer list in PPI TR-4.
 - g. Pipe shall be gray in color.
2. Polyethylene Fittings:
- a. Butt Fusion Fittings
 - 1) Fittings shall be made of HDPE material with a minimum material designation code of PE3608 and with a minimum Cell Classification as noted in 2.01A. Butt Fusion Fittings shall meet the requirements of ASTM D3261.
 - 2) Molded and fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans.
 - 3) All fittings shall meet the requirements of AWWA C906.
 - 4) Markings for molded fittings shall comply with the requirements of ASTM D 3261.
 - 5) Fabricated fittings shall be marked in accordance with ASTM F 2206.
 - 6) Socket fittings shall meet ASTM D 2683.
 - b. Electrofusion Fittings
 - 1) Fittings shall be made of HDPE material with a minimum material designation code of PE 3608 and with a minimum Cell Classification as noted in 2.01A.
 - 2) Electrofusion Fittings shall have a manufacturing standard of ASTM F1055.
 - 3) Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans.
 - 4) All electrofusion fittings shall be suitable for use as pressure conduits, and have nominal burst values of four times the Working Pressure Rating (WPR) of the fitting.
 - 5) Markings shall be according to ASTM F 1055.
 - c. Flanges and Mechanical Joint Adapters (MJ Adapters)

- 1) Flanges and Mechanical Joint Adapters shall have a material designation code of PE3608 or higher and a minimum Cell Classification as noted in 2.01A.
- 2) Flanged and Mechanical Joint Adapters can be made to ASTM D 3261 or if machined, must meet the requirements of ASTM F 2206.
- 3) Flanges and MJ Adapters shall have a pressure rating equal to the pipe unless otherwise specified on the plans.
- 4) Markings for molded or machined flange adapters or MJ Adapters shall be per ASTM D 3261.
- 5) Fabricated (including machined) flange adapters shall be per ASTM F 2206.
- 6) Van-Stone style, metallic (including stainless steel), convoluted or flat-plate, back-up rings and bolt materials shall follow the guidelines of Plastic Pipe Institute Technical Note # 38, and shall have the bolt-holes and bolt-circles conforming to one of these standards: ASME B-16.5 Class 150, ASME B-16.47 Series A Class 150, ASME B-16.1 Class 125, or AWWA C207 Class 150 Series B, D, or E.
- 7) The back-up ring shall provide a long-term pressure rating equal to or greater than the pressure-class of the pipe with which the flange adapter assembly will be used, and such pressure rating shall be marked on the back-up ring.
- 8) The back-up ring, bolts, and nuts shall be protected from corrosion by a system such as paint, coal-tar epoxy, galvanization, polyether or polyester fusion bonded epoxy coatings, anodes, or cathodic protection, as specified by the project engineer.

d. Service connections

- 1) Service connections shall be electrofusion saddles with a brass or stainless steel threaded outlet, sidewall fusion branch saddles, tapping tees, or mechanical saddles.
 - a) Electrofusion Saddles
 - (1) Electrofusion Saddles with threaded outlet the size of the outlet shall be one inch IPS unless a larger size is shown on the plans.
 - (2) Electrofusion saddles shall be made from materials required under Electrofusion Fittings.
 - b) Sidewall Fusion Saddles

- (1) For sidewall fusion saddles the size of the saddle shall be as indicated on the plans.
- (2) The saddle shall be made in accordance to ASTM D 3261 or ASTM F 2206.
- (3) After installation, approximately ¼” of the PE pipe shall be visible beyond the saddle to confirm that proper surface preparation occurred.
- (4) Saddle faces that do not provided ¼ inch of area beyond the saddle are not acceptable.

c) Tapping Tees

- (1) Tapping tees shall be made to ASTM D3261 or D2683.

d) Mechanical Strap-On Saddles

- (1) Mechanical strap-on saddles shall only be used where this use on PE pipe is approved by the mechanical saddle manufacturer.
- (2) The body of the saddle shall be stainless steel, epoxy coated cast iron or brass.
- (3) The gasket material and design must be acceptable for PE pipe.
- (4) The outlet shall be threaded for one inch IPS unless a larger size is shown on the plans.
- (5) Mechanical strap-on saddles will be installed per the manufacturer’s instructions.

e. Fitting manufacturer shall be listed in Manufacturer list in PPI TR-4

2.03 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Fernco style fittings are not allowed unless no other coupling system is manufactured to join pipes. Contractor must get approval from Engineer prior to use in the field.
- B. Pressure-Type Pipe Couplings: AWWA C219, iron-body sleeve assembly matching OD of pipes to be joined, with AWWA C111 rubber gaskets, bolts, and nuts. Include PE film, pipe encasement.
- C. Ductile-Iron, Flexible Expansion Joints: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig minimum working pressure and for offset and expansion indicated. Include PE film, pipe encasement.

- D. Ductile-Iron Deflection Fittings: Compound coupling fitting with ball joint, flexing section, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees deflection. Include PE film, pipe encasement.
- E. Ductile-Iron Expansion Joints: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated. Include PE film, pipe encasement.

2.04 VALVES AND ACCESSORIES

- A. Nonrising-Stem, Resilient-Seated Gate Valves, 2-1/2 Inch NPS and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig minimum working-pressure design, interior coating according to AWWA C550, and buried valves shall be mechanical-joint with a 2-inch operating nut, exposed or interior valves shall have flanged ends and have hand wheel operators. Valves shall open counter clockwise. Valve stems shall use double "O" ring seals. Bolts shall be stainless steel. Exterior surface of valve shall have corrosion inhibitor coating.
- B. Check Valves: AWWA C508, with 250-psig working pressure rating. Valmatic Surgebuster Swing Check Valve or approved equal. Check valve shall be of the full body type, with a domed access cover and only two moving parts, the flexible disc and the disc accelerator. Flanges shall be ANSI B16.1, Class 125. The disc shall be molded Buna-N, ASTM D2000-BG. The disc shall be of one-piece construction with an integral o-ring type sealing surface and contain alloy steel and nylon reinforcement in the flexible hinge area. The disc accelerator shall be Type 302 stainless steel. Provide mechanical indicator on all size valves. Exterior surface of valve shall have corrosion inhibitor coating.
- C. Eccentric Plug Valves:
 - 1. Plug valves shall be quarter-turn non-lubricated eccentric type with resilient faced plug. Include interior coating according to AWWA C550. Alternate seat and plug materials may be considered provided this specification is met and, in addition, the manufacturer must prove prior to approval that the valve meets AWWA C517 "proof of design tests" (10,000 cycles) in both directions. Flanged valve ends shall be faced and drilled to conform to ANSI B16.1, Class 150 for diameter and drilling. Mechanical or push-on type rubber-gasketed joint ends shall conform to AWWA C111. Port areas for valves smaller than 20-inch shall be at least 80 percent of full pipe area. Port areas for valves 24-inch and larger shall be at least 70 percent of full pipe area.
 - 2. Materials and Construction:
 - a. Bodies shall be of ASTM A126, Class B cast iron. Exterior surface of valve shall have corrosion inhibitor coating.
 - b. Valve plug shall be ASTM A126, Class B cast iron or ASTM A536 ductile iron. Resilient plug facing shall be synthetic rubber, neoprene or Buna N compound suitable for use with water and wastewater applications.
 - c. Seats shall be a raised welded overlay of 90% pure nickel, a minimum of

0.125" thick and 0.50" wide, conforming to AWWA C517. When the plug is in the closed position, the resilient plug facing shall contact only nickel. Sprayed or plated mating seat surfaces are not acceptable for resilient plugs.

- d. Bearings shall be replaceable. Sleeve bearings in the upper and lower journals shall be permanently lubricated 316 stainless steel per ASTM A743 Grade CF-8M. Nonmetallic journal bearings shall not be acceptable. Thrust bearings shall be Teflon.
- e. Shaft seals shall be self-adjusting chevron-type conforming to AWWA C517. Valve shall be designed so it can be repacked while the valve is in line and under pressure without removing the actuator. O-ring seals shall not be acceptable in valves larger than 3".
- f. All exposed fastening hardware shall be stainless steel. Provide stainless steel bolting on buried service valves.

3. Manual Operators:

- a. All valves shall open counterclockwise.
- b. Provide indicators to show position of plug except on buried operators.
- c. Actuators: Manual valves shall have lever or worm gear actuators with handwheels, chainwheels, tee wrenches, extension stems, floorstands, etc., as shown on the plans or as called for in the valve schedule. Lever actuators shall be furnished for valves 8" or smaller where the maximum shutoff pressure is 25 psi or less as indicated on the plans or in the valve schedule. Worm gear actuators shall be furnished for all valves 3" or larger where the maximum reverse shutoff pressure is greater than 25 psi. Worm gear actuators shall be sized for 150 psi. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. This adjustable stop shall be the only adjustment necessary to set the clearance between the valve plug and the seat while the valve is in line and under pressure. Handwheel and chainwheel sizes for worm gear actuators shall be no smaller than 6" in diameter and no larger than twice the diameter of the actuator's gear sector. All exposed nuts, bolts, and washers shall be stainless steel. Valves and gear actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs, and washers shall be stainless steel.
- d. Exposed or interior valves shall be operated by a hand wheel to be supplied with the valve.
- e. Buried valves shall be operated by a 2" square AWWA nut.

4. Testing: Furnish certified copies of results of tests prior to shipment. All valves shall be subjected to an AWWA C517 procedure leak test at 150 psi against the face of the plug and a body hydrostatic test at 300 psi. Valves shall be capable of providing drip-tight shutoff up to the full leak test rating with pressure in either direction.
5. Electric Motor Operator for Eccentric Plug Valves:
 - a. As manufactured by AUMA or approved equal.
 - b. SQ part turn actuator with mechanical end stops
 - c. Handwheel extension for emergency operation
 - d. AM Integral Controls – Open, Stop, Close
 - e. Flange and Output Shaft
 - 1) Coupling unbored
 - f. Plug/Socket Connector
 - g. Electromechanical Control Unit
 - 1) Limit/Torque Switch – Single Switch
 - 2) Handwheel Activation
 - 3) Vibration Resistance: Actuators withstand vibration during start-up or in case of plant failures up to 1g, within the frequency range from 10 to 200 hz
 - 4) Mount Position: Can be operated without restriction in any mounting position
 - 5) Noise Level: Noise level originated by the actuator shall remain below the noise level of 72 dB (A).
 - h. Supply Voltage: 480 VAC
 - i. Nema 4X/6 with Local Controls

D. Ball Valves

1. Ball valves shall be standard port type with 3-piece body. Flanged valve ends shall be faced and drilled to conform to ANSI B16.1, Class 50 for thickness and drilling. Mechanical or push-on type rubber-gasketed joint ends shall conform to AWWA C111.
2. Materials and Construction:
 - a. Ball valves 6” and larger shall conform to AWWA C507 with a minimum design operating pressure of 150 psig.
 - b. Bodies shall be of ASTM 126, Class B cast iron for 2-1/2” and larger.

Smaller valves shall be bronze body.

c. Valve trim shall be bronze.

3. Manual Operators:

a. All valves shall open counterclockwise.

b. Exposed valves 3" and smaller shall be lever operated.

c. Provide indicators to show position of ball.

d. AWWA 2" size nut operators operated by enclosed worm gear operators shall be provided for buried valves.

e. Exposed valves over 3" diameter shall have AWWA 2" square operation by enclosed worm gear operators.

E. Ball Valves (Polymer Service and Non-Potable Water 2" And Smaller)

1. Ball valves shall be PVC true union with either solvent socket or threaded pipe connections. Pressure rating shall exceed 230 psi.

2. Seats shall be PTFE with backing rings. Backing rings and seals shall be EPDM.

3. PVC shall meet or exceed cell classification 12454B, ASTM D-1784.

4. Socket end connections shall conform to ASTM D-2467. Threaded pipe connections shall conform to ANSI B2.1.

5. Exposed valves shall be operated by a 2" AWWA nut. Valve shall not be buried.

F. Backwater Valves

1. Gray-Iron Backwater Valves: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.

a. Horizontal Type: With swing check valve and hub-and-spigot ends.

b. Combination Horizontal and Manual Gate-Valve Type: With swing check valve, integral gate valve, and hub-and-spigot ends.

c. Terminal Type: With bronze seat, swing check valve, and hub inlet.

2. PVC Backwater Valves: Similar to ASME A112.14.1, horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

G. Air Release/Vacuum Valves:

1. Air release/vacuum valves shall be A.R.I. Model D-025 combination air valve for sewage or approved equal.

2. Valve shall be heavy-duty combination air release/vacuum, sewage style.

3. Body shall be made of stainless steel or reinforced nylon.

4. Float shall be stainless steel.
5. All internal parts shall be stainless steel or non-metallic poly materials.

H. Appurtenances:

1. Valve Boxes shall be screw-type, cast iron, adjustable with the word "SEWER" on the lid.
2. Trace Wire: Tracer wire required on all gravity mains, force mains, and service laterals.

2.05 POLYETHYLENE PLASTIC (PE) FILM, PIPE ENCASEMENT

Buried gravity ductile iron piping and fittings shall be encased with a polyethylene plastic coating conforming to ASTM A 674 or AWWA C105; PE film, tube, or sheet; 8-mil thickness.

2.06 MANHOLES

- A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for gasketed joints.
1. Diameter: 48 inches minimum, unless otherwise indicated.
 2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
 3. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section, and having base section with integral floor.
 4. Riser Sections: 5-inch minimum thickness and lengths to provide depth indicated.
 5. Transition Riser Sections: may be required to transition from 5' and 6' ID base and riser sections to standard top section.
 6. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings. Transitional barrel section required for all manholes with inner diameter greater than 48 inches to standard top section.
 7. Gaskets: ASTM C 443 rubber; Ram-Nek Joint Sealant, ASTM C990-91.
 8. Concrete Grade Rings: No more than three reinforced-concrete rings shall be used on any manhole. Combined ring height shall not be less than 4" or exceed 12". The minimum ring thickness is 4". Grade rings shall match 24-inch diameter frame and cover. No concrete grade rings are allowed on manholes requiring bolt down frame and castings.
 9. Rubber Adjustment Rings: Shall be used to ensure that the rims of all manholes are placed flush with the finished ground or road surface. Manholes in streets must be level with finished pavement elevation and sloped to match street grade longitudinally and cross slope per detail shown in construction plans. Shall be

- installed per manufacturer's guidelines and be water tight to prevent infiltration.
10. Steps: No steps are required.
 11. Pipe Connectors: ASTM C 923 resilient, of size required, for each pipe connecting to base section. A-LOK manhole pipe connector or equal.
 - a. When connecting into an existing manhole, the manhole shall be cored drilled to allow new pipe to enter. Cutting or chipping the opening is not permitted. A rubber gasket and non-shrink grout shall be used to provide a tight seal around pipe.
 12. Joint Wrap: All barrel section joints shall be wrapped with an elastic rubber type joint wrap, Infi-Shield External Gator Wrap or approved equal. Installation shall be per manufacturer's specifications. Wrap shall be a minimum width of 12 inches.
 13. All barrel sections shall be strapped together with stainless steel straps per detail in construction plans.
- B. Heavy-Traffic Precast Concrete Manholes: ASTM C 913; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for gasketed joints.
1. Ballast: Increase thickness of one or more precast concrete sections or add concrete to structure, as required to prevent flotation.
 2. Gaskets: ASTM C 443 rubber; Ram-Nek Joint Sealant, ASTM C990-91.
 3. Concrete Grade Rings: No more than three reinforced-concrete rings shall be used on any manhole. Combined ring height shall not be less than 4" or exceed 12". The minimum ring thickness is 4". Grade rings shall match 24-inch diameter frame and cover.
 4. Rubber Adjustment Rings: Shall be used to ensure that the rims of all manholes are placed flush with the finished ground or road surface. Manholes in streets must be level with finished pavement elevation and sloped to match street grade longitudinally and cross slope per detail shown in construction plans. Shall be installed per manufacturer's guidelines and be water tight to prevent infiltration.
 5. Steps: No steps are required.
 6. Pipe Connectors: ASTM C 923 resilient, of size required, for each pipe connecting to base section. A-LOK manhole pipe connector or equal.
 - a. When connecting into an existing manhole, the manhole shall be cored drilled to allow new pipe to enter. Cutting or chipping the opening is not permitted. A rubber gasket and non-shrink grout shall be used to provide a tight seal around pipe.
 7. Joint Wrap: All barrel section joints shall be wrapped with an elastic rubber type joint wrap, Infi-Shield External Gator Wrap or approved equal. Installation shall be per manufacturer's specifications. Wrap shall be a minimum width of 12 inches.

8. All barrel sections shall be strapped together with stainless steel straps per detail in construction plans. Transitional barrel section required for all manholes with inner diameter greater than 48 inches to standard top section.
- C. Manhole Frames and Covers: ASTM A48-76, Class 35.
1. Standard manhole frames and covers shall have a minimum weight of 300 pounds and shall be Neenah R-1642 or equal with waterproof gasket.
 2. Bolt down manhole frames and covers shall have bolt down lid with waterproof gasket, minimum weight of 300 pounds, and shall be Neenah R-1916-F or approved equal.
 3. Bolt down type manhole frames shall be anchored to the manhole with not less than four (4) $\frac{3}{4}$ inch diameter wedge anchor bolts having a minimum of five inches of embedment into concrete of top section.
 4. Valve manhole frames and covers shall have a minimum weight of 300 pounds and shall be Neenah R-1741-D or equal.

2.07 CONCRETE

- A. General: Cast-in-place concrete according to ACI 318, ACI 350R, and the following:
1. Cement: ASTM C 150, Type II.
 2. Fine Aggregate: ASTM C 33, sand.
 3. Coarse Aggregate: ASTM C 33, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
 2. Reinforcement Bars: ASTM A 615, Grade 60, deformed steel.
- C. Structure Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio. Include channels and benches in manholes.
1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope. Invert Slope is to be 2 percent through manhole (minimum) or as shown on construction plans.
 2. Benches: Concrete, sloped to drain into channel. Slope must be 5 percent (minimum).
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.

1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
2. Reinforcement Bars: ASTM A 615, Grade 60, deformed steel.

2.08 PROTECTIVE COATINGS

- A. Refer to Sections 099000: Painting and Coating and 071113: Bituminous Dampproofing for specifications on protective coatings for above grade piping and concrete structures.
- B. Refer to Section 333914 Antimicrobial Concrete Additives for New Concrete Sanitary Sewer Structures where indicated for specifications on protective coatings.

2.09 CLEANOUTS

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
 1. Light Duty: In earth or grass foot-traffic areas.
 2. Medium Duty: In paved foot-traffic areas.
 3. Heavy Duty: In vehicle-traffic service areas.
 4. Extra-Heavy Duty: In roads.
 5. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout. PVC Cleanout piping shall be Schedule 40.
- C. Cleanouts to be installed at right of way line, every 100 feet along service line, changes in direction of service line and at connection to existing service line above septic tank.

2.10 MANHOLE REPAIR MATERIALS

- A. Polyurethane Grout: SealGuard II or approved equal
- B. Non-Shrink Grout: Conspec 100 or approved equal

2.11 LIFT OUT RAIL SYSTEM

- A. Replacement lift out rail systems shall be constructed of stainless steel.
- B. One rail system is required for each pump. The rail system shall consist of a combined check valve and seal fitting that mounts vertically into the stationary discharge casting.
- C. Check valve and seal fitting shall seal with two (2) O-rings and a tapered rubber seal into a funnel on the discharge case. Discharge piping shall be 3" NPT female for standard pipe.
- D. An upper guide plate shall be attached to the pump to support lift-out fitting and guide the pump on the rails.

- E. The rails are to be a minimum of 1-1/4" pipe. A lifting eye located at the assembly center of gravity shall be attached to the plate and a 1/4" galvanized chain and clevis shall be furnished for lifting each pump.
- F. Hold down brackets shall be furnished for each assembly to ensure that the pump and seal fitting assembly do not rise on the rails. An adjustable top rail support and mounting bushing shall be mounted to the basin wall and shall not be attached to the basin cover or cover frame.
- G. Rail systems which require that the pump have legs to provide additional support of the pump weight, resulting in tangling of trash around the pump legs will not be acceptable.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Construction Drawings.

3.02 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."
- B. Hand trim excavations to required elevations. Correct over excavation with bedding material.
- C. Remove large stones or other hard matter that could damage pipe or impede consistent backfilling or compaction.

3.03 IDENTIFICATION

Materials and their installation are specified in Division 31 Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.

- A. Use warning tape or detectable warning tape over ferrous piping.
- B. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.04 PIPING APPLICATIONS

- A. General: Include watertight joints.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.
- C. Gravity-Flow Piping: As indicated on the Drawings:
 1. NPS 4 and NPS 6: PVC sewer pipe and fittings, solvent-cemented joints, or

gaskets and gasketed joints. (4-inch pipe is allowed on gravity service laterals from building to main line only.)

2. NPS 8 to NPS 15: PVC sewer pipe and fittings, gasketed joints.
3. NPS 15 and greater: PVC sewer pipe and fittings, gasketed joints.

D. Force-Main Piping: As indicated on the Drawings:

1. NPS 4 to NPS 15: Ductile-iron sewer pipe; standard- or compact-pattern, ductile-iron fittings; gaskets; and gasketed joints.
2. NPS 4 to NPS 15: PVC pressure pipe, PVC pressure fittings, gaskets, and gasketed joints.
3. NPS 4 and larger: Polyethylene pressure pipe, polyethylene pressure fittings, fusion welded joints.

3.05 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.

1. Use the following pipe couplings for nonpressure applications:
 - a. Sleeve type to join piping, of same size, or with small difference in OD.
 - b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
 - c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
 - d. No Fernco style couplings shall be allowed without prior approval of Engineer.
2. Use pressure-type pipe couplings for force-main joints. Include PE film, pipe encasement.

B. Special Pipe Fittings: Use where indicated. Include PE film, pipe encasement.

3.06 INSTALLATION, GENERAL

- A. Install PVC gravity piping in accordance with ASTM D2321. Install ductile iron gravity piping in accordance with ASTM A746. 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 using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
- B. All gravity sewer mains should be constructed to a minimum cover of thirty six inches (36") or as required and as measured from the final ground surface to the top of the barrel of the pipe. Minimum cover of less than thirty six inches (36") will be considered on a case by case basis by the Owner and the Missouri Department of Natural Resources. Tracer wire is required on all gravity mains.

All force mains should be constructed to a minimum cover of thirty six inches (36") or as required and as measured from the final ground surface to the top of the barrel of the pipe. Minimum cover of less than thirty six inches (36") will be considered on a case by case basis by the Owner and the Missouri Department of Natural Resources. Tracer wire is required on all force mains.

All service laterals, gravity or pressure, shall be constructed to a minimum depth of twenty four inches (24") and a minimum grade of one percent (1%). Service laterals shall provide adequate flow from the house to the main. Tracer wire is required on all service laterals, gravity or pressure.

- C. For gravity sewers, manholes with a minimum diameter of forty-eight inches (48") shall be installed at all changes in grade, size, alignment, intersections, and at distances of no greater than nine hundred and eighty feet (980') unless indicated otherwise on the plans. The use of fittings in the place of manholes is not acceptable.
- D. Use 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.
- E. Molded Tees shall be used for all "tee" connections for new construction. Molded Tees with "knock-on" fittings shall be used for all "tee" connections on existing gravity sewers and existing gravity sewers.
- F. Install ductile-iron, force-main piping according to AWWA C600. No rock greater than one (1) foot, measured along its longest axis, shall be placed within (2) feet of the top of a pipe in any backfill. No rocks greater than one (1) foot will be allowed in the backfill above service line terminations, tees and wyes. Ninety degree fittings are only allowed where shown on construction drawings.
- G. Install PVC force-main piping according to AWWA C605. No rock greater than one (1) foot, measured along its longest axis, shall be placed within (2) feet of the top of a pipe in any backfill. No rocks greater than one (1) foot will be allowed in the backfill above service line terminations, tees and wyes. Ninety degree fittings are only allowed where shown on construction drawings.
- H. Install Polyethylene force-main piping according to AWWA C906. No rock greater than one (1) foot, measured along its longest axis, shall be placed within (2) feet of the top of a pipe in any backfill. No rocks greater than one (1) foot will be allowed in the backfill above service line terminations, tees and wyes. Ninety degree fittings are only allowed where shown on construction drawings.
- I. Location of Sewers with Respect to Water Mains:
 - 1. Horizontal Separation – Sewer mains shall be laid at least ten feet (10') horizontally from any existing or proposed water line. The distance shall be measured edge-to-edge. In cases where it is not practical to maintain a ten foot (10') separation, the Missouri Department of Natural Resources may allow deviation on a case-by-case basis, if supported by data from the design engineer. This deviation may allow installation of the sewer closer to a water line, provided that the water line is in a separate trench or on an undisturbed earth shelf located on one (1) side of the sewer at an elevation that the bottom of the water line is at least eighteen inches (18") above the top of the sewer.

2. Crossings – Sewer crossing water lines shall be laid to provide a minimum vertical distance of eighteen inches (18”) between the outside of the water line and the outside of the sewer. This shall be the case where the water line is either above or below the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water line joints. When a water line crosses under a sewer, adequate structural support shall be provided for the sewer to prevent damage to the water line.
 3. Special Conditions – When it is impossible to obtain proper horizontal and vertical separation as stipulated previously, the sewer shall be designed and constructed of slip-on or mechanical joint ductile iron pipe or PVC pressure pipe for a distance of ten feet (10’) on each side of the water line and shall be pressure tested to assure watertightness prior to backfilling.
 4. Sewer Manholes – No water pipe shall pass through or come into contact with any part of a sewer manhole.
- J. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

- K. All gravity sewer lines shall be installed with slopes not less than the minimum slopes shown in the following table unless otherwise indicated in plans:

Sewer Size	Minimum Slope (Feet per 100 Feet)
6 in.	0.60
8 in.	0.40
9 in.	0.33
10 in.	0.28
12 in.	0.22
14 in.	0.17
15 in.	0.15
16 in.	0.14
18 in.	0.12
21 in.	0.10
24 in.	0.08
27 in.	0.067
30 in.	0.058
36 in.	0.046

- L. Cutting Pipe: Cut pipe in a neat manner without damage to pipe. Remove burrs and shape edges and smooth the pipe end by grinding. Repair lining where required and as approved.

3.07 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600. Install

PE film, pipe encasement over buried ductile-iron sewer pipe and ductile-iron fittings according to ASTM A 674 or AWWA C 105.

- C. PVC Pressure Pipe and Fittings: Join and install according to AWWA C605.
- D. PVC Gravity Sewer Pipe and Fittings: As follows:
 - 1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
 - 2. Join profile sewer pipe fittings with gaskets according to ASTM D 2321 and manufacturer's written instructions.
 - 3. Install according to ASTM D 2321.
- E. Polyethylene Pipe and Fittings: Join and install according with ASTM D2774 for pressure systems, AWWA Manual of Practice M55 Chapter 7 and the following:
 - 1. Butt Fusion

The pipe shall be joined by the butt fusion procedure outlined in ASTM F 2620 or PPI TR-33. All fusion joints shall be made in compliance with the pipe or fitting manufacturer's recommendations. Fusion joints shall be made by qualified fusion technicians per PPI TN-42.
 - 2. Saddle fusion

Saddle fusion shall be done in accordance with ASTM F 2620 or TR-41 or the fitting manufacturer's recommendations and PPI TR-41. Saddle fusion joints shall be made by qualified fusion technicians. Qualification of the fusion technician shall be demonstrated by evidence of fusion training within the past year on the equipment to be utilized on this project. (ASTM F905).
 - 3. Electrofusion

Electrofusion joining shall be done in accordance with the manufacturers recommended procedure. Other sources of electrofusion joining information are ASTM F 1290 and PPI TN 34. The process of electrofusion requires an electric source, a transformer, commonly called an electrofusion box that has wire leads, a method to read electronically (by laser) or otherwise input the barcode of the fitting, and a fitting that is compatible with the type of electrofusion box used. The electrofusion box must be capable of reading and storing the input parameters and the fusion results for later download to a record file. Qualification of the fusion technician shall be demonstrated by evidence of electrofusion training within the past year on the equipment to be utilized for this project.
 - 4. Mechanical
 - a. Mechanical connection of HDPE to auxiliary equipment such as valves, pumps, and fittings shall use mechanical joint adapters and other devices in conformance with the PPI Handbook of Polyethylene Pipe, Chapter 9 and AWWA Manual of Practice M55, Chapter 6.

- b. Mechanical connections on small pipe under 3” are available to connect HDPE pipe to other HDPE pipe, or a fittings, or to a transition to another material. The use of stab-fit style couplings is allowed, along with the use of metallic couplings of brass and other materials. All mechanical and compression fittings shall be recommended by the manufacturer for potable water use. When a compression type or mechanical type of coupling is used, the use of a rigid tubular insert stiffener inside the end of the pipe is recommended.
- c. Mechanical couplings that wrap around the pipe and act as saddles are made by several manufacturers specifically for HDPE pipe. All such saddles, tapping saddles, couplings, clamps etc. shall be recommended by the manufacturer as being designed for use with HDPE pipe at the pressure class listed in this section.
- d. Unless specified by the fitting manufacturer, a restraint harness or concrete anchor is recommended with mechanical couplings to prevent pullout.
- e. Mechanical coupling shall be made by qualified technicians. Qualification of the field technician shall be demonstrated by evidence of mechanical coupling training within the past year. This training shall be on the equipment and pipe components to be utilized for this project.

5. Joint Recording

The critical parameters of each fusion joint, as required by the manufacturer and these specifications, shall be recorded either manually or by an electronic data logging device. All fusion joint data shall be included in the Fusion Technician’s joint report.

- F. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- G. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.
- H. Install with top surfaces of components, except piping, flush with finished surface.

3.08 REACTION ANCHORAGE AND BLOCKING

- A. All unlogged bell and spigot or all-bell tees, Y-branches and bends deflecting 11-1/4 degrees or more which are installed in piping subjected to internal hydrostatic heads in excess of 15 feet in exposed, or 30 feet in buried, piping shall be provided with suitable reaction blocking, struts, anchors, clamps, joint harness, or other adequate means for preventing any movement of the pipe caused by unbalanced internal liquid pressure.
- B. Trench installation: Where in trench, the foregoing designated fittings shall be provided with concrete thrust blocking between the fitting and solid, undisturbed ground in each case, except where solid ground blocking support is not available. At the tops of slopes vertical angle bends shall be anchored by means of steel strap or rod anchors securely

embedded in or attached to a mass of concrete of sufficient weight to resist the hydraulic thrust at the maximum pressures to which the pipe will be subjected. All concrete blocking and anchors shall be installed in such a manner that all joints between pipe and fittings are accessible for repair.

- C. The bearing area of concrete reaction blocking against the ground or trench bank shall be as shown by the plans or as directed by the Engineer in each case. In the event that adequate support against undisturbed ground cannot be obtained, metal harness anchorages consisting of steel rods or bolts across the joint and securely anchored to pipe and fitting or other adequate anchorage facilities approved by the Engineer shall be installed to provide the necessary support. Should the lack of a solid vertical excavation face be due to careless or otherwise improper trench excavation, the entire cost of furnishing and installing metal harness anchorages in excess of the contract value of the concrete blocking replaced by such anchorages shall be borne by the Contractor.
- D. For other locations: Reaction blocking, struts, anchorages, or other supports for fittings installed in fills or other unstable ground, above grade, or exposed within structures, shall be provided as required by the plans or as directed by the Engineer.
- E. Protection of metal surfaces: All steel clamps, rods, bolts and other metal accessories used in reaction anchorages or joint harness subject to submergence or contact with earth or other fill material and not encased in concrete shall be adequately protected from corrosion with not less than two coats of Koppers "Bitumastic No. 50", or approved equal, heavy coal tar coating material, applied to clean, dry metal surfaces. The first coat shall be dry and hard before the second coat is applied. Metal surfaces exposed above grade or within structures shall be painted with two coats (in addition to a primer coat) of a paint approved by the Engineer.

3.09 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Form continuous concrete channels and benches between inlets and outlet. Manhole bottoms shall be formed to provide smooth continuous flow. Non shrink grout shall be used to form a smooth transition between downstream invert and channel of manhole.
- C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Slope of frame and covers shall match slope of pavements both longitudinally and cross slope per frame and cover adjustment detail in construction plans.
- D. Set tops 3 inches (76 mm) above finished surface elsewhere, unless otherwise indicated.
- E. Install precast concrete manhole sections with gaskets according to ASTM C 891.
- F. Construct cast-in-place manholes as indicated.
- G. Backfill around manhole per specifications. No rock greater than one (1) foot, measured along its longest axis, shall be placed within (2) feet of the manhole.
- H. Verify invert elevations with benchmark or offset stake prior to building manhole to grade. Deviations from plan elevations must be approved by Engineer prior to proceeding with construction.

3.10 REPAIR OF EXISTING MANHOLES

- A. Internal Repairs: Polyurethane Grout, repair water infiltration into manholes using polyurethane grout, SealGuard II or approved equal. Repair per manufacturer's instructions.
- B. External Repairs, Non-Shrink Grout, use to make minor repairs to manholes from outside the manhole only. Not to be used to repair water infiltration into the manhole from inside the manhole. Conspec 100 or approved equal.

3.11 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318 and ACI 350R.

3.12 BACKWATER VALVE INSTALLATION

- A. Install horizontal units in piping where indicated.
- B. Install combination units in piping and in structures where indicated.

3.13 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in ground on 4" x 8" x 16" concrete blocks on top of minimum of 4 inches of granular bedding. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.
- D. Cleanouts shall be encased in bedding material from the connection to the service lateral to bottom of frame then finished with top soil to grade.
- E. Cleanouts shall be set at the right-of way or edge of permanent easement and then every 100 feet as required. Final cleanout to be installed adjacent to service entrance to house or near connection at former septic tank location. Contractor to coordinate with Property Owner for locations of cleanouts.

3.14 AIR RELEASE FACILITIES

- A. Air release valves shall be A.R.I. model D-025 combination air valve for sewage.
- B. Air release facilities shall be located at the high points of all pressure sewer systems and shall be properly sized to prevent buildup of air or gases that will impede flow of the wastewater.
- C. Air release valves must be automatic and designed to prevent wastewater solids and grease from reaching the valve operating mechanism.
- D. Provisions for cleaning the valve by back flushing should be provided.

3.15 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures so finished Work

complies as nearly as practical with requirements specified for new Work.

- B. Use Inserta-Tees® (or approved equal) to make branch connections into existing piping, NPS 4 to NPS 20. Install Inserta-Tee® and encase entire connection with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
- C. Make branch connections from side into existing piping, NPS 21 or larger, by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. On outside of pipe, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
 - 1. Use concrete that will attain minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.
 - 2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
- D. Protect existing piping to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- E. Glue on or strap on tap connections are not allowed.

3.16 CLOSING ABANDONED SANITARY SEWERAGE SYSTEMS

- A. Abandoned Piping: Close open ends of abandoned underground piping indicated to remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:
 - 1. Close open ends of piping with at least 6-inch- thick non-shrink grout plug.
 - 2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.
- B. Abandoned Structures: Excavate around structure as required and close in place as outlined below:
 - 1. Remove top of structure. If feasible, top may be broken up and used as fill.
 - 2. Grout closed the open ends of any piping.
 - 3. Remove side walls of structure down to at least 12 inches below final grade. Break a minimum of two holes in bottom of structure to facilitate water drainage.
 - 4. Fill to within 12 inches of final grade with stone, rubble, gravel, or compacted dirt.
 - 5. Backfill to grade according to Division 31 Section "Earthwork."

3.17 LIFT OUT RAIL SYSTEMS

A. General

1. Install equipment in accordance with manufacturer's recommendations as approved by the Engineer.

3.18 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
1. Place plug in end of incomplete piping at end of day and when work stops.
 2. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (600 mm) 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 95 percent of piping diameter.
 - c. 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. Re-inspect and repeat procedure until results are satisfactory.
- C. CCTV'ing of System – All interceptors and mains shall be CCTV'd no sooner than 30 days after installation. Contractor to provide videos to Owner/Engineer for review. Any deficiencies found in the review will be corrected before acceptance of the system. If required debris, dirt or other material shall be cleaned by jetting of the system. All material removed from the system shall be properly disposed of by the Contractor. CCTV'ing and cleaning of the new interceptors and mains will not be paid for separately.

3.19 FIELD TESTING

A. General:

1. Test new piping systems, and parts of existing systems that have been altered,

extended, or repaired, for leaks and defects.

2. Leaks and loss in test pressure constitute defects that must be repaired.
3. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

B. Pressure Tests:

1. The Contractor shall furnish all pumps, piping, labor and other materials and services necessary to bring the piping up to the specified test pressure.
2. All new sewer pipes shall be pressure tested. Pipes which will be pressurized under normal operating conditions shall conform to the requirements of the hydrostatic pressure test. All other piping shall meet the requirements of the air leakage test. This shall include service lateral piping.
3. Pipe in the sections to be tested shall be backfilled or center loaded, with thrust blocks installed and completely backfilled. Interior pipe supports and restraint systems shall be completely installed prior to testing.

C. Hydrostatic Pressure Test:

1. Test connections shall be made and the pipe filled with water. Unless otherwise specified, a pressure of 1.50 times the normal operating pressure (for the lowest point on the pipe line) but not less than the greater of 1.25 times the normal operating pressure or 150 pounds per square inch (psi). In no case shall the test pressure be allowed to exceed the design pressure for the pipe, appurtenances, or thrust restraints.
2. After air removal, water shall be pumped in to bring the pipe to the specified pressure. The hydrostatic test shall be of at least a 2-hour duration. Test pressure shall not vary by more than 5 psi for the duration of the test. After two hours, additional water shall be drawn from a container of known volume. The amount of water required to return the system to the specified pressure shall not exceed the amount determined by the following formula:

$$L = ND(P)^{1/2}/7,400, \text{ (Equation 1, AWWA C605-94)}$$

Where

L - Allowable leakage, in gallons per hour

N - Number of joints in the length of pipeline tested

D - Nominal pipe diameter, inches

P - Average test pressure, psi (gauge)

The allowable leakage must not exceed the volumes specified below for 50 joints of the particular diameter of pipe being tested:

**Allowable Leakage per 50 joints of Pipe* - gph
(AWWA C-600)**

Avg. Test Pressure (psi)	Nominal Pipe Diameter (in)										
	1.5	2	3	4	6	8	10	12	14	16	18
300	0.18	0.23	0.35	0.47	0.70	0.94	1.17	1.40	1.64	1.87	2.11
275	0.17	0.22	0.34	0.45	0.67	0.90	1.12	1.34	1.57	1.79	2.02
250	0.16	0.21	0.32	0.43	0.64	0.85	1.07	1.28	1.50	1.71	1.92
225	0.15	0.20	0.30	0.41	0.61	0.81	1.01	1.22	1.42	1.62	1.82
200	0.14	0.19	0.29	0.38	0.57	0.76	0.96	1.15	1.34	1.53	1.72
175	0.13	0.18	0.27	0.36	0.54	0.72	0.89	1.07	1.25	1.43	1.61
150	0.12	0.17	0.25	0.33	0.50	0.66	0.83	0.99	1.16	1.32	1.49

3. All exposed pipe, fittings, valves, and joints shall be inspected and all evidence of moisture appearing on the surface of the ground during the test shall be investigated by the Contractor by excavation where the pipe has been covered with backfill. Should the leakage test results exceed allowable leakage, the test pressure shall be maintained for an additional period of time as directed by the Engineer to facilitate location of leaks.
4. All pipe, fittings, valves, pipe joints, and other materials which are found to be defective when the pipe line is tested shall be removed from the line immediately and replaced with new and acceptable material by and at the expense of the Contractor. The pressure test shall be repeated after repairing leaks and other defective work until the pipe line installation conforms to specified requirements and is accepted by the Engineer.

D. Air Leakage Test:

1. Contractor may perform air tests for all pipe sizes.
2. Air leakage testing shall be performed on lines as specified and on the following lines:
 - a. Outfall line.
 - b. Gravity service lines.
 - c. Gravity main lines.
3. Furnish all facilities required including necessary piping connections, test pumping equipment, pressure gauges, bulkheads, regulator to avoid over-pressurization, and all miscellaneous items required.
 - a. The pipe plug for introducing air to the line shall be equipped with two taps. One tap will be used to introduce air into the line being tested, through suitable valves and fittings, so that the input air may be regulated. The second tap will be fitted with valves and fittings to accept a pressure test gauge indicating internal pressure in the sewer pipe. An additional valve and fitting will be incorporated on the tap used to check internal pressure so that a second test gauge may be attached to the internal pressure tap. The pressure test gauge will also be used to indicate loss of air pressure due to leaks in the sewer line.
 - b. The pressure test gauge shall meet the following minimum specifications:

i.	Size (diameter)	4-1/2 inches
ii.	Pressure Range	0-15 P.S.I.
iii.	Figure Intervals	1 P.S.I. Increments
iv.	Minor Subdivisions	0.05 P.S.I.
v.	Pressure Tube	Bourdon Tube or diaphragm
vi.	Accuracy	+ 0.25% of maximum scale reading
vi.	Dial	White coated aluminum with black lettering, 270° arc and mirror edge
vii.	Pipe Connection	Low male 1/2" N.P.T.

Calibration data will be supplied with all pressure test gauges. Certification of pressure test gauge will be required from the gauge manufacturer. This certification and calibration data will be available to the Engineer whenever air tests are performed.

4. Test each reach of sewer pipe between manholes after completion of the installation of pipe and appurtenances and the backfill of sewer trench.
5. Test each reach of service line between connection to existing pipe at property connection to the main.
6. Plug ends of line and cap or plug all connections to withstand internal pressure. One of the plugs provided must have two taps for connecting equipment. After connecting air control equipment to the air hose, monitor air pressure so that internal pressure does not exceed 5.0 psig. After reaching 4.0 psig, throttle the air supply to maintain between 4.0 and 3.5 psig for at least two (2) minutes in order to allow equilibrium between air temperature and pipe walls. During this time, check all plugs to detect any leakage. If plugs are found to leak, bleed off air, tighten plugs, and again begin supplying air. After temperature has stabilized, the pressure is allowed to decrease to 3.5 psig. At 3.5 psig, begin timing to determine the time required for pressure to drop to 2.5 psig. If the time, in seconds, for the air pressure to decrease from 3.5 psig to 2.5 psig is greater than that shown in the table below, the pipe shall be presumed free of defects.

**Minimum Specified Time Required for a 1.0 psig Pressure Drop for Size and Length of Pipe
Indicated for $Q = 0.0015$
(ASTM F 1417, TABLE 1)**

Pipe Diameter, in.	Minimum Time, min:s	Length for Minimum Time, ft	Time for Longer Lengths	Specification Time for Length (L) Shown, min:s							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	597	0.380	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:3
27	25:30	88	17.306	28:51	43:16	57:41	72:07	86:32	100:5	115:2	129:4
30	28:20	80	21.366	35:37	53:25	71:13	89:02	106:5	124:3	142:2	160:1
33	31:10	72	25.852	43:05	64:38	86:10	107:4	129:1	150:4	172:2	193:5
36	34:00	66	30.768	51:17	76:55	102:3	128:1	153:5	179:2	205:0	230:4

If air test fails to meet above requirements, repeat test as necessary after all leaks and defects have been repaired. Prior to acceptance, all constructed sewer lines shall satisfactorily pass the pressure air test.

- In areas where ground water is known to exist, install a one-half inch diameter capped pipe nipple, approximately 10" long, through manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the line acceptance test, ground water level shall be determined by removing pipe cap, blowing air through pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to pipe nipple. The hose shall be held vertically and a measurement of height in feet of water shall be taken after the water stops rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings.

E. Vacuum Testing of Manholes:

1. Each manhole shall be tested immediately after assembly and prior to backfilling.
2. All lift holes shall be plugged with an approved non-shrink grout.
3. All pipes entering the manhole shall be plugged, taking care to securely brace the plug from being drawn into the manhole.
4. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturers' recommendations. Test head shall be as manufactured by P.A. Glazier, Inc., of Worcester, Massachusetts, or equal.
5. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9 inches. The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the values indicated in the following table:

**Minimum Test Times for Various Manhole Diameters in Seconds
(ASTM C 1244, TABLE 1)**

Depth (ft)	Manhole Diameter, in.								
	30	33	36	42	48	54	60	66	72
Time, in seconds									
8	60	60	60	60	60	60	60	60	60
10	60	60	60	60	60	60	60	60	60
12	60	60	60	60	60	60	60	60	60
14	60	60	60	60	60	60	60	60	60
16	60	60	60	60	60	60	60	60	67
18	60	60	60	60	60	60	60	65	73
20	60	60	60	60	60	60	65	72	81
22	60	60	60	60	60	64	72	79	89
24	60	60	60	60	60	64	78	87	97
26	60	60	60	60	64	75	85	94	105
28	60	60	60	60	69	81	91	101	113
30	60	60	60	63	74	87	98	108	121

6. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Re-testing shall proceed until a satisfactory test is obtained.

F. Deflection Tests:

1. Deflection tests shall be performed on all flexible sewer pipe by the Contractor using a mandrel pull. The mandrel must have nine (9) or more odd number of flutes or points. The mandrel pull cannot be performed any sooner than 30 days after the reach being tested has been installed and final backfill has been placed.
2. A section of sewer line reach shall be deemed as failed when the mandrel cannot be moved through it with reasonable force. The tests shall be performed without mechanical pulling devices.
3. At the conclusion of the mandrel pull, the Contractor, at his expense, shall be required to remove and replace all pipe which fails the test.
4. The mandrel diameter shall be based on 95% of the actual inside pipe diameter.

G. Alignment Tests: Sewer alignment shall be checked by using a laser beam or lamping. Alignment that is off by a half pipe diameter or greater shall be uncovered and relaid.

END OF SECTION 333000

SECTION 333122 - INSTALLATION OF TRACE WIRE (SEWER)

PART 1 - GENERAL

1.01 SECTION INCLUDES

This section covers the requirements for the installation of a conductive trace wire during the installation of sewer distribution pipelines including service lines, it will be used for locating the pipelines, laterals, services and appurtenances with an electronic pipe locator after installation.

1.02 SUBMITTALS

The Contractor shall submit the manufacturer's data on materials furnished that indicate compliance with the specifications regarding materials used.

1.03 MEASUREMENTS AND PAYMENT

There is no separate payment for the supply and installation of tracer wire on any construction or installation of sewer main by the Contractor. The Contractor shall consider the supply and installation of the tracer wire incidental to all construction of sewer main.

PART 2 – PRODUCTS

2.01 TRACE WIRE

- A. Open-Trench Installation: direct burial #12 AWG Solid (0.0808" diameter), steel core soft drawn tracer wire, 250# average tensile break load, 30 mil high molecular-high density polyethylene jacket complying with ASTM-D-1248, 30-volt rating. Color shall be "green" for sewer pipelines. Manufactured by Copperhead Industries part number 1230-SF or approved equal.
- B. Directional Bore or Jacked Installation: direct burial #12 AWG Solid (0.0808" diameter), steel core hard drawn extra high strength horizontal directional drill tracer wire, 1150# average tensile break load, 45 mil high molecular-high density polyethylene jacket complying with ASTM-D-1248, 30-volt rating. Color shall be "green" for sewer pipelines. Manufactured by Copperhead Industries part number 1245-EHS, or approved equal.

2.02 CONNECTORS

- A. Splices along the continuous run of trace wire for repair of a wire break or replacement of failed segment of wire shall use 3M Brand DBR Direct Bury Splice Kit or approved equal. Approved alternatives must securely connect two or more wires, effectively moisture seal by means of a dielectric non-hardening silicone sealant, manufacturer approved for direct burial and rated for a minimum of 50V.
- B. Branch connections for laterals, turnouts, services and appurtenances shall use DryConn Direct Bury Lug Aqua, or approved equal. Approved alternatives must securely connect one or two wires to the main trace wire without cutting the main trace wire, effectively moisture seal by means of a dielectric non-hardening silicone sealant, manufacturer approved for direct burial and rated for a minimum of 50V.

2.03 EXTRA TRACE WIRE MATERIAL

- A. Green tri-view plastic markers by Rhino w/Test Screws
- B. 4 ft U-channel posts
- C. Valve Box Top Sections
- D. Plastic test box

PART 3 – EXECUTION

Trace wire shall be installed on all sewer mains, laterals and appurtenances. The wire shall be installed in such a manner as to be able to properly trace all pipelines and services without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire.

3.01 INSTALLATION

- A. Trace wire shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation. It shall be secured to the pipe as required to ensure that the wire remains adjacent to the pipe. The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all trace wire access points.
- B. Except for approved spliced-in repair or replacement connections, tracer wire shall be continuous and without splices from each trace wire access point.
- C. Trace wire access points shall be accessible at all new sewer valve boxes, manholes, ARVs service laterals, and cleanouts. Concentrations of multiple proposed valves near pipe intersections, i.e. tees or crosses, may require more than one access point assembly in each concrete valve box collar. Trace wire access points shall be within public right-of-way or public utility easements.
 - 1. Bring trace wire to surface at a maximum spacing of one thousand (1,000) feet. The trace wire shall be brought to the surface in a vault, green plastic marker, valve box top section, or in test box. Take care not to damage the wire coating.
- D. Tracer wire shall be laid flat and securely affixed to the top or side of the pipe at 10-foot intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted. **See Figure 1.**

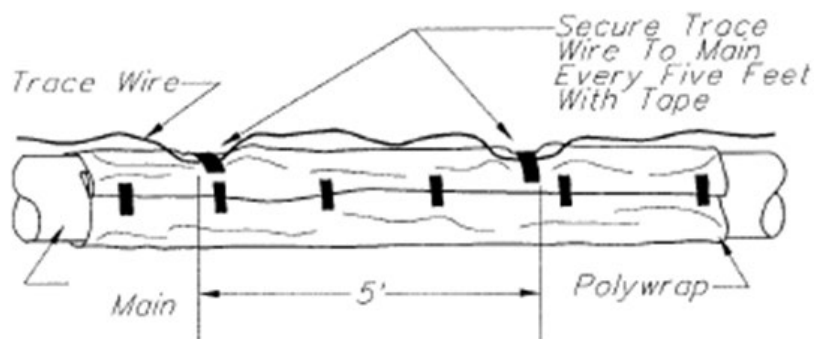


Figure 1

Trace Wire in a Vault or Manhole

When using a vault, bring the trace wire to the surface according to **Figure 2**. Leave a minimum of 2 feet of wire around 2-inch dowel and leave in top of manhole. Do not wrap the trace wire around the steps or any other place where a person entering the vault could trip.

When installing trace wire on gravity main, terminate the trace wire outside the manhole and bring the wire to the surface as shown in **Figure 2**. Do not wrap the trace wire around the steps or any other place where a person entering the manhole could trip.

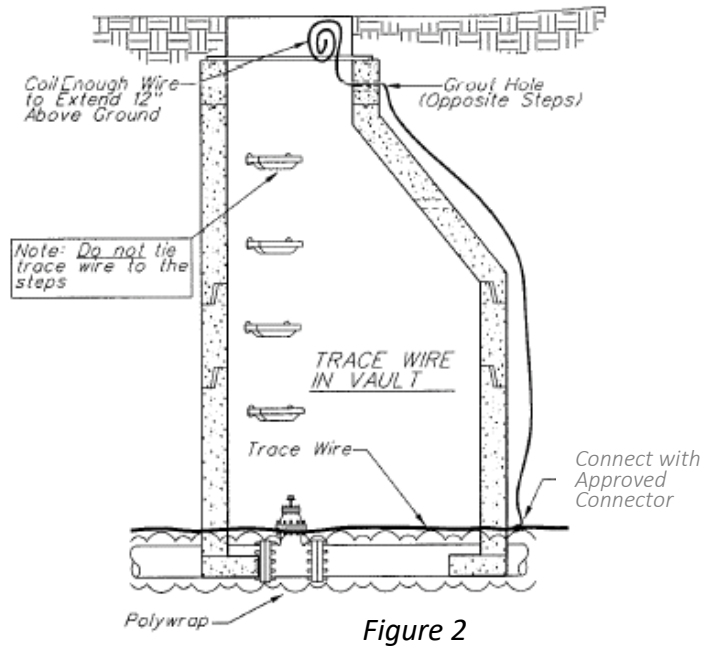


Figure 2

Trace Wire in Green Plastic Marker

When bringing the trace wire up in a green plastic marker, install the trace wire according to **Figure 3**. Bury a 4 foot u-channel post 2 feet in the ground. Run the trace wire up through the marker and slide the green plastic marker over the post. Bury the bottom six inches of the marker. Connect the trace wire to the brass connecting screws and label the screws with a permanent marker as shown in **Figure 3**. Note location of trace wire marker on as-built drawings.

Note: If a marker is used only to mark the main location and not bring up the trace wire, use the green markers without the test point connectors.

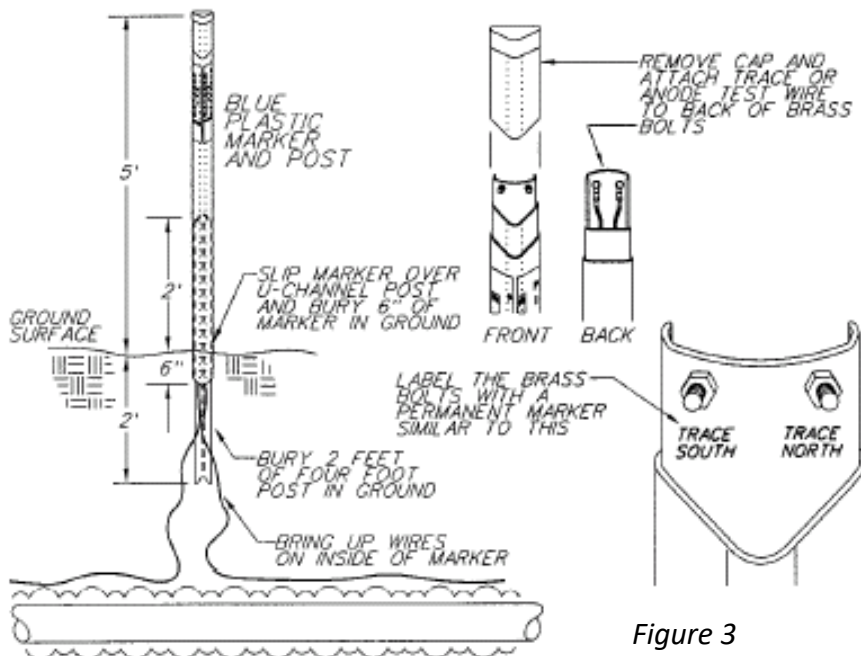


Figure 3

Trace Wire in a Test Box at a CC Valve Box

When bringing the trace wire at a valve box, install the trace wire in a test box about a foot from the valve box according to **Figure 4**. Make sure there is enough coiled wire to extend two foot above ground. Paint the lid green. Note location of test box on as-built drawing.

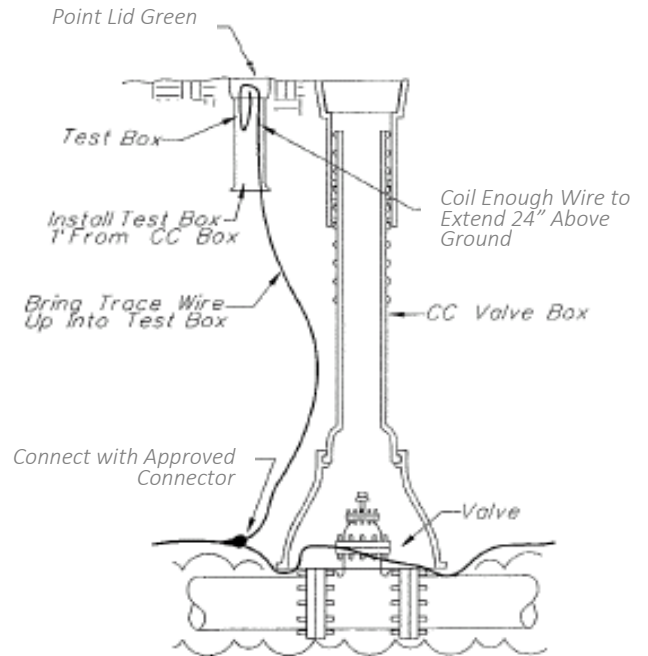


Figure 4

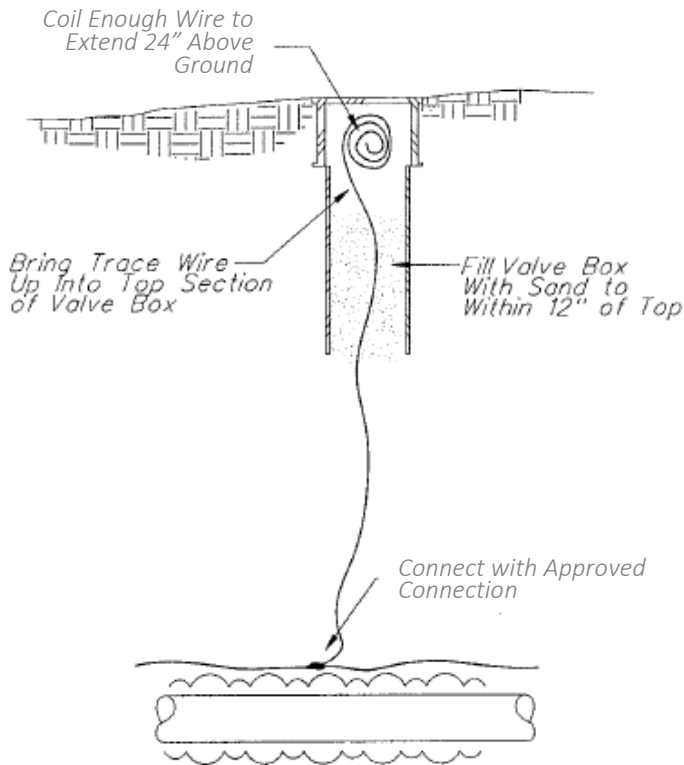


Figure 5

Trace Wire in a Valve Box Top Section

When trace wire is to be brought to the surface in an area where a marker is not practical, a valve box top section may be used as shown in **Figure 5**. Coil enough wire to extend a foot above the surface of the ground. Fill with sand to a foot from the top. Spray paint the lid green. Note location of trace wire box on as-built drawings.

3.02 BRANCHED CONNECTION

- A. Connections between the main line tracer wire and connection tracer wire shall only be allowed at service laterals, manholes, ARV's, and valve boxes.

- B. The branch connection tracer wire shall be a single tracer wire properly spliced to the main line tracer wire. DryConn Direct Bury Lug Aqua water tight connectors, or approved equal, shall be used to provide electrical continuity.

3.03 DIRECTIONAL BORING

- A. For directional boring installations, two #12 tracer wires, listed above, shall be installed with the pipe and connected to the tracer wire at both ends, or cad welded to the existing iron pipe at both ends.
- B. The tracer wires shall be laid flat and securely affixed to the top and side of the pipeline at five-foot (5') intervals to insure its placement during the boring operation.

3.04 TESTING REQUIREMENTS

Contractor shall perform a continuity test on all trace wire in the presence of the Engineer or the Engineers' representative. If the trace wire is found to be not continuous after testing, Contractor shall repair or replace the failed segment of the wire.

3.05 REPAIR / RESTORATION

At all repair locations where there is existing tracer wire, the tracer wire shall be properly reconnected and spliced as outlined above.

END OF SECTION 333122

SECTION 333213 – BOOSTER PUMP STATION BUILDING

FIBERGLASS REINFORCED POLYMER (FRP) SHELTER

PART 1 - GENERAL

1.01 SYSTEM DESCRIPTION

- A. Shelter Location (City, State): Branson, MO
- B. Equipment Inside Shelter:
 - 1. Size:
 - a. Exterior Width: 8 ft
 - b. Exterior Length (cannot be less than width): 10 ft
 - c. Wall Height: 8 ft
 - 2. Roof Slope: Sufficient to allow rain drainage, 12° - 17° pitch.
 - 3. Roof Type: Roof shall be wind-resistant "hip" design sloping up from all four sides. Roof shall form a permanent weather-proof connection with a seamless exterior appearance that uses low-maintenance silicone caulk matching the shelter's exterior color.
 - 4. Roof deck is compliant with ASTM E 108/ULC S107 (class C) with <13' Flame Spread.
 - 5. Roof shall not overhang walls in order to maximize shelter's wind speed rating.
- C. System: Design, furnish, and install complete package using manufacturer's standard components.
- D. Structure Type: Fiberglass Reinforced Polymer (FRP) shelter on a formed and poured concrete pad as specified herein.
- E. Submittals: Shelter vendor to provide one (1) digital version of shop drawings and manufacturer's data including the following:
 - 1. Dimensions, weight, materials, parts, devices, and all other information required to verify compliance with these Specifications.
 - 2. Manufacturer's Literature and Technical Data: Drawings and Specifications for proposed system.
 - 3. Drawings prepared specifically for this Project:
 - a. Materials and Details: Show materials, details of components (including doors and other accessories), finishes, fastenings, methods of joining, sealants, anchor bolt details, structural members and bracing, and openings.
 - b. Anchorage details of structure to foundation.
- F. Operations and Maintenance (O&M) Manual including installation instructions, digital version only, to be provided after shelter ships.

1.02 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Designers:

- a. No Professional Engineer certified drawings are needed.
- 2. Manufacturer:
 - a. Longevity: At least 10 years' experience in work of the type required in this section.
 - b. Capacity: Production throughput sufficient to provide work required for this Project without delay.
 - c. Certified Test Results: The manufacturer shall have an entire fiberglass panel destructive tested by an accredited Testing Laboratory and Third Party Quality Control Agency and upon request shall furnish to the engineer the certified and stamped test results of the laboratory testing. The accredited Testing Laboratory must be accredited to ISO 17020 and 17025.
 - d. Quality: The manufacturer shall maintain a quality assurance program that is reviewed and approved by a Third Party Quality Control Agency.
- 3. Erector/Installer:
 - a. Not less than 2 years' experience in the offloading and installation of prefabricated structures.

B. Material Properties:

- 1. Fiberglass Laminate Properties:
 - a. Tensile Strength (ASTM D 638) 16,000 (psi)
 - b. Flexural Strength (ASTM D 790) 33,700 (psi)
 - c. Flexural Modulus (ASTM D 790) 1,160,000 (psi)
 - d. Tensile Modulus (ASTM D 638) 1,300,000 (psi)
 - e. Barcol Hardness 45
 - f. Izod Impact - Notched ((ft.-lbs)/in) 16.30
 - g. Izod Impact - Unnotched ((ft.-lbs)/in) 21.79
- 2. Foam shall be rigid closed cell, polyisocyanurate with a density of 1.5 - 1.9 pounds per cubic foot.
 - a. Flame Spread (ASTM E 84) <75
 - b. Smoke Development (ASTM E 84) <450

1.03 DELIVERY, STORAGE, AND HANDLING

- A. The fiberglass shelter and the accessory items shall be carefully transported, stored, handled and set in place in a manner that will prevent distortion, misalignment or other damage to the units.
- B. During storage prior to installation and following installation, but prior to placing in service, the manufacturer's recommendations regarding handling shall be followed.

1.04 MANUFACTURERS WARRANTY

- A. Manufacturer shall provide a twenty-five (25) year warranty on the shelter materials and workmanship, according to the following specifications:
 - 1. The shelter will be free from manufacturing defects in workmanship and will not appreciably deteriorate under conditions of normal use and regular service and maintenance when installed properly, for a period of twenty-five (25) years from the original date of purchase.
 - 2. Component parts will be purchased from reputable manufacturers and carry their own warranties.

3. Any shelter penetrations made by shelter manufacturer must be maintained by the Customer to ensure proper sealing. Suggested intervals is every (2) two years. All penetrations made by the Customer during shelter installation are the responsibility of the Customer and may void or limit the warranty if done improperly.
4. All warranties are Null and Void if the shelter and/or its components are modified or damaged as a result of unauthorized repair, misuse, negligence, accident, or act of God. This warranty does not cover vandalism, unreasonable use, damage caused by flying or falling objects, collision with animals or vehicles, or damages caused by environmental extremes or natural disasters, such as earthquakes, floods, hail or lightning.

PART 2 - PRODUCTS

2.01 SYSTEM PERFORMANCE. Structural Loading:

- A. Shelter: Own dead load.
- B. Roof Load per ASCE 7-16. Est. 20 psf live load
- C. Wind Load per ASCE 7-16 (Risk Category III). Est. 110 mph
- D. Seismic Load: Per local building code

2.02 COMPONENTS

- A. U-BOLTS. Through-wall lifting/tie-down eyes at the top of each corner to facilitate handling.
- B. WALLS. Each wall shall be one single monolithic piece with faux brick textured appearance. Panelized construction not acceptable because connections could fail and leak over time.
- C. CONNECTIONS. Wall panels shall overlap to form a permanent weather-proof connection with a seamless exterior appearance that uses low-maintenance silicone caulk matching the shelter's exterior color. Internal connections shall use stainless steel hardware spaced no more than 12" on center.
- D. EXTERIOR. All exterior surfaces shall have 18-20 mils of superior performance marine grade gel coat, incorporating ultra-violet inhibitors. Exterior color shall be desert sand, polar white, meadow green, or storm gray. Color to be selected by the Water Utility.
- E. INTERIOR. All interior surfaces shall be sprayed with 18-20 mils of Polycor 944 high quality isophthalic white gel coat finish offering the same characteristics as the exterior surfaces without ultra-violet inhibitors. Interior surface shall not contain any visible surface-mounted strut or other unsightly channel.
- F. BASE FLANGE. Shelter shall have an FRP mounting flange around the entire interior perimeter, ¼" thick, minimum 2" wide. Pockets which reduce the wall's full insulation value shall not be accepted. Sealant shall be provided for a weather-proof connection below the shelter's base. Flange shall be pre-drilled with 7/16" diameter holes 24" on center.

G. ACCESS

1. Pedestrian doors shall be made of fiberglass reinforced polymer (FRP).
2. Pedestrian doors shall be hung with stainless steel ball bearing type hinges equipped with tamper-resistant, non-removable pins. Hinges shall be oriented with no fasteners exposed when door is closed.
3. Pedestrian doors shall be sealed with a weather-tight EPDM gasket along the entire perimeter of the door.
4. Pedestrian doors shall have a 2.5" deep aluminum rain drip molding located above.
5. All pedestrian doors must be able to be set in 'open' position with no hands. Doors must be able to be removed from 'open' position and closed with no hands. Doors must have hydraulic closer to prevent wind damage to door.
6. Single door(s).
 - a. Quantity: 1
 - b. Height: 6'-8" Width: 3'
 - c. Closure system: 3-point, pad-lockable with anti-entrapment.
 - d. Threshold: Raised step-over FRP (<3" high).
 - e. Window: No window needed.

H. ELECTRICAL. Circuits terminate in: Breaker Panel, 120/240V single-phase, 100 amp main breaker, at least 10 breaker slots.

I. WIRING

1. Conduit: Schedule 40 PVC
2. Installed around the interior perimeter of the shelter, along the top of the wall. All conduit and fittings shall be UL Listed.
3. Conduit and wiring shall be installed in accordance with the most recent National Electric Code (NEC).
4. Minimum 12 gauge shall be used for wiring in conduit.
5. Wiring shall not be loaded above 60° C temperature rating.

J. ILLUMINATION

1. LED - Interior vapor-tight, wall-mounted, light fixture(s) providing at least 100 lumen/sf.
2. Interior lights to be operated by switch with weatherproof cover located at each pedestrian door.
3. Exterior light(s): One 40 Watt LED flood light operated by photocell.

2.03 MATERIALS

- A. Walls, roof and doors shall be seamless, one-piece panels laminated with 1/8" thick sprayed fiberglass outside surface, core material, and 1/8" thick sprayed fiberglass inside surface.
- B. INSULATION. Walls and roof shall have: R-12 with core consisting of minimum 1.5" thick foam.
- C. REINFORCEMENT. Items weighing more than 10 lbs. that will be field mounted to the building require minimum 19/32" wood encapsulated within interior surface: All walls

- D. CORROSIVITY. Standard level of environmental corrosivity. Components are NEMA 1 powder coated or equivalent.
- E. EXPLOSIVITY. Electrical components are General Purpose (no explosive risk).

PART 3 - EXECUTION

3.01 EXAMINATION. Investigate site, including soils, to determine effect on proposed shelter.

3.02 PREPARATION.

- A. Install concrete slab true and level to a maximum surface variance of 3/16" where the shelter interfaces with the slab.
- B. The slab immediately surrounding the shelter perimeter shall be sloped away at a pitch of 1/2" per foot to promote proper drainage and eliminate the potential of standing water around the shelter.

3.03 ERECTION

- A. At the time of installation, the slab shall be clean and dry.
- B. Follow written offloading and installation instructions provided by shelter manufacturer.
- C. Contractor shall provide any required Type 316 stainless steel expansion anchors.
- D. Install and make final electrical connections to all equipment shipped loose with water-tight flexible conduit and fittings.

END OF SECTION 333213

SECTION 333213.01 - BOOSTER PUMPS

PART I – GENERAL

1.01 WORK INCLUDED

- A. Variable Speed Packaged Pumping System

1.02 REFERENCE STANDARDS

The work in this section is subject to the requirements of applicable portions of the following standards:

- A. Hydraulic Institute
- B. ANSI – American National Standards Institute
- C. ASTM – American Society for Testing and Materials
- D. IEEE – Institute of Electrical and Electronics Engineers
- E. NEMA – National Electrical Manufacturers Association
- F. NEC – National Electrical Code
- G. ISO – International Standards Organization
- H. UL – Underwriters Laboratories, Inc.

PART 2 – PRODUCTS

2.01 VARIABLE SPEED PACKAGED PUMPING SYSTEM

- A. Furnish and install a pre-fabricated and tested variable speed packaged pumping system to maintain constant water delivery pressure.
- B. The packaged pump system shall be a standard product of a single pump manufacturer. The entire pump system including pumps and pump logic controller, shall be designed, built, and tested by the same manufacturer.
- C. The complete packaged water booster pump system shall be certified and listed by UL (Category QCZJ – Packaged Pumping Systems) for conformance to U.S. and Canadian Standards.
- D. The complete packaged pumping system shall be NSF61 / NSF372 Listed for drinking water and low lead requirements.
- E. The packaged pump system shall be ASHRAE 90.1 – 2010 compliant without the need of a remote mounted sensor. The control logic used to simulate a remote mounted sensor shall be proportional pressure control with squared or linear adaptation. An actual flow rate or calculated flow rate based on performance curves (5th order polynomial) loaded into the controller; shall be used to adjust setpoint pressure in proportional pressure control.

2.02 PUMPS AND BLADDER PRESSURE TANK

- A. All pumps shall be ANSI NSF 61 / NSF372 Listed for drinking water and low lead requirements.
- B. The pumps shall be of the in-line vertical multi-stage design.

C. The head-capacity curve shall have a steady rise in head from maximum to minimum flow within the preferred operating region. The shut-off head shall be a minimum of 20% higher than the head at the best efficiency point.

D. Small Vertical In-Line Multi-Stage Pumps (Nominal flow from 3 to 125 gallons per minute) shall have the following features:

1. The pump impellers shall be secured directly to the pump shaft by means of a splined shaft arrangement.
2. The suction/discharge base shall have ANSI Class 250 flange or internal pipe thread (NPT) connections as determined by the pump station manufacturer.
3. Pump Construction:
 - a. Suction/discharge base, pump head, motor stool: Cast iron (Class 30)
 - b. Impellers, diffuser chambers, outer sleeve: 304 Stainless Steel
 - c. Shaft: 316 or 431 Stainless Steel
 - d. Impeller wear rings: 304 Stainless Steel
 - e. Shaft journals and chamber bearings: Silicon Carbide
 - f. O-rings: EPDM

Shaft couplings for motor flange sizes 184TC and smaller shall be made of cast iron or sintered steel. Shaft couplings for motor flange sizes larger than 184TC shall be made of ductile iron (ASTM 60-40-18).

Optional materials for the suction/discharge base and pump head shall be cast 316 stainless steel (ASTM CF-8M) resulting in all wetted parts of stainless steel.

4. The shaft seal shall be a balanced o-ring cartridge type with the following features:
 - a. Collar, Drivers, Spring: 316 Stainless Steel
 - b. Shaft Sleeve, Gland Plate: 316 Stainless Steel
 - c. Stationary Ring: Silicon Carbide
 - d. Rotating Ring: Silicon Carbide
 - e. O-rings: EPDM

The Silicon Carbide shall be imbedded with graphite.

5. Shaft seal replacement shall be possible without removal of any pump components other than the coupling guard, shaft coupling and motor. The entire cartridge shaft seal shall be removable as a one piece component. Pumps with motors equal to or larger than 15 hp (fifteen horsepower) shall have adequate space within the motor stool so that shaft seal replacement is possible without motor removal.

E. Motor and Booster Pumps:

Booster Pump - Two
Motor Rating: 1.5 HP (Fixed)
Motor sizing specification : Max power (non-overloading)
Margin over specification : 0.00 %
Service factor : 1.00

Max power (non-overloading) : 0.70 hp
Motor rating : 1.50 hp / 1.12 kW (Fixed)
Panel Max FLA : 6.1 A
MCA : 6.8 A
MOCP : 15 A
System flowrate : 19.00 US gpm
Flowrate per pump : 19.00 US gpm
Differential head / pressure, rated (actual) : 60 ft
Suction pressure, min / max : 0.00 / 0.00 psi.g
NPSH available, rated : Ample
Site Supply Frequency : 60 Hz
Power Supply : 3ph 460V

- E. Pressure Tank:
Durable metal construction
10 gal. capacity
145 PSI max.; 38 PSI pre-charge pressure
Pressure switch setting: 30/50
210°F max. working temperature
Pressure tank approved by IAPMO Z1089-2013
Bladder approved by NSF/ANSI 61

2.03 INTEGRATED VARIABLE FREQUENCY DRIVE MOTORS

- A. Each motor shall be of the Integrated Variable Frequency Drive design consisting of a motor and a Variable Frequency Drive (VFD) built and tested as one unit by the same manufacturer.
- B. The VFD shall be of the PWM (Pulse Width Modulation) design using current IGBT (Insulated Gate Bipolar Transistor) technology.
- C. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of motor. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump control and to eliminate the need for motor de-rating.
- D. The VFD shall utilize an energy optimization algorithm to minimize energy consumption. The output voltage shall be adjusted in response to the load, independent of speed.
- E. The VFD shall automatically reduce the switching frequency and/or the output voltage and frequency to the motor during periods of sustained ambient temperatures that are higher than the normal operating range. The switching frequency shall be reduced before motor speed is reduced.
- F. An integral RFI filter shall be standard in the VFD.
- G. The VFD shall have a minimum of two skip frequency bands which can be field adjustable.
- H. The VFD shall have internal solid-state overload protection designed to trip within the range of 125-150% of rated current.

- I. The integrated VFD motor shall include protection against input transients, phase imbalance, loss of AC line phase, over-voltage, under-voltage, VFD over-temperature, and motor over-temperature. Three-phase integrated VFD motors shall be capable of providing full output voltage and frequency with a voltage imbalance of up to 10%.
- J. The integrated VFD motor shall have, as a minimum, the following input/output capabilities:
 - 1. Speed Reference Signal: 0-10 VDC, 4-20mA
 - 2. Digital remote on/off
 - 3. Fault Signal Relay (NC or NO)
 - 4. Fieldbus communication port (RS485)
- K. The motor shall be Totally Enclosed Fan Cooled (TEFC) with a standard NEMA C-Face, Class F insulation with a temperature rise no higher than Class B.
- L. The cooling design of the motor and VFD shall be such that a Class B motor temperature rise is not exceeded at full rated load and speed at a minimum switching frequency of 9.0 kHz.
- M. Motor drive end bearings shall be adequately sized so that the minimum L10 bearing life is 17,500 hours at the minimum allowable continuous flow rate for the pump at full rated speed.

2.04 PUMP SYSTEM CONTROLLER

- A. The pump system controller shall be a standard product developed and supported by the pump manufacturer.
- B. The controller shall be microprocessor based capable of having software changes and updates via personal computer (notebook). The controller user interface shall have a color display with a minimum screen size of 3-1/2" x 4-5/8" for easy viewing of system status parameters and for field programming. The display shall have a back light with contrast adjustment. Password protection of system settings shall be standard.
- C. The controller shall provide internal galvanic isolation to all digital and analog inputs as well as all fieldbus connections.
- D. The controller shall have the ability to be connected to a battery to maintain power on controller during periods of loss of supply power.
- E. The controller shall have built in data logging capability. Logged values shall be graphically displayed on the controller and able to be exported. A minimum of 3600 samples per logged value with the following parameters available for logging:
 - Estimated flow-rate
 - Speed of pumps
 - Inlet pressure
 - Process Value (usually discharge pressure or differential pressure depending on application)
 - Power consumption
 - Controlling parameter (process value)

- F. The controller shall display the following as status readings from a single display on the controller (this display shall be the default):
- Current value of the control parameter, (typically discharge pressure)
 - Most recent existing alarm (if any)
 - System status with current operating mode
 - Status of each pump with current operating mode and rotational speed as a percentage (%)
 - Estimated flow-rate, (not requiring flow meter connection)
- G. The controller shall have as a minimum the following hardware inputs and outputs:
- Three analog inputs (4-20mA or 0-10VDC)
 - Three digital inputs
 - Two digital outputs
 - Ethernet connection
 - Field Service connection to PC for advanced programming and data logging
- H. Pump system programming (field adjustable) shall include as a minimum the following:
- Water shortage protection (analog or digital)
 - Sensor Settings (Suction, Discharge, Differential Pressure analog supply/range)
 - PI Controller (Proportional gain and Integral time) settings
 - High system pressure indication and shut-down
 - Low system pressure indication and shut-down
 - Low suction pressure/level shutdown (via digital contact)
 - Low suction pressure/level warning (via analog signal)
 - Low suction pressure/level shutdown (via analog signal)
 - Flow meter settings (if used, analog signal)
- I. The system controller shall be able to accept up to seven programmable set-points via a digital input, (additional input/output module may be required).
- J. The controller shall have advanced water shortage protection. When analog sensors (level or pressure) are used for water shortage protection, there shall be two indication levels. One level is for warning indication only (indication that the water level/pressure is getting lower than expected levels) and the other level is for complete system shutdown (water or level is so low that pump damage can occur). System restart after shutdown shall be manual or automatic (user selectable).
- K. The system pressure set-point shall be capable of being automatically adjusted by using an external set-point influence. The set-point influence function enables the user to adjust the control parameter (typically pressure) by measuring an additional parameter. (Example: Lower the system pressure set point based on a flow measurement to compensate for lower friction losses at lower flow rates).
- L. The controller shall be capable of receiving a remote analog set-point (4-20mA or 0-10 VDC) as well as a remote system on/off (digital) signal.
- M. The controller shall be able to adjust the ramp time of a change in set point on both an increase or decrease change in set point.

- N. The pump system controller shall store up to 24 warning and alarms in memory. The time, date and duration of each alarm shall be recorded. A potential-free relay shall be provided for alarm notification to the building management system. The controller shall display the following alarm conditions:

High System Pressure	Low system pressure
Low suction pressure (warning and alarm)	Individual pump failure
VFD trip/failure	Loss of sensor signal (4-20 mA)
Loss of remote set-point signal (4-20mA)	System power loss

- O. The pump system controller shall be mounted in a UL Type 3R rated enclosure. A self-certified NEMA enclosure rating shall not be considered equal. The entire control panel shall be UL 508 listed as an assembly. The control panel shall include a main disconnect, circuit breakers for each pump and the control circuit and control relays for alarm functions.

Control panel options shall include, but not be limited to:

Pump Run Lights	System Fault Light
Audible Alarm (80 db[A])	Surge Arrestor
Emergency/Normal Operation Switches	Service Disconnect Switches
Qty (9) Configurable Digital Outputs available for monitoring	

- P. The controller shall be capable of receiving a redundant sensor input to function as a backup to the primary sensor (typically discharge pressure).
- Q. The controller shall have a pump “Test Run” feature such that pumps are switched on during periods of inactivity (system is switched to the “off” position but with electricity supply still connected). The inoperative pumps shall be switched on for a period of two to three (3-4) seconds every 24 hours, 48 hours or once per week and at specific time of day (user selectable).
- R. The controller shall be capable of changing the number of pumps available to operate or have the ability limit the maximum power consumption by activation of a digital input for purposes of limited generator supplied power.
- S. The controller shall be capable of displaying instantaneous power consumption (Watts or kilowatts) and cumulative energy consumption (kilowatt-hours).
- T. The controller shall be capable of displaying instantaneous specific energy use (kW/gpm), (optional flow meter must be connected).
- U. The actual pump performance curves (5th order polynomial) shall be loaded (software) into the pump system controller. Pump curve data shall be used for the following:
- Display and data logging of calculated flow rate (not requiring flow measurement)
 - Proportional pressure control
 - Pump outside of duty range protection
 - Pump cascade control based on pump efficiency
- V. The controller shall be capable of displaying an estimated flow-rate on the default status screen.

- W. The controller shall have proportional pressure control to compensate for pipe friction loss by decreasing pressure set-point at lower flow-rates and increasing pressure set-point at higher flow-rates by using actual flow rate or calculated flow rate. Proportional pressure control that uses pump speed or power consumption only shall not be considered equal to proportional pressure control that uses actual or calculated flow rate.
- X. The controller shall have the ability to communicate common field-bus protocols, (BACnet, Modbus, Profibus, and LON), via optional communication expansion card installed inside controller.
- Y. The controller shall have Ethernet connection with a built-in server allowing for connection to a network with read/write access to controller via web browser and internet.
- Z. The controller shall have a programmable Service Contact Field that can be populated with service contact information including: contact name, address, phone number(s) and website.

2.05 SEQUENCE OF OPERATION

- A. The system controller shall operate equal capacity variable speed pumps to maintain a constant discharge pressure or differential pressure (system set point), depending on the application. The system controller shall receive an analog signal [4-20mA] from the factory installed pressure transducer on the discharge manifold, indicating the actual system pressure.

Standard Cascade Control (Pumping Efficiency Based):

The pump system controller shall adjust pump speed as necessary to maintain system set-point pressure as flow demand increases. Utilizing the pump curve information (5th order polynomial), the pump system controller shall stage on additional pumps when pump hydraulic efficiency will be higher with additional pumps in operation. Exception: When the flow and head are outside the operating pump(s) allowable operating range the controller shall switch on an additional pump thus distributing flow and allowing all pump(s) to operate in allowable operating range. When the system pressure is equal to the system set point, all pumps in operation shall reach equal operating speeds. The pump system controller shall have field adjustable Proportional Gain and Integral time (PI) settings for system optimization.

Optional Cascade Control (Pump Start Speed Based):

As flow demand increases the pump speed shall be increased to maintain the system set-point pressure. When the operating pump(s) reach 96% of full speed (adjustable), an additional pump will be started and will increase speed until the system set point is achieved. When the system pressure is equal to the system set point all pumps in operation shall reach equal operating speeds. The pump system controller shall have field adjustable Proportional Gain and Integral time (PI) settings for system optimization.

- B. The system controller shall be capable of switching pumps on and off to satisfy system demand without the use of flow switches, motor current monitors or temperature measuring devices.

- C. All pumps in the system shall alternate automatically based on demand, time and fault. If flow demand is continuous (no flow shutdown does not occur), the system controller shall have the capability to alternate the pumps every 24 hours, every 48 hours or once per week. The interval and actual time of the pump change-over shall be field adjustable.
- D. The system controller shall be able to control a pressure maintenance pump, (jockey pump), in the system in pressure boosting applications. The set point of the pressure maintenance pump shall be able to be any value above or below the pump system's set point. The pressure maintenance pump shall be able to be staged on as back-up pump when capacity of pump system is exceeded.

2.06 LOW FLOW STOP FUNCTION (Constant Pressure Applications)

The system controller shall be capable of stopping pumps during periods of low-flow or zero-flow without wasting water or adding unwanted heat to the liquid. Temperature based no flow shut-down methods that have the potential to waste water and add unwanted temperature rise to the pumping fluid are not acceptable and shall not be used.

Standard Low Flow Stop and Energy Saving Mode

If a low or no flow shut-down is required (periods of low or zero demand) a bladder type diaphragm tank shall be installed with a pre-charge pressure of 70% of system set-point. The tank shall be piped to the discharge manifold or system piping downstream of the pump system. When only one pump is in operation the system controller shall be capable of detecting low flow (less than 10% of pump nominal flow) without the use of additional flow sensing devices. When a low flow is detected, the system controller shall increase pump speed until the discharge pressure reaches the stop pressure (system set point plus 50% of programmed on/off band, adjustable). The pump shall remain off until the discharge pressure reaches the start pressure (system set point minus 50% of programmed on/off band, adjustable). Upon low flow shut-down a pump shall be restarted in one of the following two ways:

- A. Low Flow Restart: If the low flow condition still exists, the pump shall start, and the speed shall again be increased until the stop pressure is reached and the pump shall again be switched off.
- B. Normal Flow Restart: If the pump system controller determines a low flow condition no longer exists the pump shall start and the speed shall be increased until the system pressure reaches the system set-point.

[OPTIONAL] Low Flow Stop and Energy Saving Mode

The pump system controller shall be capable receiving a digital signal from a flow switch or an analog signal from a flow meter to indicate a low flow condition. A bladder type diaphragm tank shall be installed with a pre-charge pressure of 70% of system set-point. The tank shall be piped to the discharge manifold or system piping downstream of the pump system. When low flow is detected (signal from flow switch or meter), the system controller shall increase pump speed until the discharge pressure reaches the stop pressure (system set-point plus 50% of programmed on/off band). The pump shall remain off until the discharge pressure reaches the start pressure (system set-point minus 50% of programmed on/off band). The pump shall remain in the energy saving on/off mode during low flow indication. When low flow is no longer present (low flow indication ceases), the pump(s) shall resume constant pressure operation.

It shall be possible to change from the standard low flow stop to the optional low flow stop (and vice-versa) via the user interface.

PART 3 - EXECUTION

PART 3 - EXECUTION

3.01 SYSTEM CONSTRUCTION

- A. Suction and discharge manifold construction shall be in way that ensures minimal pressure drops, minimize potential for corrosion, and prevents bacteria growth at intersection of piping into the manifold. Manifold construction that includes sharp edge transitions or interconnecting piping protruding into manifold is not acceptable. Manifold construction shall be such that water stagnation can not exist in manifold during operation to prevent bacteria growth inside manifold.
- B. The suction and discharge manifolds material shall be 316 stainless steel. Manifold connection sizes shall be as follows:
- 3 inch and smaller: Male NPT threaded
 - 4 inch through 8 inch: ANSI Class 150 rotating flanges
 - 10 inch and larger: ANSI Class 150 flanges
- C. Pump Isolation valves shall be provided on the suction and discharge of each pump. Isolation valve sizes 2 inch and smaller shall be nickel plated brass full port ball valves. Isolation valve sizes 3 inch and larger shall be a full lug style butterfly valve. The valve disk shall be of stainless steel. The valve seat material shall be EPDM and the body shall be cast iron, coated internally and externally with fusion-bonded epoxy.
- D. A spring-loaded non-slam type check valve shall be installed on the discharge of each pump. The valve shall be a wafer style type fitted between two flanges. The head loss through the check valve shall not exceed 5 psi at the pump design capacity. Check valves 1-1/2" and smaller shall have a POM composite body and poppet, a stainless steel spring with EPDM or NBR seats. Check valves 2" and larger shall have a body material of stainless steel or epoxy coated iron (fusion bonded) with an EPDM or NBR resilient seat. Spring material shall be stainless steel. Disk shall be of stainless steel or leadless bronze.
- E. For systems that require a diaphragm tank, a connection of no smaller than 3/4" shall be provided on the discharge manifold.
- F. A pressure transducer shall be factory installed on the discharge manifold (or field installed as specified on plans). Systems with positive inlet gauge pressure shall have a factory installed pressure transducer on the suction manifold for water shortage protection. Pressure transducers shall be made of 316 stainless steel. Transducer accuracy shall be +/- 1.0% full scale with hysteresis and repeatability of no greater than 0.1% full scale. The output signal shall be 4-20 mA with a supply voltage range of 9-32 VDC.
- G. A bourdon tube pressure gauge, 2.5 inch diameter, shall be placed on the suction and discharge manifolds. The gauge shall be liquid filled and have copper alloy internal parts in a stainless steel case. Gauge accuracy shall be 2/1/2 %. The gauge shall be capable of a pressure of 30% above its maximum span without requiring recalibration.
- H. Systems with a flooded suction inlet or suction lift configuration shall have a factory installed water shortage protection device on the suction manifold.

- I. The base frame shall be constructed of corrosion resistant 304 stainless steel. Rubber vibration dampers shall be fitted between each pumps and baseframe to minimize vibration.
- J. Depending on the system size and configuration, the control panel shall be mounted in one of the following ways:
 - On a 304 stainless steel fabricated control cabinet stand attached to the system skid.
 - On a 304 stainless steel fabricated skid, separate from the main system skid
 - On its own base (floor mounted with plinth)

3.02 TESTING

- A. The entire pump station shall be factory tested for functionality. Functionality testing shall include the following parameters: Dry Run Protection, Minimum Pressure and Maximum Pressure alarms (where applicable), Setpoint Operation, and Motor Rotation.
- B. The system shall undergo a factory hydrostatic test at the end of the production cycle. The system shall be filled with water and pressurized to 1.5 times the nameplate maximum pressure. Systems with 150# flange connections shall be tested at 350 psig, and systems with 300# flange connections shall be tested at 450 psig. The pressure shall be maintained for a minimum of 15 minutes with no leakage (slight leakage around pump(s) mechanical seal is acceptable) prior to shipment.

3.03 WARRANTY

- A. The warranty period shall be a non-prorated period of 24 months from date of installation, not to exceed 30 months from date of manufacture.

END OF SECTION 333213.01

SECTION 333914 - ANTI-MICROBIAL CONCRETE ADDITIVES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The section specifies antimicrobial concrete additives usage in concrete to reduce corrosion due to the reaction of hydrogen sulfide gas with cast-in-place concrete wet wells, precast concrete structures and/or sewer pipes. The antimicrobial additive shall be used to render the concrete uninhabitable for bacterial growth.
- B. The applications for antimicrobial concrete additives work of this section include the following:
 - 1. Concrete used to manufacture precast pipe for use in municipal sewer environments.
 - 2. Concrete used to pour cast-in-place wet wells and concrete used to manufacture precast structures for use in municipal sewer environments.

1.02 SYSTEM PERFORMANCES

- A. Provide antimicrobial concrete additives that have been produced and installed to establish and maintain resistance to corrosion caused by the hydrogen sulfide gas in municipal sewer environments. The antibacterial additive shall have successfully demonstrated prevention of microbiologically induced corrosion in sanitary sewers for ten or more years.
- B. Provide antimicrobial concrete additives that have been recommended by the manufacturer for service under the conditions of the particular concrete admixture application, including but not limited to precast concrete pipes and structures or wherever Thiobacillus bacteria may cause microbiologically induced corrosion.

1.03 SUBMITTALS

- A. Product data: Submit manufacturer's technical data for each antimicrobial concrete product required, including instructions for admixture preparation and application.
- B. Product Certification: Submit certification in writing by the antimicrobial concrete additive manufacturer that each admixture product is recommended and suitable for the proposed application. The written certification shall name the admixture product and shall identify the specific structures and locations where the admixture will be installed.
- C. Product Tests: Submit certified test reports for the antimicrobial concrete additives ability to completely neutralize Thiobacillus bacteria in precast concrete products in municipal sewer environments.
- D. Concrete Mix Design including Additives.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Antimicrobial concrete admixtures are harmful if swallowed, inhaled or absorbed through skin. Do not get in eyes, on skin or clothing. Wash thoroughly with soap and water after handling.

- B. Keep containers closed. Do not use or store near heat or open flames. Do not freeze. Store antimicrobial concrete additive material, either as a nominally pure generic product or as an equivalent-performance modification thereof or proprietary product.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. General: Manufacturers listed in this article include those known to produce the indicated category of antimicrobial concrete additive material, either as a nominally pure generic product or as an equivalent-performance modification thereof or proprietary product.
- B. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
 - 1. Manufacturers of antimicrobial concrete additives:
 - a. Conshield Technologies Inc; Atlanta, GA
 - b. Xypex Chemical Corporation; Richmond, BC
 - c. MarMac Applied Infrastructure Sciences; McBee, SC
 - d. or approved equal.

2.02 MATERIALS

- A. Antimicrobial Concrete Additives:
 - 1. The liquid antibacterial additive shall be an EPA registered material and the registration number shall be submitted for approval prior to use in the project.
 - 2. Antimicrobial concrete additives prevent microbiologically induced corrosion (MIC) common to concrete pipe, wet wells and similar structures in municipal sewer environments. As an additive, it permeates the concrete or repair mortar during the mixing phase of hydrogen sulfide generated corrosion and molecularly bonds to the cement particles to become an integral component of the hardened product and to create an environment incompatible to harmful bacterial growth. The additive becomes an integrated component of the hardened binder. It cannot wash off, delaminate or lose its effectiveness from wear. Scraping or erosion of the concrete surface only serves to expose additional material to the environment that would otherwise foster bacterial growth. As bacterial growth is neutralized, hydrogen sulfide gases released from the raw sewerage cannot be metabolized and converted into sulfuric acid in concentrations sufficient to damage the impregnated concrete and mortar.
 - 3. Antimicrobial concrete additives are ideally suited for concrete used to manufacture precast pipes and structures for use in municipal sewer environments or wherever Thiobacillus bacteria may cause microbiologically induced corrosion (MIC).

PART 3 - EXECUTION

3.01 MIXING

- A. The mix design for proposed cast-in-place and precast concrete shall be reviewed to verify compatibility with other admixtures being used in the mix.
- B. ConmicShield®, or approved equal, shall be added to concrete mix at concrete plant or precasters plant per manufacturers recommendations. The amount to be used shall be as recommended by the manufacturer of the antimicrobial additive. This amount shall be included in the total water content of the concrete mix design. The additive shall be added into the concrete mix water to insure even distribution of the additive throughout the concrete mixture.
- C. A chemical injection pump and meter system may be utilized to inject the proper amount of ConmicShield®, or approved equal, into the mix water at the time of production.

3.02 FIELD REPAIRS

- A. Field repairs to the cast-in-place or precast concrete shall be made using ConmicShield® Joint Set Grout, or approved equal, pre-portioned and factory packaged that requires the addition of no other components. This repair grout may be used for filling joints, lift holes, damaged areas, benches and similar.

3.03 IDENTIFICATION

- A. An additive color identifier-indicator shall be applied to the interior of each piece and each piece shall be plainly stenciled with the name of the antimicrobial additive on the interior and exterior.

3.04 VERIFICATION AND TESTING

- A. Acceptance shall be a letter of certification from the concrete contractor or precaster to the project owner stating that the correct amount and correct mixing procedure were followed for all antimicrobial concrete.
- B. The concrete contractor or precast producer shall retain two cured pieces of concrete from each batch made with ConmicShield®, or approved equal. The pieces must have a minimum dimension of 1 square inch but they need not be uniform. Pieces may be obtained from remnants of cylinder break tests. The specimens shall be placed in plastic baggies and clearly labeled with the date, batch number, pipe or wet well dimension and specific project.
- C. One set of samples from each concrete batch shall be retained by the concrete contractor or precast producer and one set shall be sent to the additive manufacturer or an independent laboratory for verification of the presence of the additive.
- D. Testing by an independent lab shall proceed as follows:
 - 1. Specimens shall be conditioned in such a manner as to lower the pH to levels conducive to the promotion of the rapid growth of the indicator bacteria;
 - 2. Specimens shall then be inoculated with measurable amounts of the indicator bacteria and incubated in a closed container at 25 Centigrade for 24 hours;

3. Inoculated specimens shall be swabbed and examined;
 4. If any bacteria are living on the specimens at the end of the 24 hour period, the test is NEGATIVE for the presence of ConmicShield®, or approved equal; if there are no living bacteria then the test is POSITIVE for the presence of ConmicShield®, or approved equal.
- E. The report shall be sent to the Engineer and Owner for review and approval.

END OF SECTION 333914

APPENDIX 1

Stormwater Pollution Prevention Plan (SWPPP)
TABLE ROCK STATE PARK
GRE: 4579

Stormwater Pollution Prevention Plan (SWPPP)

TABLE ROCK STATE PARK
GRE: 4579
5272 STATE HWY 165, CAMPGROUND #2
BRANSON, MO 65616

SWPPP Prepared For:
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Estimated Project Duration: .77 YEARS
SWPPP Preparation Date: 2/15/2023
Estimated Project Start Date: 4/3/2023
Estimated Project Completion Date: 1/5/2024

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SECTION 1: NATURE OF CONSTRUCTION ACTIVITY

Instructions:

- Describe the function of the project and estimate the total area expected to be disturbed by tree removal, excavation, grading, or other construction activities, including, but not limited to, off-site borrow and fill areas.
- Provide a general description of the nature of the construction activities at your project.
- What is the size of the property (in acres), the total area expected to be disturbed by the construction activities (in acres), and the maximum area expected to be disturbed at any one time? Include the area needed for material production such as batch plants and storage of materials or piles.
- A general map (e.g., United States Geological Survey quadrangle map, a portion of a city or county map, or other map) with enough detail to identify the location of the construction site and waters of the state within one mile of the site.

General Description of Project

Table Rock State Park is a project improving Missouri State Parks which includes meeting the demands of modern recreational vehicles by providing 50-amp electrical service, water, and wastewater connections for 22 campsites. The project is located at 5272 State Highway 165, Campground 2 in Branson, Missouri.

Size of Construction Project

TOTAL ACREAGE OF PROPERTY: 356.0 AC

TOTAL ACREAGE TO BE DISTURBED BY ACTIVITY: 3.12 AC

TOTAL ACREAGE TO BE DISTURBED AT ONE TIME DURING EACH PHASE OF THE SITE (refer to phasing and stabilization section for more information): 3.12 AC (repeat for each phase)

Public Improvement Project: N/A

- The site is associated with a Public Improvement Project.
- The Public Improvement is inside the area of disturbance.
- The Public Improvement is connected and continues outside of the area of disturbance.

1.1 Discharge Information

Instructions:

- Describe water resources found on or near the site.
- Describe the locations and methods (e.g. channel or sheet flow) of water leaving the site through all site outfalls.
- List the name of the first surface water that receives discharges from your site. If your site has discharges to multiple surface waters, indicate the names of all such waters.

General Description of Water Resources found on Site (e.g. streams and sinkholes) and Stormwater Outfalls (where the water leaves the site).

Stormwater from this site leaves the site from two outfalls located at 36°34'40.8"N 93°18'06.5W and 36°34'38.4"N 93°18'06.0W and into Table Rock Lake.

List Receiving Waters

TABLE ROCK LAKE

1.2 Construction Support Activities

Instructions:

- Will there be any construction support activities for the project (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas)?
- Describe how the support activities will be contained and stormwater runoff prevented.

Description of construction support activity and BMPs used to prevent runoff.

Material storage area

Support activity subcontractor:

COMPANY OR ORGANIZATION NAME _____

NAME _____

ADDRESS _____

ADDRESS _____

CELL PHONE NUMBER _____

OFFICE PHONE NUMBER _____

EMAIL _____

Location of construction support activity

See Site Map

SECTION 2: SWPPP TEAM CONTACT INFORMATION/RESPONSIBLE PARTIES

2.1 *Property Owner: Notification, Certification & Delegation of Authority to Contractor*

Instructions:

- The following certification statement must be signed and dated by the owner or legally authorized representative.
This person has authority to bind the company and signs Security Agreement contracts.
 - For a corporation, this could be a president, secretary, treasurer, or vice president, or any other person who performs similar policy or decision making functions for the corporation.
 - For a partnership or sole proprietorship, this could be a general partner or the proprietor.
 - For a municipality, state, federal or other public agency, this could be a principal executive officer or ranking elected official.
- This certification must be re-signed in the event of a SWPPP Modification.

Property Owner/Permittee:

Missouri Department of Natural Resources
Missouri State Parks
1659 E. Elm St.
PO Box 176
Jefferson City, MO 65102-0176
(573) 751-2479
moparks@dnr.mo.gov

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Submittal of the SWPPP and/or permit fee does not imply that the permit has been or will be authorized or issued. The permit fee will be adjusted according to the fee schedule if it's determined during the review process of the SWPPP that the area to be disturbed is more or less than that represented on the application.

I hereby certify that I am the legal owner of the property for which this permit is requested or his/her legally authorized agent.

OWNER: Please *Use Ink* to Print Name, Sign and Date

2.2 CONTRACTOR GIVEN AUTHORITY: NOTIFICATION & CERTIFICATION

Instructions:

- The designee is authorized if:
 - The authorization is made in writing by the individual making the designation.
 - The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as an operator, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company.
 - The signed and dated written authorization is included in the SWPPP.

Delegation of Authority

I, _____ (OWNER/PERMITTEE), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Missouri State Operating Permit, at (CONSTRUCTION SITE) Top of the Rock Golf Course.

The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit. This person will conduct inspections once a week and within 48 hours of stormwater event which causes runoff on-site and make corrective actions.

General Contractor:

Site Superintendent and/or designated Inspector #1 (makes decisions for corrective actions)

Name of person _____

Company _____

Cell Phone _____

Email _____

Site Superintendent and/or designated Inspector #2 (makes decisions for corrective actions)

Name of person _____

Company _____

Cell Phone _____

Email _____

[Repeat as needed for Contractor team.]

Delegation of Authority Continued

By signing this authorization, I confirm that I meet the requirements to make such a designation, and that the designee above meets the definition of a “duly authorized representative.”

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

OWNER: Please *Use Ink* to Print Name, Sign and Date

**CONTRACTOR NOTIFICATION OF
STORMWATER POLLUTION PREVENTION PLAN**

While working at a permitted job-site, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP). Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract (if under a contractual agreement). You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is on-site and shall be made available upon request.

Each contractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

**Site Superintendent and/or designated Inspector #1
CONTRACTOR: Please *Use Ink* to Print Name, Sign and Date**

**Site Superintendent and/or designated Inspector #2
CONTRACTOR: Please *Use Ink* to Print Name, Sign and Date**

2.3 *Additional Contractors: Notification & Certification*

Instructions:

- List the additional contractors expected to work on-site. Notify contractors of stormwater requirements applicable to their work.
- “Subcontractor” refers to any person or company performing work on-site for completion of the project, not just entities under contractual agreement.
- Only contractors performing activities which could impact stormwater quality (working in the dirt) need to be listed.

ALL ADDITIONAL CONTRACTORS MUST SIGN THE CONTRACTOR AGREEMENT FOUND IN THE APPENDIX.

Additional Contractors: Demolition, Excavation, Dirt Work, ESC Contractor, Plumbing & Utilities must sign the Contractor Agreement found in the appendix.

COMPANY OR ORGANIZATION NAME _____

NAME _____

ADDRESS _____

ADDRESS _____

CELL PHONE NUMBER _____

OFFICE PHONE NUMBER _____

EMAIL _____

COMPANY OR ORGANIZATION NAME _____

NAME _____

ADDRESS _____

ADDRESS _____

CELL PHONE NUMBER _____

OFFICE PHONE NUMBER _____

EMAIL _____

COMPANY OR ORGANIZATION NAME _____

NAME _____

ADDRESS _____

ADDRESS _____

CELL PHONE NUMBER _____

OFFICE PHONE NUMBER _____

EMAIL _____

Contractor Agreement

CONTRACTOR NOTIFICATION OF STORMWATER POLLUTION PREVENTION PLAN

While working at a permitted job-site, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP). Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract (if under a contractual agreement). You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is on-site and shall be made available upon request.

Each contractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

CONTRACTOR: Please *Use Ink* to Print Name, Sign and Date

CONTRACTOR: Please *Use Ink* to Print Name, Sign and Date

CONTRACTOR: Please *Use Ink* to Print Name, Sign and Date

CONTRACTOR: Please *Use Ink* to Print Name, Sign and Date

CONTRACTOR: Please *Use Ink* to Print Name, Sign and Date

CONTRACTOR: Please *Use Ink* to Print Name, Sign and Date

SECTION 3: TRAINING, INSPECTION AND CORRECTIVE ACTION

3.1 *Training*

Instructions:

The following personnel, at a minimum, must be trained, and therefore should be listed out individually in the table below:

- Person responsible for environmental matters
- Designated inspector (if different than above)

The Missouri State Operating Permit MORA10190 for land disturbance require the following: (1) The Permittee must designate a person responsible for environmental matters that has a thorough and demonstrable knowledge of the site's SWPPP and erosion and sediment control practices in general. (2) The Permittee is responsible for ensuring that the person who conducts inspections is a "qualified person", defined in MORA10190 as "a person knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention, who possesses the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any stormwater controls selected to control the quality of stormwater discharges from the construction activity."

3.2 *Inspection Personnel and Procedures*

Instructions:

- Describe the procedures you will follow for conducting inspections.
- Describe the procedures you will follow for corrective action.
- The person/people conducting inspections and corrective actions must be delegated as the people/person of authority.
- **Site Superintendent and/or designated Inspector #1 and #2 are responsible for conducting inspections and corrective actions. This person may be determined after project is awarded and the schedule will be determined at that time by the contractor.**

Inspection Schedule:

Choice A

- **SELF INSPECTION FORM TO BE USED FOR THIS SITE IS IN THE APPENDIX.**
- Inspection will be done at least **once per 7 calendar days**. Inspections must also occur within 48 hours after any rain event equal to or greater than 3.74 inches (2 year, 24 hour storm) and has ceased during a normal work day and within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday.

Choice B

- **SELF INSPECTION FORM TO BE USED FOR THIS SITE IS IN THE APPENDIX.**
- Inspection will be done at least once per **14 calendar days**. Inspections must also occur within 24 hours after any rain event equal to or greater than 0.25 inches or the occurrence of run off from snowmelt. If the storm event continues for multiple days and continues to accumulate 0.25 inches, you are required to conduct an inspection within 24 hours of the first day of the storm and within 24 hours after the end of the storm.
- Inspections are only required during project normal working hours. Areas on-site that have been finally stabilized must be inspected at least once per month.

Corrective Action Schedule to be used for choice A and B

Any structural or maintenance problems shall be noted in an inspection report and corrected within seven calendar days of the inspection. If weather conditions prevent correction of BMPs within 7 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 7 day time period. The documentation must be filed with the regular inspection reports, and the problem shall be corrected as soon as weather conditions allow. The responsible person must be notified by phone, text or email when stormwater runoff occurs.

SECTION 4: Best Management Practices (BMPs) for Pollution Control

General Instructions:

- Describe the erosion and sediment controls that will be installed and maintained at your site.
- BMPs shall be maintained and remain in effective operating condition during the entire duration of the project.
- **COMBINE ALL BMP DESIGNS WITH PHASING TABLES TOGETHER ON ONE LARGE DETAIL PLAN SHEET AND INCLUDE THEM ON THE EROSION CONTROL SITE PLANS.**
- You shall design, install and maintain effective erosion, sediment and chemical controls to minimize the discharge of pollutants. At a minimum, such controls shall be designed, installed and maintained to:
 - Control storm water volume and velocity within the site to minimize soil erosion;
 - Control storm water discharges, including both peak flowrates and total storm water volume, to minimize erosion at outlets and to minimize downstream channel and streambank erosion;
 - Minimize the amount of soil exposed during construction activity;
 - Minimize the disturbance of steep slopes;
 - Minimize sediment discharges from the site. The design, installation and maintenance of erosion and sediment controls shall address factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting storm water runoff, and soil characteristics, including the range of soil particle sizes expected to be present on the site;
 - If feasible, provide and maintain a 50-foot undisturbed natural buffer around surface waters of the state, direct storm water to vegetated areas to increase sediment removal and maximize storm water infiltration. If it is infeasible to provide and maintain an undisturbed 50-foot natural buffer, you shall comply with the stabilization requirements for areas within 50 feet of a surface water; and
 - Minimize soil compaction and, unless infeasible, preserve topsoil.

BMP Details and Design Narratives:

BMP DESIGN DETAIL, DESCRIPTION AND NARATIVE NOTES ARE PROVIDED ON EROSION SEDIMENT CONTROL DETAIL SHEET AND LISTED ON PHASING PLAN. ALL BMPS ARE SHOWN ON EROSION CONTROL PLAN.

BMP Notes shall address the following:

- Name
- Physical Description
- Site Conditions Requiring BMP (e.g. size of site, sheet flow, concentrated flow, 3:1 or greater slope)
- BMP Installation and Construction Procedures
- Operation and Maintenance Procedures
- Whether the BMP is Temporary or Permanent
- Site Conditions that must be met before removal of the BMP if it is not a permanent BMP.

4.1 Phasing of Construction Activities

Instructions:

- Describe the intended sequence and timing of activities that disturb soils at the site. For each phase of construction, include the following information:
 - Installation of stormwater filtering or damming, structural or non-structural Best Management Practices (BMPs) ;
 - Beginning and duration of earth-disturbing activities, including clearing and grubbing, demolition, mass grading, site preparation (i.e., excavating, cutting and filling), final grading, and creation of soil and vegetation stockpiles requiring stabilization;
 - Cessation, temporarily or permanently, of construction activities on the site, or in designated portions of the site;
 - Final or temporary stabilization of areas of exposed soil. The dates for stabilization must reflect applicable deadlines.
 - Make sure that the phases for installation of each BMP are consistent with installation sequencing.
 - You determine how many phases are appropriate.
 - **COMBINE ALL TYPICAL BMP DESIGN DETAILS WITH PHASING TABLE ON ESC DETAIL PLAN SHEET.**

Example of BMP Phasing Table to be printed on ESC Plan Details Sheet:

Phase	BMP	Date Installed/ Removed
Pre-Construction	<ol style="list-style-type: none"> 1. Permit Sign 2. Staging Yard 3. Portable Toilet 4. Trash Dumpster 5. Construction Exit 6. Perimeter control 7. Ditch Check 8. Tree protection fencing 9. Inlet protection for existing inlets 10. Temporary Sed Basin 	
Phase 1: Demo	<ol style="list-style-type: none"> 1. Natural Buffer Preservation 2. Dust Control 	
Phase 2: Grading	<ol style="list-style-type: none"> 1. Install Permanent Basin with Outlet Protection 2. Erosion Control Matting for Basin Slopes 3. Hydroseed Basin Slopes 4. Grade and Stabilize: one half of site at a time 5. Stock Pile Containment 6. Street Sweep 7. Dust Control 	
Phase 3: Storm System	<ol style="list-style-type: none"> 1. Inlet Protection 2. Ditch Checks 3. Check Dams 4. Stream Diversion 5. Stream Crossing 6. Dewatering Pump 7. Chemical Wash-Out Pit 	
Phase 4: Construction	<ol style="list-style-type: none"> 1. Plastic Lined Masonry area 	
Phase 5: Stabilization	<ol style="list-style-type: none"> 2. Sod Channels 3. Turf Reinforcement Matting 4. Hydroseed 	

Table Rock State Park Campground #2 Phasing of Construction Activities

Phase	BMP		Date Installed/Removed
Pre- Construction	1	Permit Sign	
	2	Staging Yard	
	3	Concrete Wash Out	
	4	Portable Toilet	
	5	Trash Dumpster	
	6	Perimeter Erosion Control	
Demo	1	Natural Buffer Preservation	
	2	Dust Control	
Grading /Paving	1	Street Sweep	
	2	Dust Control	
Stabilization	1	Seeding	

4.2 Natural Buffers

Instructions:

- Preserve existing vegetation where practical.
- A minimum of a 50-ft buffer of undisturbed natural vegetation should be provided between disturbed portions of the site and surrounding surface waters. You must show the 50-foot boundary line of the natural buffer on your Erosion Sediment Control (ESC) plan. Show on your ESC plan how any discharge will first be treated prior to entering the natural buffer and if velocity dissipation devices will be used to prevent erosion.
- You should measure a buffer perpendicular from any of the following points, whichever is further landward from the water:
 - 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
 - The edge of the stream or river bank, bluff, or cliff, whichever is applicable.
- If Buffer disturbances are authorized as part of in-stream work under a US Army Corps Engineers (USACE) Clean Water Act (WCA) Section 404 permit, no further documentation is required for Section 4.1 of the Template. Attach CWA Section 404 Permit. This exception only applies to the limits of disturbance authorized under the Section 404 permit, and does not apply to any upland portion of the construction project.
- Indicate preservation of existing vegetation by including boundaries on site map.

Will any areas of vegetation in addition to areas associated with surface water buffers be preserved during construction?

- YES, this project will practice preservation of existing vegetation as a non-structural BMP.
- NO, existing vegetation that is not associated with surface water buffers will be preserved.

Are there any surface waters within 50 feet of your project's earth disturbances?

- No (If no, no further documentation is required for the SWPPP Template.)
- Yes, I will provide and maintain a 50-foot undisturbed natural buffer as per ESC plan.
- Yes, buffer will be less than 50-foot supplemented by erosion and sediment controls that achieve the sediment load reduction equivalent to 50-foot undisturbed natural buffer.
- Yes, however I will NOT provide and maintain an undisturbed natural buffer of any size.
- Yes, however buffer disturbances are authorized as part of in-stream work under an Army Corps Section 404 permit found in Appendix.
- Yes and buffer disturbances will occur for the construction of a water-dependent structure or water access area (e.g., pier, boat ramp, and trail).

4.3 *Tree and Vegetation Preservation*

Instructions:

- The SWPPP shall require existing vegetation and trees to be preserved where practical.
- Determine if any trees will be preserved during this project. Tree preservation is as an example of non-structural BMPs. If applicable, include a tree preservation plan in the Appendix under Site Plans.
- Indicate all trees that will be preserved on your erosion control site map or on a separate tree preservation plan

Check box if section is NOT applicable.

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.4 *Perimeter Controls*

Instructions:

- Describe sediment controls used to eliminate sediment from being moved in a sheet flow or channelized flow during a rain event.
- If there is a portion of the perimeter with no sheet flow, slope or channelized runoff, a vegetated buffer of 8 ft can be substituted as perimeter control.

Check box if section is NOT applicable.

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.5 *Sediment Track-Out*

Instructions:

- All efforts should be made to prevent the deposition of earth and sediment onto roadways through the use of proper BMPs.
 - Stormwater inlets susceptible to receiving sediment shall have curb inlet protection.
- Describe stormwater controls that will be used to minimize the track-out of sediment onto off-site streets, other paved areas, and sidewalks from vehicles exiting your construction site.

Check box if section is NOT applicable.

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.6 Soil, Materials and Borrow/Fill sites

Instructions:

- Describe stormwater controls and other measures you will take to minimize the discharge of sediment or soil particles from stockpiled sediment or soil. Include a description of structural practices (e.g., diversions, berms, ditches, storage basins), including design, installation, and maintenance specifications used to divert flows from stockpiled sediment or soil, retain or detain flows, or otherwise limit exposure and the discharge of pollutants from stockpiled sediment or soil.
- Describe how topsoil will be preserved and identify these areas and control measures on your site map(s).
- Indicate if a borrow/fill site will be used for the project and provide information of permitted or non permitted site.

Check box if section is NOT applicable.

Borrow/fill sites (excavated material disposal areas, borrow areas)

Excess soil will be disposed of:

- On-site
- Off-site area is covered under this project's permit numbers and will be stabilized following construction as per the stabilization plan.
- Off-site area will not be stabilized following construction, a separate permit is needed.

Additional fill soil will be obtained from:

Off-site

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

Borrow/Fill site

City LDP# _____

State Permit # _____

COMPANY OR ORGANIZATION NAME _____

ADDRESS _____

CELL PHONE NUMBER _____

EMAIL _____

Disposal site

City LDP# _____

State Permit # _____

COMPANY OR ORGANIZATION NAME _____

ADDRESS _____

CELL PHONE NUMBER _____

EMAIL _____

4.7 *Minimization of Dust*

Instructions:

- Describe controls and procedures you will use at your project/site to minimize the generation of dust.

Check box if section is NOT applicable.

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.8 *Minimization of Disturbance of Steep Slopes*

Instructions:

- Describe how you will minimize the disturbance to steep slopes. A steep slope is greater than 3:1 (three feet horizontal to one foot vertical) or greater than 3% AND greater than 150 feet in length.
- Describe controls (e.g., erosion control blankets, tackifiers), including design, installation and maintenance specifications, that will be implemented to minimize sediment discharges from slope disturbances.

Check box if section is NOT applicable.

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.9 *Stormwater Control Measures*

Instructions:

- Examples of Stormwater Control Measures: Basins, Swales, Rain Gardens, Pervious Paving and Bioretention Features.
- In areas where final vegetative stabilization or infiltration practices will be installed, describe the control measures, design, and installation. Include maintenance specifications that will be used to restrict vehicle or equipment access and preservation of top soil for future seeding.

Check box if section is NOT applicable.

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.10 *Storm Drain Inlets*

Instructions:

- Describe controls that will be implemented to protect all inlets that will receive stormwater from your construction activities and that you have authority to access.

Check box if section is NOT applicable.

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.11 *Constructed Stormwater Conveyance Channels*

Instructions:

- If you will be installing a stormwater conveyance channel, describe control practices (e.g. velocity dissipation devices) that will be implemented at the construction site.

Check box if section is NOT applicable

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.12 *Sediment Basins and Sediment Traps*

Instructions:

- A sedimentation basin will be provided for each drainage area with 10 or more acres disturbed at one time. The basin shall be sized to treat a local 2-year, 24-hour storm. Include design specifications for each basin including volume, dimensions and outlet structure.
- Sediment basins must also utilize outlet structures that withdraw water from the surface unless infeasible.
- Temporary and permanent sedimentation basins must have a stabilized spillway to minimize the potential for erosion of the spillway or basin embankment.
 - Discharges from the basin shall not cause scouring of the banks or bottom of the receiving stream.
- Accumulated sediment shall be removed from the basin when the basin is 50% full. The basin shall be maintained until final stabilization of the disturbed area served by the basin.
- If use of a sediment basin is impractical, similarly effect BMPs must be chosen and employed to control erosion and sediment delivery. These similarly effective BMPs must provide equivalent water quality protection.
- Sediment traps are smaller and do not require a temporary outfall structure. However, a dewatering plan may be required to empty traps, such as a pump with filtering BMP.

Check box if section is NOT applicable

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.13 *Treatment Chemicals and Flocculants*

Instructions:

- Provide details below if you are using treatment chemicals (polymers, flocculants, etc.) at your site.

Check box if section is NOT applicable.

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.14 Allowable Non-Stormwater Discharges

Instructions:

- Identify all allowable sources of non-stormwater discharges including:
 - Water only (i.e., without detergents or additives) rinsing of streets and buildings; and
 - Site watering to establish vegetation.

Check box if section is **NOT** applicable.

- Fire hydrant flushing
- Landscape irrigation
- Potable water including uncontaminated water line flushing
- Routine external building wash off waters
- Pavement wash off waters through a BMP

4.15 Dewatering Practices and Water Diversions

Instructions:

- If you will be discharging sediment water that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation, include design specifications and details of all dewatering practices.
 - An estimation of the volume of water discharged from these dewatering activities shall be kept with the SWPPP after each discharge has ended along with the type and maximum capacity of equipment used.
- You shall list specific BMPs designed to treat water pumped from trenches and excavations and in NO CASE shall this water be pumped off-site without being treated by the specific BMP.
- When working within a waterway, it may be necessary to divert water around the job site using a berm, pipe, or pump structure. This is an ideal BMP as it keeps the work area dry and water is not exposed to sediment.

Check box if section is **NOT** applicable.

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

4.16 Wash Water (Paving, Concrete, Stucco, Paint and Equipment/Vehicle)

Instructions:

- Describe how you will minimize the discharge of pollutants from wash waters and process water associated with paint, concrete and mortar activities.
- Describe equipment/vehicle washing practices that will be used to minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water and other types of washing (e.g. locating activities away from surface waters and stormwater inlets or conveyances, directing wash waters to a sediment basin or sediment trap, using filtration devices such as filter bags or sand filters, or using other similarly effective controls).

Check box if section is **NOT** applicable.

- Paving Operations- Sediment, Oils & Grease, Trash, Debris, Solids
- Concrete Wash-Out and Cement Waste- Heavy Metals, pH (acids and bases), Trash, Debris, Solids
- Structure Construction, Stucco, Painting and Cleaning- Heavy Metals, pH (acids and bases), Trash, Debris, Solids, Toxic Chemicals
- Equipment/Vehicle Washing- Sediment, Heavy Metals, pH (acids and bases), Oils & Grease, Trash, Debris, Solids, Toxic Chemicals

Best Management Practice Applicable:
BMP design detail, description and narrative notes are provided at the end of Section 4.

4.17 Fuel, Oil, and Petroleum Products (Equipment and Vehicles)

Instructions:

- All fueling will adhere to applicable federal and state regulations concerning underground storage, above ground storage and dispensing.
- Describe how you will minimize the discharge of pollutants from fuel, oil, and petroleum products associated with equipment and vehicles.
- Describe fueling, storage and mechanic practices that will be used to minimize the discharge of pollutants (e.g. locating activities away from surface waters and stormwater inlets or conveyances, containing activities with plastic liners, using filtration devices such as filter bags or sand filters, or using other similarly effective controls).
- Implement chemical spill and leak prevention and response procedures. These procedures include but are not limited to maintenance of spill kits, installation of containment berms, and use of drip pans at petroleum product and liquid storage tanks and containers.

Check box if section is not applicable.

Fueling- pH (acids and bases), Oils & Grease, Toxic Chemicals

Equipment Maintenance- Sediment, Nutrients, Heavy Metals, pH (acids and bases), Pesticides/Herbicides, Oils & Grease, Trash, Debris, Solids, Toxic Chemicals

Other Toxic Chemicals- [DESCRIBE HERE](#)

Best Management Practice Applicable:
BMP design detail, description and narrative notes are provided at the end of Section 4.

- Fuel, oil, and other petroleum products will not be stored below the ordinary high water mark at any time or in the adjacent floodway beyond normal working hours. All fueling facilities present on the site shall adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers. All fuel, oil, and other fluids exposed to precipitation shall be stored in watertight, structurally sound, closed containers.
- Minimize the discharge of fluids from spills and leaks by implementing chemical spill and leak prevention and response procedures, including, but not limited to, installation of containment berms and use of drip pans.
- Machinery will be kept out of the waterway as much as possible.
- No fueling, servicing, maintenance or repair of equipment or machinery should be done within 100 feet of a stream, or within 150 feet of a classified stream, losing stream, or sinkhole.
- Tarps or drop cloths and drip pads should be used when servicing, repairing, or performing maintenance on construction equipment in the field.
- When work is complete, the contaminated materials should be disposed of appropriately.

4.18 Chemical Storage, Handling and Spill Response

Instructions:

- All chemicals will adhere to applicable federal and state regulations concerning storage and dispensing.
- Describe how you will minimize the discharge of pollutants from chemicals associated with construction activities.
- Describe storage and dispensing practices that will be used to minimize the discharge of pollutants (e.g. locating activities away from surface waters and stormwater inlets or conveyances, containing activities with plastic liners, using filtration devices such as filter bags or sand filters, or using other similarly effective controls).
- Describe the spill response plan for minor and major spills over 25 gallons.

- Implement chemical spill and leak prevention and response procedures. These procedures include but are not limited to maintenance of spill kits, installation of containment berms, and use of drip pans and liquid storage tanks and containers.

Check box if section is not applicable.

- Material/Chemical Delivery and Storage- Sediment, Nutrients, Heavy Metals, pH (acids and bases), Oils & Grease, Trash, Debris, Solids, Toxic Chemicals
- Material/Chemical Use During Building Process- Nutrients, Heavy Metals, pH (acids and bases), Oils & Grease, Trash, Debris, Solids, Toxic Chemicals
- Other Polluting Material/Chemical Used During Construction Process- [DESCRIBE HERE](#)

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

- Location and contents of spill kit will be printed on Site Sign. Spill kit on-site will be kept with equipment necessary for spill clean-up. Equipment and materials include, but are not limited to: brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sawdust, and trash containers.
- Missouri, state law will be followed. It requires the responsible party to report releases greater than 50 gallons to the Missouri Department of Natural Resources at the earliest practical moment after discovery. If the release is from an underground storage tank, or UST, or piping, the reportable quantity is 25 gallons or more. Reports are also required for above ground storage tanks, or AST, that have released 50 gallons or greater. Further, federal law requires the responsible party to report any release of oil if the oil reaches or threatens any waterway. Any such spills or petroleum or other chemicals are to be reported as soon as possible to the Missouri Department of Natural Resources. Call the Southwest Regional Office at (417) 891-4300 or the Department's 24-hour Environmental Emergency Response number at (573) 634-2436
- Hazardous wastes shall comply with Missouri Hazardous Waste Laws and Regulations. For guidance, contact 1-800-361-4827
- Post guidelines for proper handling, storage and disposal of materials, and emergency spill cleanup on site.
- An accurate, up-to-date inventory of materials delivered and stored on-site will be kept.
- Retain original labels and material safety data sheets.
- All paint, solvents, petroleum products, petroleum waste products and storage containers such as drums, cans, or cartons shall be stored using best management practices.
 - The materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers.
 - All containers shall be inspected for leaks or spillage during the inspection of BMPs.
- Materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers with proper labels.
- Store bagged and boxed materials on pallets.
- Cover bagged and boxed materials during non-working days and prior to rain events.
- Incompatible materials, such as ammonia and chlorine, must not be stored in the same temporary containment facility.
- Containers for proper disposal of waste paints, solvents, and cleaning compounds shall be provided.

4.19 Pesticides, Herbicides, Insecticides, Fertilizers, and Landscape Materials

Instructions:

- Exposure of these chemicals to precipitation and stormwater on-site should be minimized.
- Implement chemical spill and leak prevention and response procedures. These procedures include but are not limited to maintenance of spill kits, installation of containment berms, and use of drip pans at petroleum product and liquid storage tanks and containers.

Check box if section is not applicable.

- Chemical Use During Landscaping Operations- Sediment , Nutrients, Pesticides, Herbicides, Insecticides, Fertilizers, Trash, Debris, Solids, Toxic Chemicals
- Material/Chemical Delivery and Storage- Sediment, Nutrients, Heavy Metals, pH (acids and bases), Oils & Grease, Trash, Debris, Solids, Toxic Chemicals
- Other Polluting Chemicals Used During Landscaping Process- [DESCRIBE HERE](#)

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

- Hazardous wastes shall comply with Missouri Hazardous Waste Laws and Regulations. For guidance, contact 1-800-361-4827
- An accurate, up-to-date inventory of materials delivered and stored on-site will be kept.
- Retain original labels and material safety data sheets.
- Products and storage containers such as drums, cans, or cartons shall be stored using best management practices.
- Materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers with proper labels.
- Store bagged and boxed materials on pallets.
- Cover bagged and boxed materials during non-working days and prior to rain events.
- Incompatible materials, such as ammonia and chlorine, must not be stored in the same temporary containment facility.
- Containers for proper disposal of waste shall be provided.

4.20 Waste Management (Trash and Recycling Dumpster, Portable Toilet)

Instructions:

- Describe how you will control the pollutants from solid waste and Sanitary waste.
 1. Examples include: packaging materials, scrap construction materials, masonry products, timber, pipe, and electrical cuttings, plastics, Styrofoam, concrete, and other trash or building materials.)
 2. Avoid locating sanitary facilities on impervious surfaces

Check box if section is NOT applicable.

Solid Waste Disposal- Trash, Debris, Solids, Toxic Chemicals

Portable Toilet - Nutrients, pH (acids and bases), Bacteria & Viruses

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4.

PHASING/SEQUENCING

DEFINITION & PURPOSE

Phasing involves developing a schedule that includes the sequencing of construction activities with the implementation of construction site BMPs. The purpose of phasing is to reduce the amount and duration of soil exposed to erosion and to implement and maintain BMPs in coordination with the sequence of construction activities.

CONDITIONS FOR EFFECTIVE USE

A schedule of the sequence and timing of construction activities is a permit requirement for all sites that disturb 1 acre or greater and must be provided in Section 2.4 - Sequencing and Estimated Dates of Construction Activities in the City's SWPPP template. Projects should be phased when possible to reduce the amount and duration of soil exposed at any one time. The phasing plan should be developed during project design. Disturbed areas in one phase should be stabilized before disturbing subsequent phases. When possible, land disturbance and construction in and around waterways should be scheduled during dry weather.

INSTALLATION/CONSTRUCTION PROCEDURES

The phasing schedule should follow the format in Section 2.4 - Sequencing and Estimated Dates of Construction Activities in the City's SWPPP template.

OPERATION & MAINTENANCE PROCEDURES

During inspections, verify that work is progressing in accordance with the phasing shown in the SWPPP and that BMPs are installed prior to the start of each construction phase. If phasing has changed, update Section 2.4 of the SWPPP, the site plan, and document the update in Appendix D - SWPPP Amendment Log.



PRESERVATION OF EXISTING VEGETATION

DEFINITION & PURPOSE

Permanent preservation of existing vegetation and topsoil minimizes the area of disturbance, reducing the need for erosion and sediment control BMPs and the potential for violations. It also provides a financial benefit by reducing the cost of grading, BMPs, topsoil, and seeding. Preserved areas can provide long-term stormwater benefits through increased absorption of rainfall compared to turf grass areas with compacted soil.

CONDITIONS FOR EFFECTIVE USE

Preservation of existing vegetation requires planning and should be the first step in the design process. The site should be surveyed to identify high quality soils, trees, vegetation, and steep slopes to be preserved. The site improvements, including any temporary roadways, should be designed around these features and follow existing contours to reduce cutting and filling. Sediment control BMPs such as compost filter sock or silt fence may be desirable to protect the preservation area from significant sediment accumulation.

INSTALLATION/CONSTRUCTION PROCEDURES

Protection of preservation areas with temporary construction fencing and any sediment control BMPs shall be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities. Construction materials, equipment storage, and parking areas should be located outside of protected areas where they will not cause root compaction.

OPERATION & MAINTENANCE PROCEDURES

During weekly and rain event inspections, verify that temporary construction fencing and any sediment control BMPs to protect preservation areas are still in place and operational. If the area to be preserved is adjusted during construction, update the site plan and document the update in Appendix D – SWPPP Amendment Log.

SITE CONDITIONS FOR REMOVAL

Temporary fencing and any sediment control BMPs shall be removed after final stabilization of the site has occurred.

COMPANION BMPs

- Tree Preservation



VEGETATED FILTER STRIP

DEFINITION & PURPOSE

Vegetated filter strips are areas of vegetation that are used as sediment control practices during construction. Vegetation slows down stormwater runoff and filters out sediment.

CONDITIONS FOR EFFECTIVE USE

Vegetated filter strips are appropriate where a strip of existing vegetation can be left in place in downhill areas to provide sediment control in place of or in addition to other sediment control BMPs. They should be used in areas of sheet flow only. Level spreaders may be needed to ensure sheet flow. Filter strip width and length should be determined based on the size and slope of the drainage area and type of vegetation. See [MDNR Guide Section 6-201](#). If the vegetated filter strip is part of a preservation area (see Preservation of Existing Vegetation), additional sediment control BMPs may be desired to protect the preservation area from excessive sediment deposition. Vegetated filter strips installed as a permanent stormwater quality control measure should not be used as a sediment control BMP.

INSTALLATION/CONSTRUCTION PROCEDURES

Existing vegetation that will be used as a vegetated filter strip should be marked the width and length shown on the plans prior to construction and designated as no disturbance. It may be desirable to fence off the filter strip to protect it from construction activities.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Verify that the vegetated filter strip has not been removed or damaged by construction activities. Remove excessive sediment accumulation if needed for functionality. Seed areas of erosion or dead vegetation as needed. Install additional BMPs if the vegetated filter strip becomes ineffective, and update the site plan and Appendix D – SWPPP Amendment Log.

SITE CONDITIONS FOR REMOVAL

The vegetated filter strip should remain in place until the drainage area is stabilized, at which point it is typically replaced with permanent vegetation or, in the case of a phased site, replaced with improvements. The SWPPP should provide site-specific information on removal/replacement of the vegetated filter strip.

ROBUST ALTERNATIVES

- Compost Filter Sock and Silt Fence

COMPANION BMPs

- Preservation of Existing Vegetation



SEEDING

DEFINITION & PURPOSE

Seeding is used to establish temporary or permanent vegetation in order to protect exposed soil from erosion.

CONDITIONS FOR EFFECTIVE USE

The SWPPP should include a site-specific seeding specification for permanent seeding and for temporary seeding if needed. For public improvements, seeding specifications can be found in Chapter 13, City of Springfield General Conditions and Technical Specifications. See MDNR Guide [Section 6-71 Temporary Seeding](#) and [Section 6-77 Permanent Seeding](#) for other specifications and guidance. Conduct a soil test to determine the need for soil amendments. Specifications for topsoil and soil amendments should be followed to ensure vegetation establishment and growth. Fertilizer should only be applied if a soil test indicates it is needed. Use additional stabilization (erosion control blankets, etc.) on slopes steeper than 3:1 and in areas of concentrated flow.

INSTALLATION/CONSTRUCTION PROCEDURES

Seeding should be done immediately after completion of a phase of grading, or in areas where construction activity has ceased for 14 days. Follow seeding specification for topsoil, soil amendments, seed type, seeding rate, and seeding dates. Apply straw or other mulch (see Mulching). Water immediately, to a depth of 4 inches.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Protect seeded areas from vehicular and foot traffic. Reseed and mulch areas that have not sprouted within 21 days of planting. Repair damaged or eroded areas and reseed/mulch as needed. Do not mow until 4 inches of growth occurs. During the first 4 months, mow no more than 1/3 the grass height. Seeded areas should be repaired and reseeded/mulched for one year following permanent seeding to ensure successful establishment.

ROBUST ALTERNATIVES:

- Sod and Hydroseed



SOIL BINDERS

DEFINITION & PURPOSE

Soil binders are materials applied to the soil surface to temporarily prevent water-induced erosion of exposed soils on construction sites. These materials must be made for this purpose and material safety data sheet available upon request. Soil binders also provide temporary dust, wind, and soil stabilization (erosion control) benefits. The useful life of most products is 3 to 6 months.

CONDITIONS FOR EFFECTIVE USE

Soil binders should be used in areas of sheet flow only. Soil binders are typically applied to disturbed areas requiring short-term, temporary protection and in combination with other BMPs, such as perimeter controls, seeding, and mulching. Because soil binders can often be incorporated into the work, they may be a good choice for areas where grading activities will soon resume. Binders can also be applied to stockpiles to prevent water and wind erosion. See MDNR [Guide Section 6-103 on Dust Control](#) for more information on soil binders.

INSTALLATION/CONSTRUCTION PROCEDURES

Consider drying time for the selected soil binder, and apply with sufficient time before anticipated rainfall. Soil binders shall not be applied during or immediately before rainfall. Soil binders may not cure if low temperatures occur within 24 hours of application. Follow manufacturer's specifications for application rates, pre-wetting of application area, and cleaning of equipment after use. Use the recommendations to maximize usefulness and avoid formation of pools or impervious areas where stormwater cannot infiltrate.

OPERATION & MAINTENANCE PROCEDURES

Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site, looking for damage from vehicles, runoff, or freeze-thaw conditions. Reapply product or utilize additional BMPs.

SITE CONDITIONS FOR REMOVAL

Soil binders are typically left in place to degrade naturally.

COMPANION BMPs

- Seeding and Hydroseeding



DUST CONTROL/ WIND EROSION

DEFINITION & PURPOSE

Practices of controlling wind-borne dust include phasing, preservation of trees and existing vegetation, minimization of soil disturbance, mulching, watering, wind barriers, and soil binders.

CONDITIONS FOR EFFECTIVE USE

Phase work to the extent practical to minimize the amount of area disturbed at one time (see Phasing/Sequencing). Preservation of grass and trees and the use of solid board fences may also serve as wind barriers. For areas not subjected to traffic, vegetation provides the most practical method of dust control and should be established as early as possible. Effectiveness of application of water, adhesives, and chemical treatment depends on soil, temperature, humidity and wind velocity. See [MDNR Guide Section 6-103](#) for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Use dust control when clearing and grading activities create blowing dust, especially during periods of dry weather. Water shall be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution. Place barriers at right angles to prevailing wind at intervals of about 10 times their height to control soil blowing. Paved areas that have soil on them from construction sites should be cleaned with street sweeper. Mulching offers a fast and effective means of controlling dust when properly applied. Binders and tackifiers should be used on organic mulches. NOTE: If calcium chloride or spray-on adhesives are used for dust control, a permit may be required from MDNR. Follow manufacturer's specifications for binders and tackifiers.

OPERATION & MAINTENANCE PROCEDURES

Check areas where mulch or binders have been applied for dust control and adjust/reapply as needed, according to manufacturer's specifications.

SITE CONDITIONS FOR REMOVAL

Dust control practices can be terminated when stabilization has been achieved.

ROBUST ALTERNATIVES

- Binders and Tackifiers



STREET CLEANING

DEFINITION & PURPOSE

Street cleaning includes shoveling, brooming, sweeping and/or vacuuming to remove track-out of sediment from paved public roads.

CONDITIONS FOR EFFECTIVE USE

Shoveling should be used to remove mud layers and large dirt clods. Sweeping and vacuuming may not be effective when paved roads are wet or muddy.

INSTALLATION/CONSTRUCTION PROCEDURES

If track out is present, street cleaning should be performed as soon as possible, at the end of the work day, and before rain events. If not mixed with debris or trash, consider incorporating the removed sediment back into the project. Otherwise, sweeper waste should be disposed in a solid waste dumpster on or off-site. Do not wash any sediment or debris down the storm drain.

OPERATION & MAINTENANCE PROCEDURES

Inspect ingress/egress access points daily, and clean tracked sediment as needed and/or required.



COMPOST FILTER SOCKS

DEFINITION & PURPOSE

A compost filter sock is a mesh tube filled with composted material used to control sediment through settling and filtration.

CONDITIONS FOR EFFECTIVE USE

Compost filter socks are generally placed along the perimeter of a site, at intervals along a slope, or as ditch checks to slow down runoff and retain sediment, allowing cleaned water to flow through. Compost material shall be screened ≤ 2 inches. Filter socks generally come in 8", 12", and 18" diameters. Compost filter socks can be used for sheet flow and small concentrated flows. Common industry practice is that drainage areas should not exceed 0.25 acres per 100 feet of sock length and flow should not exceed one cubic foot per second. Manufacturer's specifications should be followed for selecting the sock diameter. See [MDNR Guide Section 6-167](#) for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install prior to disturbance of the site. Follow manufacturer's specifications. See Typical Detail.

OPERATION & MAINTENANCE PROCEDURES

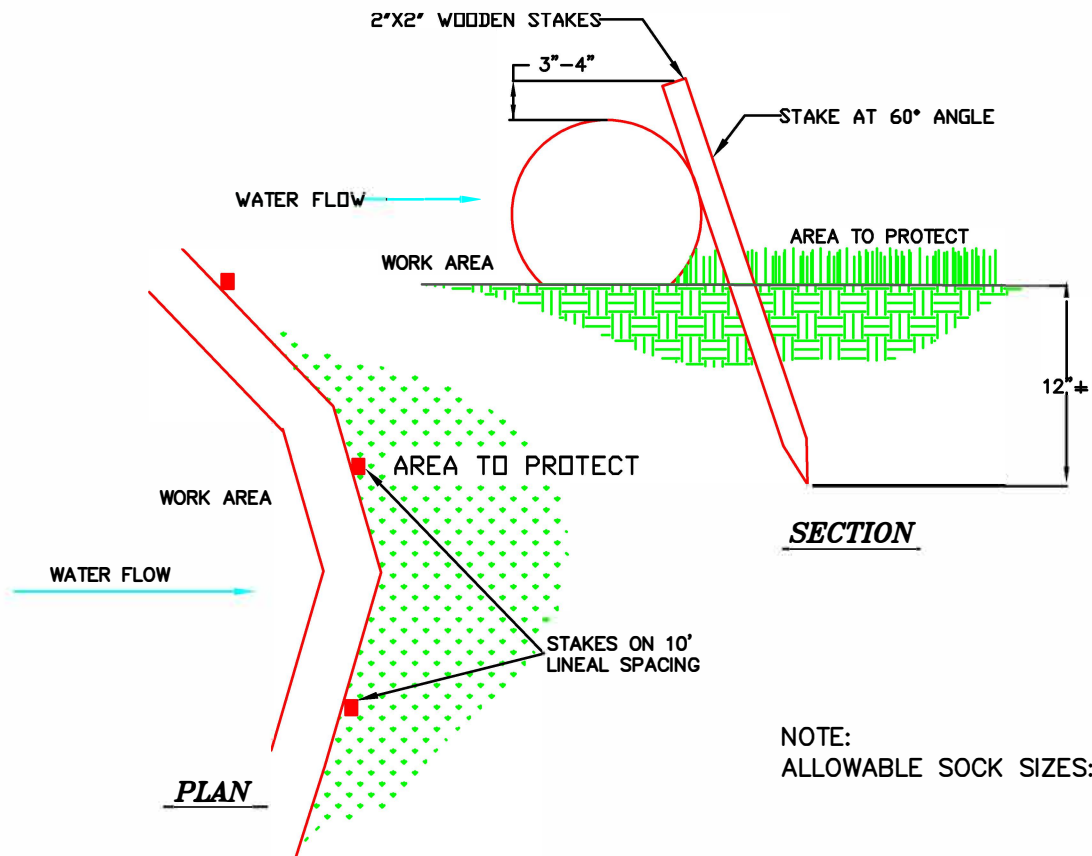
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Prevent vehicles and machinery from damaging sock. Remove accumulated sediment generally when it reaches half the height of the sock, replace broken stakes, and repair or replace sections that are torn.

SITE CONDITIONS FOR REMOVAL

Removal of sock can occur after permanent vegetation is established. The mesh material can be cut open and removed, leaving the compost to degrade naturally.

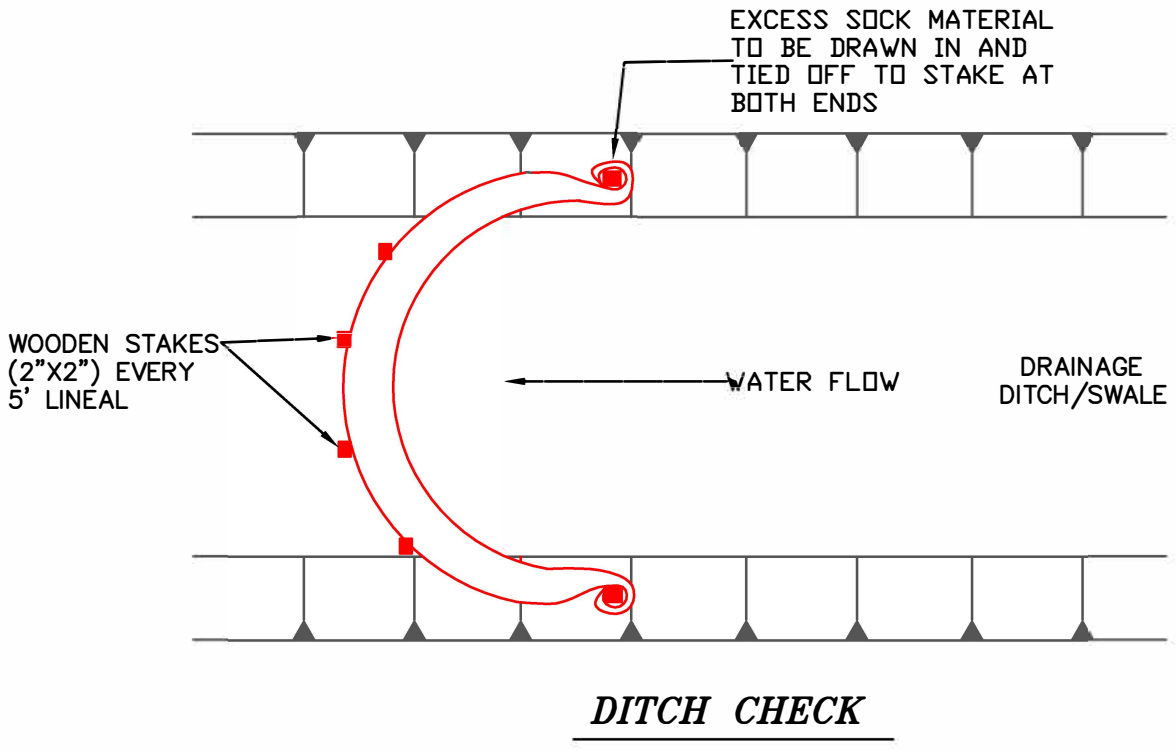
ROBUST ALTERNATIVES

- Tie Down Composted River Sock
- Silt fence



NOTE:
ALLOWABLE SOCK SIZES: 8", 12" & 24"

PERIMETER CONTROL



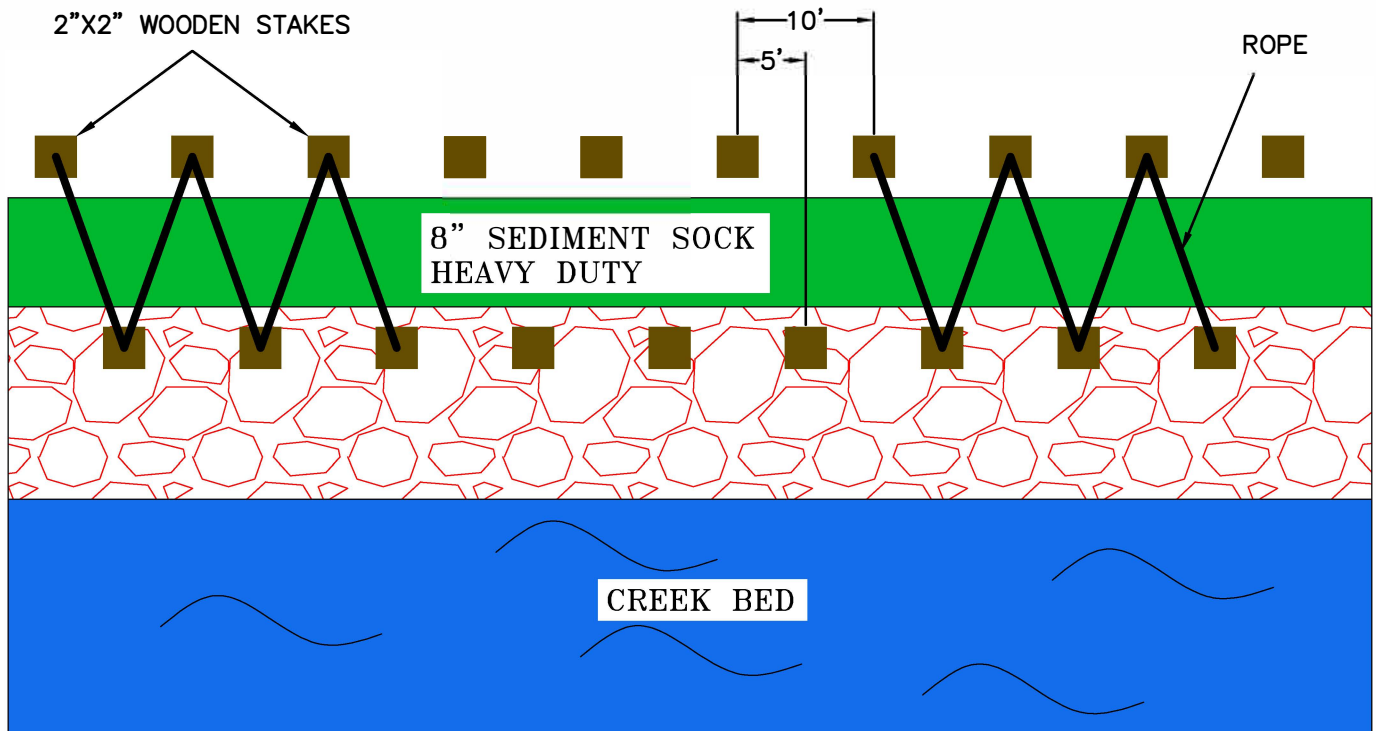
DITCH CHECK

NOTE: FOLLOW MANUFACTURER'S SPECIFICATION

Modified from Filtrexx Standard Specification and Design Manual, Version 5.0, 2006

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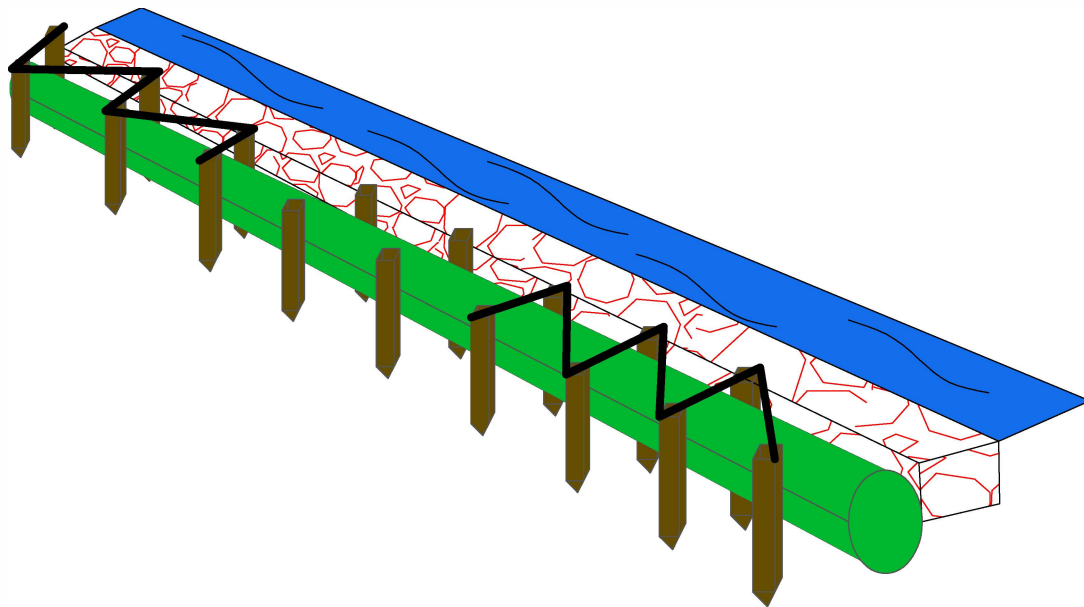
COMPOST FILTER SOCK



PERIMETER CONTROL

NOTES:

- USE 2"X2"X2.5" WOODEN STAKES SPACED EVERY TEN FEET, OFFSET EVERY 5 FEET ON OPPOSITE SIDE OF SOCK.
- TIE ROPE TO FOUR STAKES ALTERNATING SIDE.
- LEAVE 30 FEET BETWEEN TIED STAKES



NTS

**COMPOST FILTER SOCK
ROBUST METHOD**



SILT FENCE

DEFINITION & PURPOSE

A silt fence consists of a run of filter fabric, stretched, trenched in the ground and attached to anchored posts. Silt fence used as a perimeter control BMP encourages ponding of runoff and settling of sediment from stormwater.

CONDITIONS FOR EFFECTIVE USE

Install silt fence along slopes, at bases of slopes, and around the perimeter of a site as a final barrier to sediment being carried off site. Silt fence should follow level contour lines with ends turned upslope in a J-Hook. Silt fence should never be used in areas of concentrated flow. Common industry practice is that drainage areas should not exceed 0.25 acres per 100 feet of fence length. See [MDNR Guide Section 6-137](#) for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install silt fence prior to disturbance and at intervals during construction of fill slopes. Follow Manufacturer's Specifications. See Typical Detail.

OPERATION & MAINTENANCE PROCEDURES

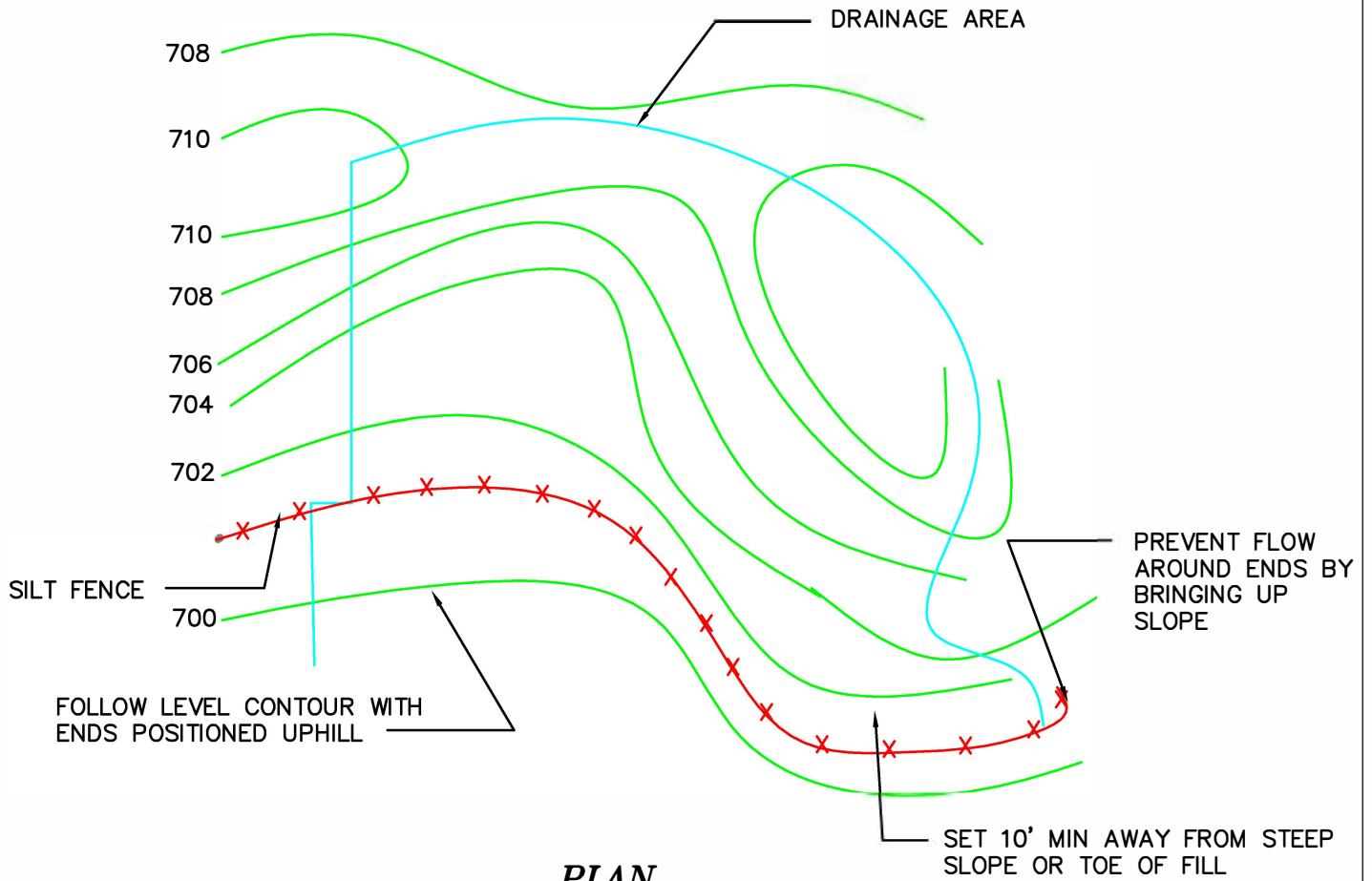
Inspect every week and within 48 hours after every rain event that causes stormwater runoff to occur on-site. Remove sediment buildup once it accumulates to 6 inches. Replace torn/clogged fabric, and repair loose fabric and broken stakes.

SITE CONDITIONS FOR REMOVAL

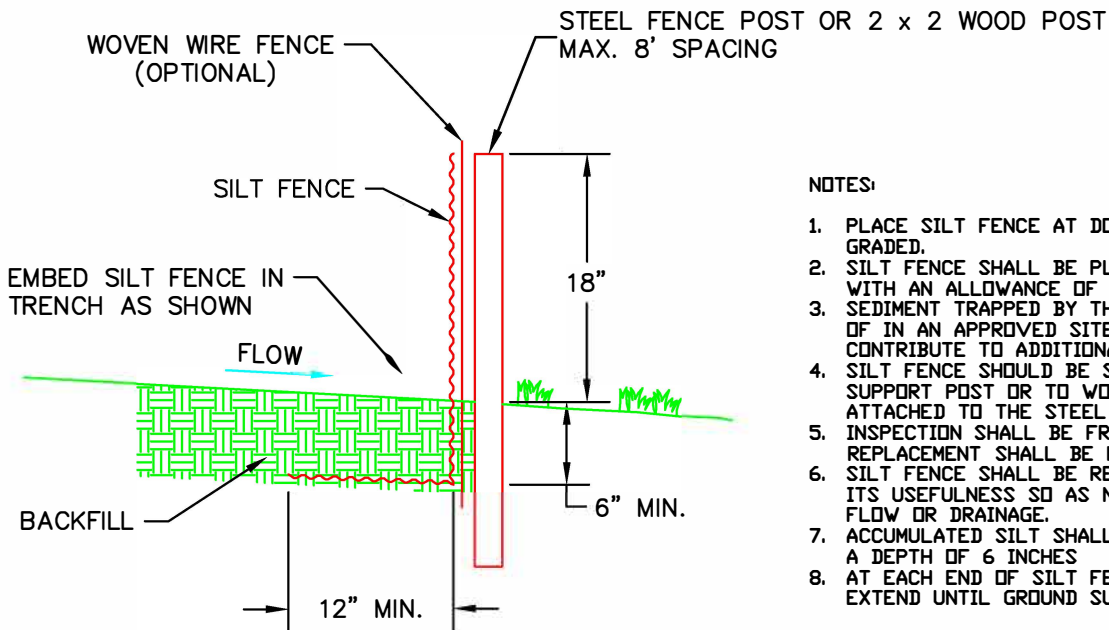
Remove silt fence after permanent vegetation is established. Remove fence, grade trench area and vegetate.

ALTERNATIVES

- Compost Sock



PLAN



NOTES:

1. PLACE SILT FENCE AT DOWNSLOPE LIMIT OF AREA TO BE GRADED.
2. SILT FENCE SHALL BE PLACED ALONG A LEVEL CONTOUR WITH AN ALLOWANCE OF ± 4 INCHES.
3. SEDIMENT TRAPPED BY THIS PRACTICE SHALL BE DISPOSED OF IN AN APPROVED SITE IN A MANNER THAT WILL NOT CONTRIBUTE TO ADDITIONAL SILTATION.
4. SILT FENCE SHOULD BE SECURELY FASTENED TO EACH SUPPORT POST OR TO WOVEN WIRE, WHICH IS IN TURN ATTACHED TO THE STEEL FENCE POSTS.
5. INSPECTION SHALL BE FREQUENT AND REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY AS NEEDED.
6. SILT FENCE SHALL BE REMOVED WHEN IT HAS SERVED ITS USEFULNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
7. ACCUMULATED SILT SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 6 INCHES.
8. AT EACH END OF SILT FENCE, TURN FENCE UPSLOPE AND EXTEND UNTIL GROUND SURFACE RISES 18 INCHES.

Modified from Chesterfield, Missouri Model BMPs for Land Disturbance

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SILT FENCE



HOUSEKEEPING

DEFINITION & PURPOSE

Housekeeping refers to construction site management measures that are designed and implemented to minimize discharge of pollutants from the site. Chemicals, hazardous materials, solid waste, human waste and construction debris are some materials stored on site that can be sources of stormwater pollution without proper BMPs and good housekeeping. Follow manufacturer's specifications and refer to material safety data sheets for proper use and disposal of chemicals.

CONDITIONS FOR EFFECTIVE USE

An effective management system requires training and signage to promote proper storage, handling and disposal of materials. Storage areas should be regularly inspected for compliance. Plans should contain notes clearly stating requirements for addressing potential pollutants. Provide sufficient temporary toilet facilities to serve the number of workers on the site. Temporary sanitary facilities should not be placed on top of storm inlets or near waterways. Secondary containment can be added at the base of porta-potties to address leaks/spills. The porta-pottie can be tied down using t-posts to prevent tipping over. Collection of trash and construction debris should be in covered dumpsters. Products should be stored in original containers and tightly sealed. Fueling should be done in areas that do not receive a substantial amount of runoff and do not drain directly to lakes, creeks, streams, rivers, sewers, groundwater, wetlands, or road ditches. Place waste receptacles near area of work and empty them on a regular basis. All fueling activities present on the site shall adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers. Hazardous wastes shall be managed according to Missouri Hazardous Waste Laws and Regulations. Install appropriate signage. Post guidelines for proper handling, storage and disposal of materials, and emergency spill clean-up on site. See [MDNR Guide Section 2](#) for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Good housekeeping starts concurrently with work at the site.

OPERATION & MAINTENANCE PROCEDURES

Inspect for good housekeeping in storage areas and throughout the site weekly and within 48 hours of every rain event which causes stormwater runoff to occur on site. Maintenance of temporary toilet facilities should be frequent and thorough. Make necessary corrections and repairs.

SITE CONDITIONS FOR REMOVAL

Housekeeping measures can be removed at the completion of the project.



POLLUTION PREVENTION PROCEDURES (GENERAL POLLUTION NOTES)

SPILL PREVENTION CONTROLS

Keep a spill kit on-site with equipment necessary for spill clean-up. Equipment and materials include, but are not limited to: brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sawdust, oil-absorbent booms, and trash containers.

FUELING, MAINTENANCE OF EQUIPMENT & VEHICLES

No fueling, servicing, maintenance or repair of equipment or machinery should be done within 100 feet of a stream, or within 150 feet of a classified stream, losing stream, or sinkhole. Tarps or drop cloths and drip pads should be used when servicing, repairing, or performing maintenance on construction equipment in the field. When work is complete, the contaminated materials should be disposed of appropriately.

WASHING OF EQUIPMENT & VEHICLES

No wash water is allowed to discharge into storm drains or drainage way without proper treatment.

PESTICIDES, HERBICIDES, INSECTICIDES, FERTILIZERS & LANDSCAPE MATERIALS

Exposure of these chemicals to precipitation and stormwater on-site should be minimized.

DIESEL FUEL, OIL, HYDRAULIC FLUIDS, OTHER PETROLEUM PRODUCTS & CHEMICALS

All fueling facilities present on the site shall adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers. All fuel, oil, and other fluids exposed to precipitation shall be stored in watertight, structurally sound, closed containers. Minimize the discharge of fluids from spills and leaks by implementing chemical spill and leak prevention and response procedures, including, but not limited to, installation of containment berms and use of drip pans. Machinery should be kept out of the waterway as much as possible.

HAZARDOUS OR TOXIC WASTE

Hazardous wastes shall be Missouri Hazardous Waste Laws and Regulations. Post guidelines for proper handling, storage and disposal of materials, and emergency spill cleanup on site. An accurate, up-to-date inventory of materials delivered and stored on-site should be kept. Retain original labels and material safety data sheets. All paint, solvents, petroleum products, petroleum waste products and storage containers such as drums, cans, or cartons shall be stored using best management practices. Materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers with proper labels. Store bagged and boxed materials on pallets. Cover bagged and boxed materials during non-working days and prior to rain events. Incompatible materials, such as ammonia and chlorine, must not be stored in the same temporary containment facility. Containers for proper disposal of waste paints, solvents, and cleaning compounds shall be provided. All hazardous wastes that are transported, stored, or used for maintenance, cleaning, or repair shall be managed according to the provisions of the Missouri Hazardous Waste Laws and Regulations. For guidance, contact 1-800-361-4827.



CONCRETE WASH-OUT PIT

DEFINITION & PURPOSE

Concrete wash-out pits are used to contain concrete wash-out when truck chutes, drums and/or hoses are rinsed out after delivery to construction site. Disposal can occur when concrete wash-out becomes a solid. Concrete wash-out water is a pollutant because of the high pH level and chemical additives in the wash-out. Concrete wash-out management prevents the contamination of stormwater with high Ph and additives that may cause adverse impact to water quality.

CONDITIONS FOR EFFECTIVE USE

Concrete wash-out pits must be implemented on construction projects where concrete slurries are generated. Wash-out should be located a minimum of 50 feet from storm drains, ditches, and 100 feet from classified streams, losing streams or sinkholes. Design concrete wash-out pits to sufficiently hold all liquid and concrete waste. Plastic liner should be a minimum of 10 mil. polyethylene sheeting. See [MDNR Guide Section 6-63](#) for additional guidance.

INSTALLATION/CONSTRUCTION PROCEDURES

Install concrete wash-out pits prior to concrete pouring activities. See Typical Detail.

OPERATION & MAINTENANCE PROCEDURES

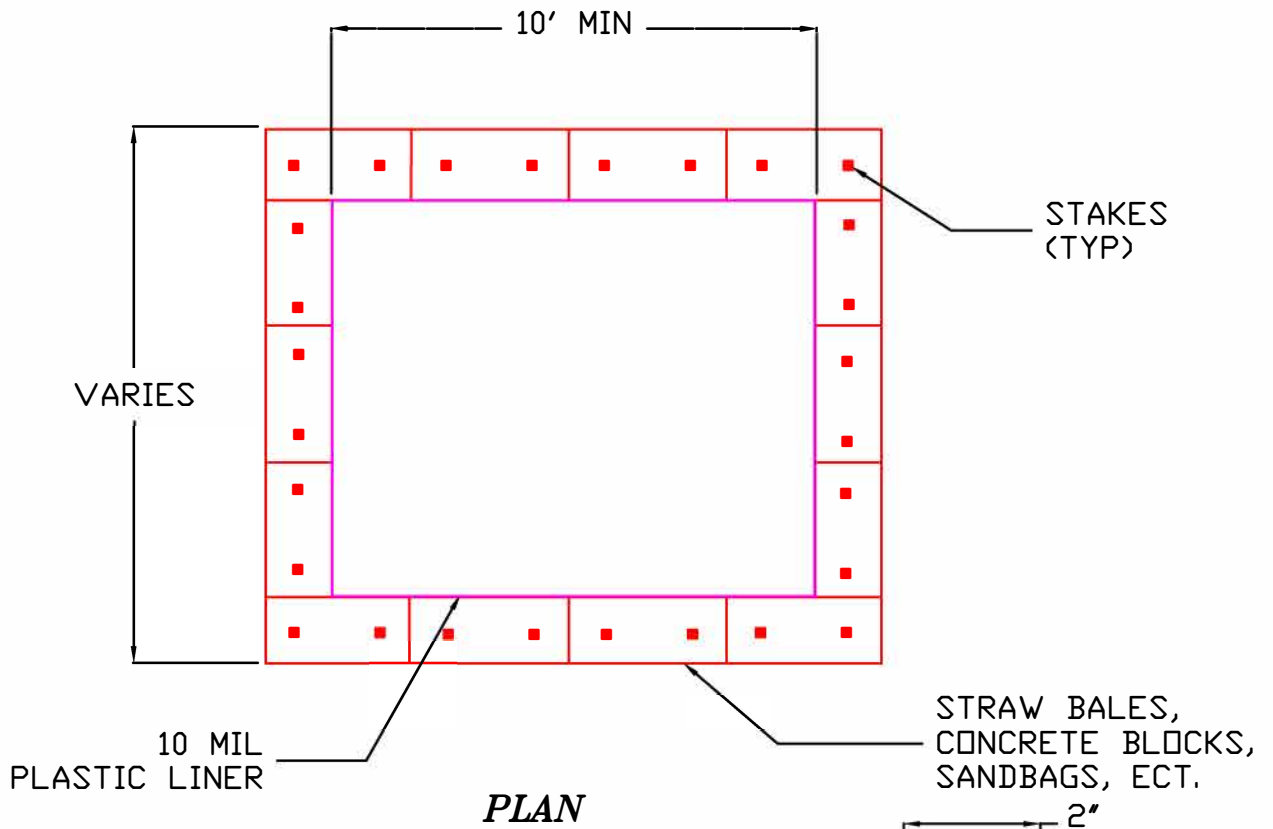
Inspect every week and within 48 hours after a rain event that causes stormwater runoff to occur on-site. Remove and dispose of solid concrete material. Wash-out facilities must be cleaned when volume reaches 75% of capacity. Cover the concrete wash-out pit before predicted rain events to prevent overflow.

SITE CONDITIONS FOR REMOVAL

Remove concrete wash-out pit when concrete wash-out activity ceases.

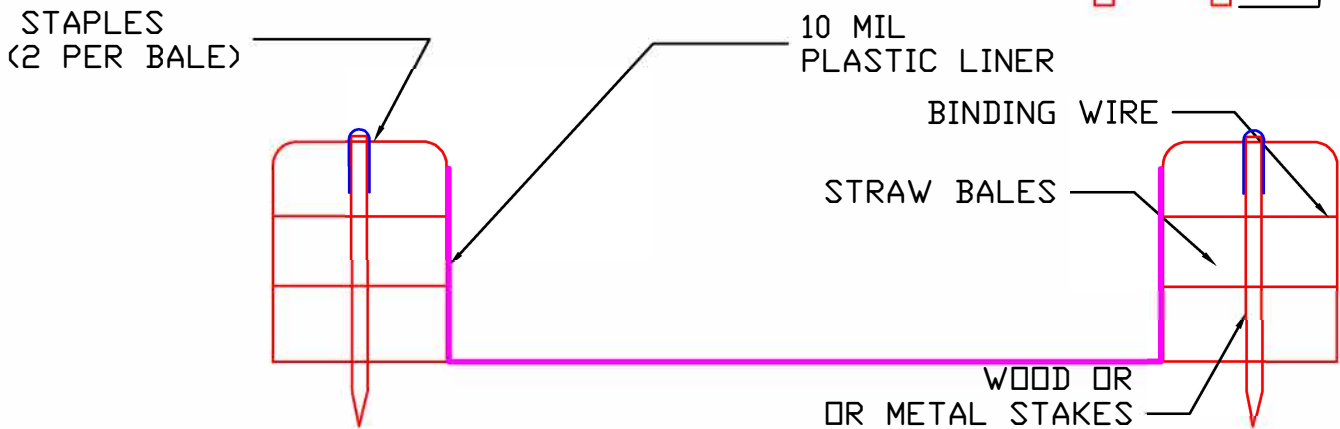
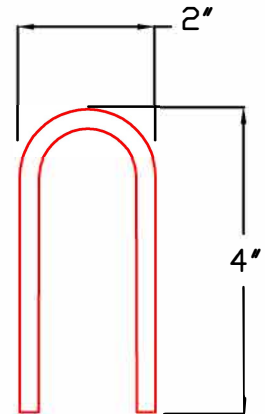
ALTERNATIVES

- Return unwanted concrete back to concrete batch plant to wash-out, proprietary disposal boxes, roll-off dumpster



NOTES:

1. ACTUAL LAYOUT DETERMINED IN FIELD
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY



NTS

CONCRETE WASHOUT-ABOVE GRADE

SECTION 5: SITE STABILIZATION

5.1 Temporary Stabilization

Instructions:

- Describe the specific vegetative and/or non-vegetative practices that will be used to stabilize exposed soils where construction activities have ceased.
- 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:
 1. The permittee shall construct BMPs to establish interim stabilization; and
 2. Stabilization must be initiated immediately and completed within 14 calendar days.
- Interim stabilization 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. These BMPs may include a combination of sediment basins, check dams, sediment fences and mulch. 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) or if the slope is greater than 3% and greater than 150 feet in length, then the permittee shall establish interim stabilization within 7 days of ceasing operations on that part of the site.
- Allowances to the 14 day completion period for temporary and final stabilization may be made due to weather and equipment malfunctions. Use of allowances shall be documented in the SWPPP.

Stabilization practices selected (select all that apply):

- BMPs
- Seed and Straw
- Hydroseed
- Tackifier/Soil Binder
- Other:

Best Management Practice Applicable:

BMP design detail, description and narrative notes are provided at the end of Section 4

5.2 Final Permanent Stabilization

Instructions:

- For spoil disturbing activities that have been permanently ceased on any portion of the site, final stabilization of the disturbed areas must be initiated immediately and completed within 14 calendar days.
- Allowances to the 14 day completion period for temporary and final stabilization may be made due to weather and equipment malfunctions. Use of allowances shall be documented in the SWPPP.
- Describe the vegetative and/or non-vegetative practices that will be used to stabilize exposed soils where construction activities have permanently ceased.
- The seeded area shall be maintained as necessary to assure growth for a two-week period after application. Seeding shall be placed from September 1 to November 15 and March 15 to May 31 unless otherwise authorized by the Engineer. If a project is completed except for seeding and this project completion occurs during the period when seeding is not allowed, the contractor will be required to complete all seeding and have confirmed growth within thirty (30) calendar days after the next seeding period begins.

Stabilization practices (select all that apply):

- Concrete/Asphalt
- Mulch
- Seed and Straw
- Hydroseed
- Sod
- Other: DESCRIBE HERE

Best Management Practice Applicable:
BMP design detail, description and narrative notes are provided at the end of Section 4

5.3 *Explanation for Delayed Completion of Stabilization*

Instructions:

- Only use this page if uncontrollable circumstances have delayed the initiation or completion of stabilization.
- Insert a description of circumstances that prevent you from stabilizing site with mulch, grass, rock, etc., as well as the schedule you will follow for initiating and completing stabilization.

Check box if section is NOT applicable.

Justification

N/A

Stabilization practice selected:

- Tackifier/Soil Binder
 Sod
 Concrete/Asphalt
 Other:

- Mulch
 Seed and Straw
 Hydroseed

Best Management Practice Applicable:

SECTION 6: PERMIT TERMINATION OR RENEWAL

6.1 *Directions for Permit Termination*

Instructions:

- To terminate a permit the following activities must be completed:
 - EITHER the project site is stabilized with perennial vegetation, pavement, buildings or structures using permanent materials over all areas that have been disturbed. With respect to the areas that have been vegetated, vegetation coverage is at least 70% plant density over 100% of the site. Temporary erosion and sediment control BMPs are no longer found on the site and any source of pollution to the City's MS4, such as sediment in storm water boxes, mud on public streets, solid waste issues, etc. have been removed.
 - OR the Permittee sold the permitted site to an entity who has obtained a new land disturbance permit. The SWPPP has been amended to show the area is no longer under the original permit's jurisdiction.

SECTION 7: DOCUMENTATION OF COMPLIANCE WITH OTHER FEDERAL REQUIREMENTS

7.1 *US Army Corps of Engineers (USACE) Clean Water Act (WCA) Section 404 permit Cover Page*

Instructions:

- Section 404 of the Clean Water Act (CWA) establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands.
- Obtain USACE permits at their regulatory program website (<http://www.usace.army.mil/Missions/Civil-Works/Regulatory-Program-and-Permits/Obtain-a-Permit/>)

- Provide the cover page of the general permit. General permits are usually valid for five years and may be re-authorized by USACE. Do not include the entire permit in the SWPPP.

Check box if section is NOT applicable.

7.2 Missouri State Operating Permit MOR100038

Instructions:

- Obtain a new land disturbance permit from the Missouri Department of Natural Resources ePermitting website (<http://dnr.mo.gov/env/wpp/epermit/help.htm>)
- Provide the cover page of the Missouri State Operating Permit. Do not include the entire permit in the SWPPP.

Attached at the end of Section 7.

7.3 Endangered Species Protection

Instructions:

- This SWPPP does not supersede compliance with the Endangered Species Act.
- Results from both requested reports need to be included in this section. Projects must be reviewed on U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Conservation (IPaC) website (<http://ecos.fws.gov/ipac/>) AND Missouri Department of Conservation's (MDC) Natural Heritage Review website (<https://naturalheritagereview@mdc.mo.gov>).
- For suitable habitat definitions refer to USFW IPaC report.
- If disturbances May affect, describe BMPs used to minimize impact.
- The applicant assumes all risk of violating section 9 of the ESA. Take is prohibited and cannot mitigated without an Incidental Take Permit (ITP). To get an ITP, a Habitat Conservation Plan (HCP) is required. The only option to proceed without risk of violating section 9 is to avoid take or apply for an HCP.
- For further directions regarding the IPaC Report (may affect determination and when a project does not involve a federal authority) contact: karen_herrington@fws.gov, (573) 234-2132 ext: 166
- For further directions regarding the Natural Heritage Review (Level Two and Three) contact: Natural Heritage Review@mdc.mo.gov, 573-522-4115 ext: 3182

USFWS's Official Species List determination:

Project is reviewed under the US Army Corps 404 Permit process.

May affect:

- Will impact suitable bat habitat (live trees and standing snags which possess exfoliating bark and/or cavities, cracks and crevices).
- Will remove any suitable bat habitat during the active season between the periods of April 1st - October 31st.
- Impact subterranean features such as caves/mine shafts/springs.

No effect (April 1st - October 31st, AND no suitable habitat)

IPaC REPORT AND COPIES OF LETTERS, EMAILS, OR OTHER COMMUNICATION BETWEEN YOU AND FEDERAL OR STATE AGENCIES ATTACHED AT END OF SECTION 7 AFTER MOR100038 PERMIT.

Missouri Natural Heritage Review Response:

Level One response:

There are no known records of Species and Natural Communities of Conservation Concern within the project area. No further coordination with the Missouri Department of Conservation is necessary.

Level Two response:

Records of state-listed Species and Natural Communities of Conservation Concern occur within or near the project area. Please contact the Missouri Department of Conservation for further coordination and information.

Level Three response:

Records of federal, and possibly also state-listed Species and Natural Communities of Conservation Concern occur within or near the project area. Please contact the Missouri Department of Conservation for further coordination and information. In addition, further coordination and consultation with the U.S. Fish and Wildlife Service for USFWS trust resources including Endangered Species Act species, is necessary. Please visit the U.S. Fish and Wildlife Website – Information for Planning and Conservation at <https://ecos.fws.gov/ipac/> for additional information or contact the USFWS.

MISSOURI NATURAL HERITAGE REVIEW AND COPIES OF LETTERS, EMAILS, OR OTHER COMMUNICATION BETWEEN YOU AND FEDERAL OR STATE AGENCIES ATTACHED AT END OF SECTION 7 AFTER MOR100038 PERMIT.

Best Management Practice Applicable:

BMP DESIGN DETAIL, DESCRIPTION AND NARATIVE NOTES ARE PROVIDED ON EROSION SEDIMENT CONTROL DETAIL SHEET AND LISTED ON PHASING PLAN. ALL BMPS ARE SHOWN ON EROSION CONTROL PLAN.

7.4 *Historic Preservation*

Instructions:

- Under Section 106 of the National Historic Preservation Act, federal agencies must consider the effect of their actions on historic properties and provide the federal Advisory Council on Historic Preservation (ACHP) the opportunity to comment on proposed actions.
 - To successfully complete Section 106 review via website (<https://dnr.mo.gov/shpo/sectionrev.htm>), Federal agencies must:
 - gather information to decide which properties in the project area **are listed in or eligible for listing in the National Register of Historic Places**;
 - if so, determine how these historic properties might be affected;
 - explore alternatives to avoid or reduce harm to historic properties; and
 - reach agreement with the State Historic Preservation Office (SHPO) and the ACHP in some cases, on measures to deal with any adverse effects or obtain advisory comments from the ACHP, which are sent to the head of the agency.

Check box if section is not applicable. See attached Taney County National Register Listings at end of Section 7 after Endangered Species and National Heritage Documents.

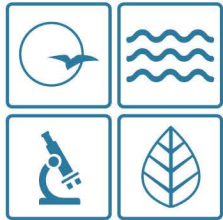
Project is reviewed under the US Army Corps 404 Permit process.

Historic properties were located; however, they do NOT meet the eligibility standards for listing in the National Register of Historic Places

Historic properties were located which meet the eligibility standards for listing in the National Register of Historic Places

Historic properties may meet requirements for National Register Listing; Phase II testing is recommended

Best Management Practice Applicable:



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/>.

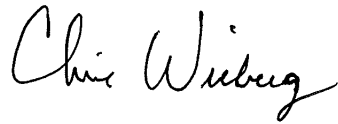


Office of Administration
Page Two

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".

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, 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; 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.

Table A	Schedule for Quarterly Reporting
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:

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 1st 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; 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, 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. For more information visit; 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

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, dnr.generalpermits@dnr.mo.gov



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Missouri Ecological Services Field Office
101 Park Deville Drive
Suite A
Columbia, MO 65203-0057
Phone: (573) 234-2132 Fax: (573) 234-2181

In Reply Refer To:
Project Code: 2023-0046178
Project Name: Table Rock State Park

February 16, 2023

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Threatened and Endangered Species

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. **Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days.** The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Consultation Technical Assistance

Refer to the Midwest Region [S7 Technical Assistance](#) website for step-by-step instructions for making species determinations and for specific guidance on the following types of projects:

projects in developed areas, HUD, pipelines, buried utilities, telecommunications, and requests for a Conditional Letter of Map Revision (CLOMR) from FEMA.

Federally Listed Bat Species

Indiana bats, gray bats, and northern long-eared bats occur throughout Missouri and the information below may help in determining if your project may affect these species.

Gray bats - Gray bats roost in caves or mines year-round and use water features and forested riparian corridors for foraging and travel. If your project will impact caves, mines, associated riparian areas, or will involve tree removal around these features – particularly within stream corridors, riparian areas, or associated upland woodlots –gray bats could be affected.

Indiana and northern long-eared bats - These species hibernate in caves or mines only during the winter. In Missouri the hibernation season is considered to be November 1 to March 31. During the active season in Missouri (April 1 to October 31) they roost in forest and woodland habitats. Suitable summer habitat for Indiana bats and northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥ 5 inches diameter at breast height (dbh) for Indiana bat, and ≥ 3 inches dbh for northern long-eared bat, that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Tree species often include, but are not limited to, shellbark or shagbark hickory, white oak, cottonwood, and maple. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of other forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat and evaluated for use by bats. If your project will impact caves or mines or will involve clearing forest or woodland habitat containing suitable roosting habitat, Indiana bats or northern long-eared bats could be affected.

Examples of unsuitable habitat include:

- Individual trees that are greater than 1,000 feet from forested or wooded areas;
- Trees found in highly-developed urban areas (e.g., street trees, downtown areas);
- A pure stand of less than 3-inch dbh trees that are not mixed with larger trees; and
- A stand of eastern red cedar shrubby vegetation with no potential roost trees.

Using the IPaC Official Species List to Make No Effect and May Affect Determinations for Listed Species

1. If IPaC returns a result of “There are no listed species found within the vicinity of the project,” then project proponents can conclude the proposed activities will have **no effect** on any federally listed species under Service jurisdiction. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records. An example ["No Effect" document](#) also can be found on the S7 Technical Assistance website.
-

2. If IPaC returns one or more federally listed, proposed, or candidate species as potentially present in the action area of the proposed project – other than bats (see #3 below) – then project proponents can conclude the proposed activities **may affect** those species. For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, you can obtain [Life History Information for Listed and Candidate Species](#) through the S7 Technical Assistance website.
3. If IPaC returns a result that one or more federally listed bat species (Indiana bat, northern long-eared bat, or gray bat) are potentially present in the action area of the proposed project, project proponents can conclude the proposed activities **may affect** these bat species **IF** one or more of the following activities are proposed:
 - a. Clearing or disturbing suitable roosting habitat, as defined above, at any time of year;
 - b. Any activity in or near the entrance to a cave or mine;
 - c. Mining, deep excavation, or underground work within 0.25 miles of a cave or mine;
 - d. Construction of one or more wind turbines; or
 - e. Demolition or reconstruction of human-made structures that are known to be used by bats based on observations of roosting bats, bats emerging at dusk, or guano deposits or stains.

If none of the above activities are proposed, project proponents can conclude the proposed activities will have **no effect** on listed bat species. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records. An example ["No Effect" document](#) also can be found on the S7 Technical Assistance website.

If any of the above activities are proposed in areas where one or more bat species may be present, project proponents can conclude the proposed activities **may affect** one or more bat species. We recommend coordinating with the Service as early as possible during project planning. If your project will involve removal of over 5 acres of suitable forest or woodland habitat, we recommend you complete a Summer Habitat Assessment prior to contacting our office to expedite the consultation process. The Summer Habitat Assessment Form is available in Appendix A of the most recent version of the [Range-wide Indiana Bat Summer Survey Guidelines](#).

Other Trust Resources and Activities

Bald and Golden Eagles - Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. Should bald or golden eagles occur within or near the project area please contact our office for further coordination. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds - The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA

to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of recommendations that minimize potential impacts to migratory birds. Such measures include clearing forested habitat outside the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers - Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed [voluntary guidelines for minimizing impacts](#).

Transmission Lines - Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. To minimize these risks, please refer to [guidelines](#) developed by the Avian Power Line Interaction Committee and the Service. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas that support large numbers of raptors and migratory birds.

Wind Energy - To minimize impacts to migratory birds and bats, wind energy projects should follow the Service's [Wind Energy Guidelines](#). In addition, please refer to the Service's [Eagle Conservation Plan Guidance](#), which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

Next Steps

Should you determine that project activities **may affect** any federally listed species or trust resources described herein, please contact our office for further coordination. Letters with requests for consultation or correspondence about your project should include the Consultation Tracking Number in the header. Electronic submission is preferred.

If you have not already done so, please contact the Missouri Department of Conservation (Policy Coordination, P. O. Box 180, Jefferson City, MO 65102) for information concerning Missouri Natural Communities and Species of Conservation Concern.

We appreciate your concern for threatened and endangered species. Please feel free to contact our office with questions or for additional information.

John Weber

Attachment(s):

- Official Species List
-

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Missouri Ecological Services Field Office

101 Park Deville Drive

Suite A

Columbia, MO 65203-0057

(573) 234-2132

Project Summary

Project Code: 2023-0046178
Project Name: Table Rock State Park
Project Type: Utility Infrastructure Maintenance
Project Description: Upgrading sanitary sewer, water, and electric at Table Rock State Park Campground 2.

Project Location:

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@36.5777887,-93.30146238949648,14z>



Counties: Taney County, Missouri

Endangered Species Act Species

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries¹, as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

1. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Gray Bat <i>Myotis grisescens</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat <i>Myotis sodalis</i> There is final critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5949 General project design guidelines: https://ipac.ecosphere.fws.gov/project/EJT32Z4PSZAXPMJG44AEKLUPQA/documents/generated/6868.pdf	Endangered
Northern Long-eared Bat <i>Myotis septentrionalis</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045 General project design guidelines: https://ipac.ecosphere.fws.gov/project/EJT32Z4PSZAXPMJG44AEKLUPQA/documents/generated/6868.pdf	Threatened
Tricolored Bat <i>Perimyotis subflavus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Reptiles

NAME	STATUS
Alligator Snapping Turtle <i>Macrochelys temminckii</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/4658	Proposed Threatened

Insects

NAME	STATUS
Monarch Butterfly <i>Danaus plexippus</i> No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

IPaC User Contact Information

Agency: State of Missouri
Name: Makayla Fox
Address: 4220 Duncan Ave Suite 201
City: St. Louis
State: MO
Zip: 63110
Email: mfox@greatriv.com
Phone: 3144007677

Lead Agency Contact Information

Lead Agency: State of Missouri



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Missouri Ecological Services Field Office
101 Park Deville Drive
Suite A
Columbia, MO 65203-0057
Phone: (573) 234-2132 Fax: (573) 234-2181

In Reply Refer To:
Project code: 2023-0046178
Project Name: Table Rock State Park

February 16, 2023

Subject: Consistency letter for the 'Table Rock State Park' project indicating that any take of the northern long-eared bat that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o).

Dear Makayla Fox:

The U.S. Fish and Wildlife Service (Service) received on February 16, 2023 your effects determination for the 'Table Rock State Park' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. You indicated that no Federal agencies are involved in funding or authorizing this Action. This IPaC key assists users in determining whether a non-Federal action may cause “take”^[1] of the northern long-eared bat that is prohibited under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, any take of the northern long-eared bat that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the Action is not likely to result in unauthorized take of the northern long-eared bat.

Additionally, please note that on March 23, 2022, the Service published a proposal to reclassify the northern long-eared bat (NLEB) as endangered under the Endangered Species Act. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the NLEB by November 2022 (Case 1:15-cv-00477, March 1, 2021). The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome (WNS), a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species. Depending on the type of effects a project has on NLEB, the change in the species’ status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective (anticipated to occur by December 30, 2022). If

your project may result in incidental take of NLEB after the new listing goes into effect this will first need to be addressed in an updated consultation that includes an Incidental Take Statement. If your project may require re-initiation of consultation, please contact our office for additional guidance.

Please report to our office any changes to the information about the Action that you entered into IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation.

If your Action proceeds as described and no additional information about the Action's effects on species protected under the ESA becomes available, no further coordination with the Service is required with respect to the northern long-eared bat.

The IPaC-assisted determination for the northern long-eared bat **does not** apply to the following ESA-protected species that also may occur in your Action area:

- Alligator Snapping Turtle *Macrochelys temminckii* Proposed Threatened
- Gray Bat *Myotis grisescens* Endangered
- Indiana Bat *Myotis sodalis* Endangered
- Monarch Butterfly *Danaus plexippus* Candidate
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered

You may coordinate with our Office to determine whether the Action may cause prohibited take of the animal species listed above.

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description

You provided to IPaC the following name and description for the subject Action.

1. Name

Table Rock State Park

2. Description

The following description was provided for the project 'Table Rock State Park':

Upgrading sanitary sewer, water, and electric at Table Rock State Park Campground 2.

Approximate location of the project can be viewed in Google Maps: <https://www.google.com/maps/@36.5777887,-93.30146238949648,14z>



Determination Key Result

This non-Federal Action may affect the northern long-eared bat; however, any take of this species that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o).

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on **May 15, 2017**. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for non-Federal actions is to assist determinations as to whether proposed actions are excepted from take prohibitions under the northern long-eared bat 4(d) rule.

If a non-Federal action may cause prohibited take of northern long-eared bats or other ESA-listed animal species, we recommend that you coordinate with the Service.

Determination Key Result

Based upon your IPaC submission, any take of the northern long-eared bat that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o).

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

No

2. Will your activity purposefully **Take** northern long-eared bats?

No

3. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/media/nleb-roost-tree-and-hibernacula-state-specific-data-links-0.

Yes

4. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

No

5. Will the action involve Tree Removal?

Yes

6. Will the action only remove hazardous trees for the protection of human life or property?

Yes

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type '0' in questions 1-3.

1. Estimated total acres of forest conversion:

0

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type '0' in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type '0' in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type '0' in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

IPaC User Contact Information

Agency: State of Missouri
Name: Makayla Fox
Address: 4220 Duncan Ave Suite 201
City: St. Louis
State: MO
Zip: 63110
Email: mfox@greatriv.com
Phone: 3144007677

Lead Agency Contact Information

Lead Agency: State of Missouri



Missouri Department of Conservation

Missouri Department of Conservation's Mission is to protect and manage the forest, fish, and wildlife resources of the state and to facilitate and provide opportunities for all citizens to use, enjoy and learn about these resources.

Natural Heritage Review Level Two Report: State Listed Endangered Species and/or Missouri Species/Natural Communities of Conservation Concern

There are records of state-listed Endangered Species, or Missouri Species or Natural Communities of Conservation Concern within or near the defined Project Area. Please contact Missouri Department of Conservation for further coordination.

Foreword: Thank you for accessing the Missouri Natural Heritage Review Website developed by the Missouri Department of Conservation with assistance from the U.S. Fish and Wildlife Service, the U.S. Army Corps of Engineers, Missouri Department of Transportation and NatureServe. The purpose of this report is to provide information to federal, state and local agencies, organizations, municipalities, corporations, and consultants regarding sensitive fish, wildlife, plants, natural communities, and habitats to assist in planning, designing, and permitting stages of projects.

PROJECT INFORMATION

Project Name and ID Number: Table Rock State Park #12247

User Project Number: 4579

Project Description: Upgrading sanitary sewer, water, and electric to Table Rock State Park campground 2. Section 2, Township 22N, Range 22W, 36°34'39.4"N 93°18'05.3"W, N/A, Taney County.

Project Type: Recreation, Campgrounds/parking lots, playgrounds, Maintenance of existing facilities

Contact Person: Makayla Fox

Contact Information: mfox@greatriv.com or 3144007677

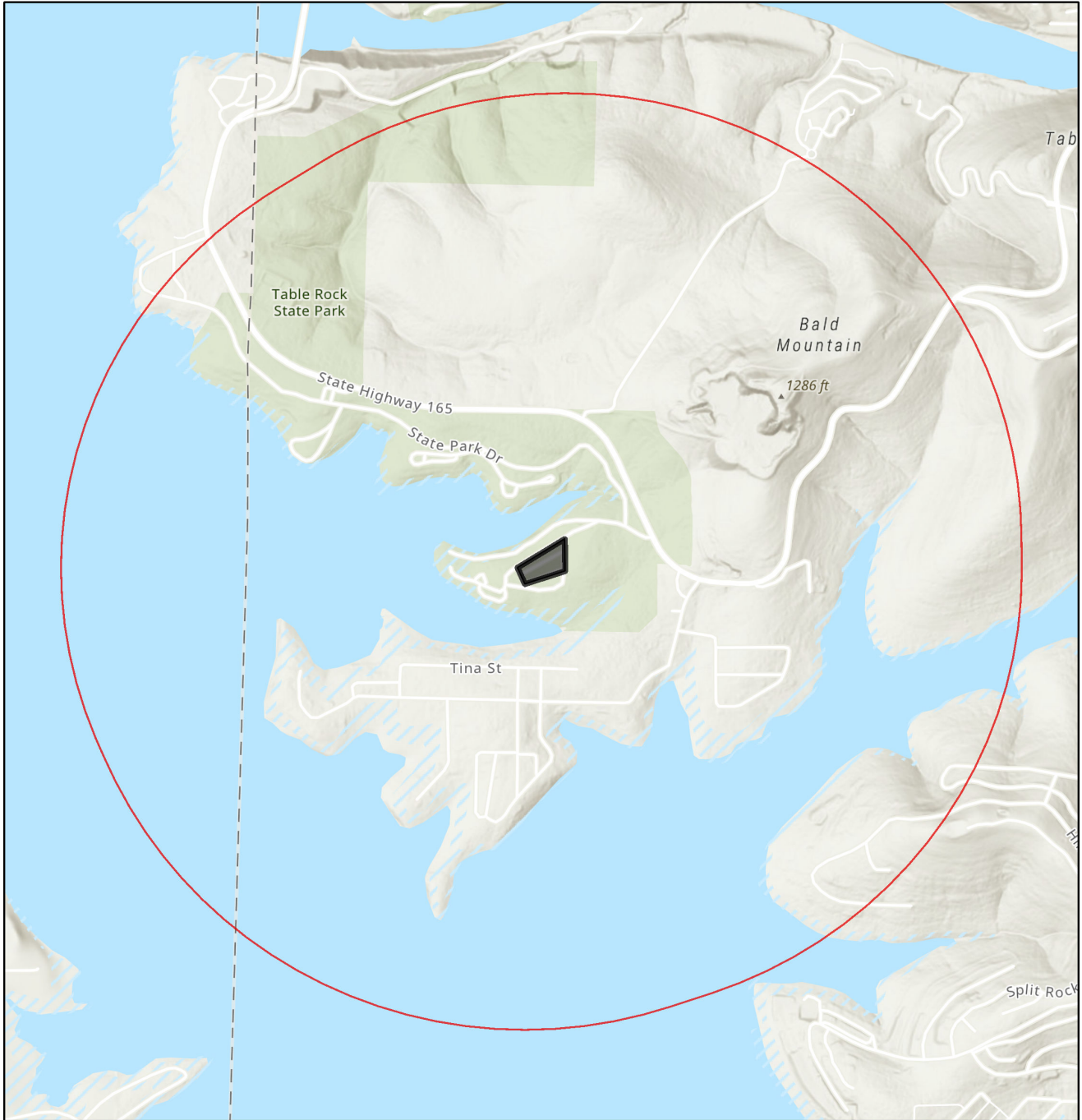
Disclaimer: This NATURAL HERITAGE REVIEW REPORT identifies if a species or natural community tracked by the Natural Heritage Program is known to occur within or near the project area submitted, and shares recommendations to avoid or minimize project impacts to sensitive species or natural habitats. Incorporating information from the Natural Heritage Program into project plans is an important step in reducing impacts to Missouri's sensitive natural resources. If an occurrence record is present, or the proposed project might affect federally listed species, the user must contact the Department of Conservation or U.S. Fish and Wildlife Service for more information.

This Natural Heritage Review Report is not a site clearance letter for the project. Rather, it identifies public lands and records of sensitive resources located close to and/or potentially affected by the proposed project. If project plans or location change, this report may no longer be valid. Because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, reports include information about records near but not necessarily on the project site. Lack of an occurrence record does not mean that a sensitive species or natural community is not present on or near the project area. On-site verification is the responsibility of the project. However, the Natural Heritage Program is only one reference that should be used to evaluate potential adverse project impacts and additional information (e.g. wetland or soils maps, on-site inspections or surveys) should be considered. Reviewing current landscape and habitat information, and species' biological characteristics would additionally ensure that Missouri Species of Conservation Concern are appropriately identified and addressed in planning efforts.

U.S. Fish and Wildlife Service – Endangered Species Act (ESA) Coordination: Lack of a Natural Heritage Program occurrence record for federally listed species in your project area does not mean the species is not present, as the area may never have been surveyed. Presence of a Natural Heritage Program occurrence record does not mean the project will result in negative impacts. This report does not fulfill Endangered Species Act consultation with the U.S. Fish and Wildlife Service (USFWS) for listed species. Direct contact with the USFWS may be necessary to complete consultation and it is required for actions with a federal connection, such as federal funding or a federal permit; direct contact is also required if ESA concurrence is necessary. Visit [IPaC: Home \(fws.gov\)](https://www.fws.gov/ipac) to initiate USFWS Information for Planning and Conservation (IPaC) consultation. Contact the Columbia Missouri Ecological Field Services Office (573-234-2132, or by mail at 101 Park Deville Drive, Suite A, Columbia, MO 65203) for more information.



Transportation Projects: If the project involves the use of Federal Highway Administration transportation funds, these recommendations may not fulfill all contract requirements. Please contact the Missouri Department of Transportation at 573-526-4778 or visit [Home Page | Missouri Department of Transportation \(modot.org\)](https://www.modot.org) for additional information on recommendations.

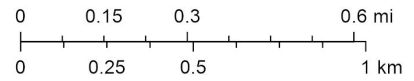
Table Rock State Park



February 16, 2023

1:19,879

-  Buffered Project Boundary
-  Project Boundary



Esri, NASA, NGA, USGS, FEMA, Missouri Dept. of Conservation, Missouri DNR, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA

Species or Communities of Conservation Concern within the Area:

There are records of state-listed Endangered Species, or Missouri Species or Natural Communities of Conservation Concern within or near the defined Project Area. Please contact the Missouri Department of Conservation for further coordination.

Email (preferred): NaturalHeritageReview@mdc.mo.gov

MDC Natural Heritage Review

Science Branch

P.O. Box 180

Jefferson City, MO

65102-0180

Phone: 573-522-4115 ext. 3182

Other Special Search Results:

The project occurs on or near public land, TABLE ROCK LAKE USACOE, Table Rock State Park, please contact COE, DNR.

Project Type Recommendations:

Recreation: Campgrounds -New and Maintenance construction should be managed to minimize erosion and sedimentation/runoff to nearby streams and lakes, including adherence to any Clean Water Act permit conditions. Project design should include stormwater management elements that assure storm discharge rates to streams for heavy rain events will not increase from present levels. Revegetate disturbed areas to minimize erosion using native plant species compatible with the local landscape and wildlife needs. Annual ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive exotic perennials such as crownvetch and sericea lespedeza.

Project Location and/or Species Recommendations:

Endangered Species Act Coordination - If this project has the potential to alter habitat (e.g. tree removal, projects in karst habitat) or cause direct mortality of bats, please coordinate directly with U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132 Ext. 100 for Ecological Services) for further coordination under the Endangered Species Act. Indiana bats (*Myotis sodalis*, federal- and state-listed endangered) and Northern long-eared bats (*Myotis septentrionalis*, federal-listed threatened) may occur near the project area. Both of these species of bats hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in wooded areas, often riparian forests and upland forests near perennial streams. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor Indiana bats or Northern long-eared bats, especially from September to April.

Gray Bat: The submitted project location is within the range of the Gray Myotis (i.e., Gray Bat) in Missouri. Depending on habitat conditions of your project's location, Gray Myotis (*Myotis grisescens*, federal and state-listed endangered) could occur within the project area, as they forage over streams, rivers, lakes, and reservoirs. Avoid entry or disturbance of any cave inhabited by Gray Myotis and when possible retain forest vegetation along the stream and from the cave opening to the stream. Please see [Best Management Practices for Construction and Development Projects Gray bat \(mo.gov\)](#).

Karst: This county has known karst geologic features (e.g., caves, springs, and sinkholes, all characterized by subterranean water movement). Few karst features are recorded in Natural Heritage records, and ones not noted here may be encountered at the project site or affected by the project. Cave fauna (many of which are Species of Conservation Concern) are influenced by changes to water quality; please check your project site for any karst features and make every effort to protect groundwater in the project area. Additional information and specific recommendations are available at [Management Recommendations for Construction and Development Projects Affecting Missouri Karst Habitat \(mo.gov\)](#).

Invasive exotic species are a significant issue for fish, wildlife and agriculture in Missouri. Seeds, eggs, and larvae may be moved to new sites on boats or construction equipment. Please inspect and clean equipment thoroughly before moving between project sites. See [Managing Invasive Species in Your Community | Missouri Department of Conservation \(mo.gov\)](#) for more information.

- Remove any mud, soil, trash, plants or animals from equipment before leaving any water body or work area.
- Drain water from boats and machinery that have operated in water, checking motor cavities, live-well, bilge and transom wells, tracks, buckets, and any other water reservoirs.
- When possible, wash and rinse equipment thoroughly with hard spray or HOT water (>140° F, typically available at do-it-yourself car wash sites), and dry in the hot sun before using again.

Streams and Wetlands – Clean Water Act Permits: Streams and wetlands in the project area should be protected from activities that degrade habitat conditions. For example, soil erosion, water pollution, placement of fill, dredging, in-stream activities, and riparian corridor removal, can modify or diminish aquatic habitats. Streams and wetlands may be protected under the Clean Water Act and require a permit for any activities that result in fill or other modifications to the site. Conditions provided within the U.S. Army Corps of Engineers (USACE) Clean Water Act Section 404 permit ([Kansas City District Regulatory Branch \(army.mil\)](#)) and the Missouri Department of Natural Resources (DNR) issued Clean Water Act Section 401 Water Quality Certification ([Section 401 Water Quality Certification | Missouri Department of Natural Resources \(mo.gov\)](#)), if required, should help minimize impacts to the aquatic organisms and aquatic habitat within the area. Depending on your project type, additional permits may be required by the Missouri Department of Natural Resources, such as permits for stormwater, wastewater treatment facilities, and confined animal feeding operations. Visit [Wastewater Permits | Missouri Department of Natural Resources \(mo.gov\)](#) for more information on DNR permits. Visit both the USACE and DNR for more information on Clean Water Act permitting.

For further coordination with the Missouri Department of Conservation and the U.S. Fish and Wildlife Services, please see the contact information below:

Email (preferred): NaturalHeritageReview@mdc.mo.gov
MDC Natural Heritage Review
Science Branch
P.O. Box 180
Jefferson City, MO
65102-0180
Phone: 573-522-4115 ext. 3182

U.S. Fish and Wildlife Service
Ecological Service
101 Park Deville Drive
Suite A
Columbia, MO
65203-0007
Phone: 573-234-2132

Miscellaneous Information

FEDERAL Concerns are species/habitats protected under the Federal Endangered Species Act and that have been known near enough to the project site to warrant consideration. For these, project managers must contact the U.S. Fish and Wildlife Service Ecological Services (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132; Fax 573-234-2181) for consultation.

STATE Concerns are species/habitats known to exist near enough to the project site to warrant concern and that are protected under the Wildlife Code of Missouri (RSMo 3 CSR 1 0). "State Endangered Status" is determined by the Missouri Conservation Commission under constitutional authority, with requirements expressed in the Missouri Wildlife Code, rule 3CSR 1 0-4.111. Species tracked by the Natural Heritage Program have a "State Rank" which is a numeric rank of relative rarity. Species tracked by this program and all native Missouri wildlife are protected under rule 3CSR 10-4.110 General Provisions of the Wildlife Code.

See [Missouri Species and Communities of Conservation Concern Checklist \(mo.gov\)](#) for a complete list of species and communities of conservation concern. Detailed information about the animals and some plants mentioned may be accessed at [Mofwis Search Results](#). Please contact the Missouri Department of Conservation to request printed copies of any materials linked in this document.



Enter Keyword or Phrase...

Things to Do

Make a Reservation

Find My Park

TANEY COUNTY NATIONAL REGISTER LISTINGS

Bonniebrook Homestead , 10 miles north of Branson, Walnut Shade, U.S. 65 vicinity (4/20/84)

Branson City Park Historic District (*Historic Taneycomo Lakefront Tourism Resources of Branson, Taney County, Missouri MPDF*), junction of St. Limas and Oklahoma streets, Branson (8/31/93; demolished 4/25/03)

Downing Street Historic District (The English Village; [map](#)), Downing Street between Third and Fourth streets, Hollister (12/29/78)

Parnell, Samuel T. and Mary B., House , 220 Angels Trail, Branson vicinity (4/25/08)

Ross, John, House (Old Matt's Cabin), west of Branson on MO 76 (7/21/83)

Sammy Lane Resort Historic District (*Historic Taneycomo Lakefront Tourism Resources of Branson, Taney County, Missouri MPDF*), 320 E. Main St., Branson (8/31/93; demolished 4/25/03)

Southwest Missouri Prehistoric Rock Shelter and Cave Sites Discontiguous Archaeological District (*Prehistoric Rock Shelter and Cave Sites in Southwestern Missouri MPDF*), address restricted (10/24/91)

Swan Creek Bridge , north of Forsyth (9/08/83; destroyed 9/28/89)

*Each bold-faced link in the list above leads to a word-searchable NATIONAL REGISTER NOMINATION for that resource; other links provide maps or additional context for the resource. The items may be downloaded (right-click) or viewed in your Web browser (double-click). File sizes range from 1 MB to several hundred MB, the time required for loading will depend on your connection speed. You may obtain a free copy of Adobe Reader software required to read the materials by visiting our [Help page](#).

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[Acronym Key](#)

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- [Assessing NR Eligibility](#)
- [NR Nominations by County](#)
- [Survey](#)
- [Architectural Survey](#)
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- [Section 106 Training](#)
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Missouri State Parks – a division of the Missouri Department of Natural Resources

Appendix 2

BMP Self-Inspection: Land Disturbance Permit

Date & Time:	Project Name:	Permit #: LDP
Designated Responsible Person In SWPPP: (Name & Company)		
<input type="checkbox"/> Weekly <input type="checkbox"/> Biweekly <input type="checkbox"/> Post Rain Event Rainfall Total: <input type="checkbox"/> Other:		

Inspection Checklist	Satisfactory?	Corrective Action Needed and Notes
SWPPP -Is SWPPP on site and updated with records attached? Is sign posted on construction site? Is ESC Plan updated?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA	Date Completed:
Construction Exit -Is sediment trackout controlled at the construction exit? Are streets substantially free of sediment?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA	Date Completed:
Stockpiles -Are stockpiles stabilized or controlled by a BMP? Are borrow/fill areas identified on the SWPPP?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA	Date Completed:
Dewatering operations -Are dewatering operations filtering sediment/pollutants?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA	Date Completed:
Housekeeping -Are litter, construction debris, and construction chemicals controlled?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA	Date Completed:
BMP Maintenance -Have all BMPs been repaired/ sediment accumulation removed? Should any BMPs be added and/or removed?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA	Date Completed:
Tree Protection -Is fencing installed properly? Are root zones and tree canopy protected from equipment, vehicles and construction material?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA	Date Completed:
Stabilization -Has temporary or final stabilization been achieved on areas inactive for more than 14 days?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA	Date Completed:
Stormwater Outfall and Receiving Streams -Is the outfall free from sediment accumulation? Are receiving waters free of visible pollutants?	<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> NA	Date Completed:
Additional Comments –		

<p>SWPPP Amendment Log – Create a log here of changes and updates to the SWPPP. You shall amend and update the SWPPP as appropriate during the term of the land disturbance activity. You shall amend the SWPPP at a minimum when the: Design, operation, or maintenance of BMPs are changed; Design of the construction project is changed that could significantly affect the quality of the stormwater discharges; Permittee’s inspections indicate deficiencies in the SWPPP or any BMP; or supporting agencies notify you in writing of deficiencies in the SWPPP; SWPPP is determined to be ineffective in minimizing or controlling erosion and sedimentation; and/or supporting agencies determine violations of water quality standards may occur or have occurred.</p>	<input type="checkbox"/> New amendment detail added to SWPPP	<p>Date:</p> <p>Explanation of amendment found on ESC plan:</p>
---	--	---

<p>Grading and Stabilization Log – Create a log here of grading and stabilization. The Construction General Permit requires that interim stabilization must be initiated immediately and completed within 7 calendar days where soil disturbing activities have temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days. Interim stabilization shall consist of well established and maintained BMPs. Final stabilization of disturbed areas must be initiated immediately and completed within 7 calendar days whenever any clearing, grading, excavating or other earth disturbing activities have permanently ceased on any portion of the site. Stabilization refers to actions taken to secure soil in its location and to prevent it from moving via stormwater runoff or trackout.</p>	<input type="checkbox"/> Construction temporarily ceased <input type="checkbox"/> Temporary BMPs are in place <input type="checkbox"/> Construction permanently ceased <input type="checkbox"/> Stabilization has begun <input type="checkbox"/> Stabilization is complete	<p>Date:</p> <p>Location & Temporary BMPs:</p> <p>Permanently Stabilized by:</p> <input type="checkbox"/> Mulch <input type="checkbox"/> Rock <input type="checkbox"/> Concrete/Asphalt <input type="checkbox"/> Hydroseed <input type="checkbox"/> Sod <input type="checkbox"/> Seed and Straw <input type="checkbox"/> Other:
---	--	--

Unless otherwise noted, all corrective actions must be completed by:

Training: The person designated as responsible for environmental matters, and the person designated to conduct self-inspections (if different) are required to have thorough and demonstrable knowledge of erosion and sediment control practices. Training is recommended. Please call 864-1944 for local training opportunities.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ **Signature:**

APPENDIX 3

Stormwater Pollution Prevention Plan (SWPPP)

TABLE ROCK STATE PARK

GRE: 4579

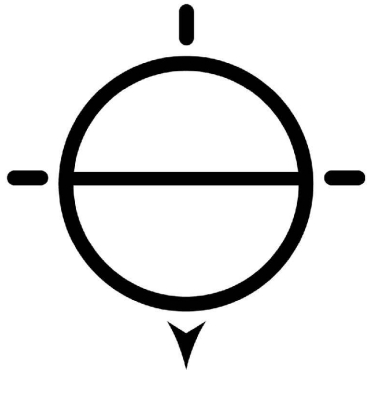
Instructions:

- Attach a general location map.
- Attach an Erosion and Sediment Control (ESC) Plan including features listed below.
- All sites over 20 acres shall submit a phased (ESC) Plan.
- Phased grading shall be under 10 acres at one time.
- Attach an Erosion and Sediment Control (ESC) Plan for associated Public Improvement Plans including features listed below.
- Attach BMP Details sheet **with Phasing of Construction Activities Table** in the ESC Plan sheet.
- Attach the stormwater infrastructure site plan.
- Attach the landscape plan including tree preservation and new plantings.
- Attach a tree preservation plan if applicable.

The erosion and sediment control site map(s) must include the following features:

- Limits of disturbance
- Property lines
- Labeled outfall(s)
- Geologic features (springs, sinkholes and caves)
- Locations where stormwater discharges to surface water and all waters of the State (including wetlands)
- Drainage patterns and slopes anticipated before and after major grading activities are completed
- Areas of soil disturbance and areas that will not be disturbed (perimeter control options: are there any areas where perimeter control could be substituted with a vegetated buffer?)
- Existing and planned streets, buildings and parking lots
- Existing and proposed Stormwater Sewer System and if applicable Sanitary Sewer System
- Location and phase of permanent Stormwater Control Measures (SCMs), including permanent erosion control
- Location and phase of installation of temporary structural and non-structural Best Management Practices (BMPs)
- Temporary sanitary facility and trash receptacles
- Material storage areas, vehicle/equipment fueling, batch plants, maintenance areas, concrete wash-outs and spill kits
- Locations of stockpiles and off-site borrow/fill areas
- Areas of stabilization and description of stabilization method: hydroseed, seed/straw, sod, mulch, rock, paved, etc
- Protected features: trees, natural vegetation, buffer strips, steep slopes, surface waters, sinkholes, etc
- Specify where existing vegetation and trees will be preserved where practical
- Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply
- A legend which includes all symbols
- Locations where stabilization practices are expected to occur
- Locations of all waters of the state (including wetlands)

****ATTACH ALL MAPS, PLANS AND DETAIL SHEETS HERE**



REVISION:	
DATE:	
REVISION:	
DATE:	
REVISION:	
DATE:	
ISSUE DATE:	01/17/2023

CAD DWG FILE: X2216-01_C-005
DRAWN BY: MAF
CHECKED BY: DAL
DESIGNED BY: MAF

SHEET TITLE:

**SEDIMENT &
EROSION CONTROL
PLAN**

SHEET NUMBER:

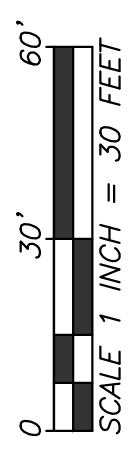
C-104

5 OF 18 SHEETS
JANUARY 17, 2023



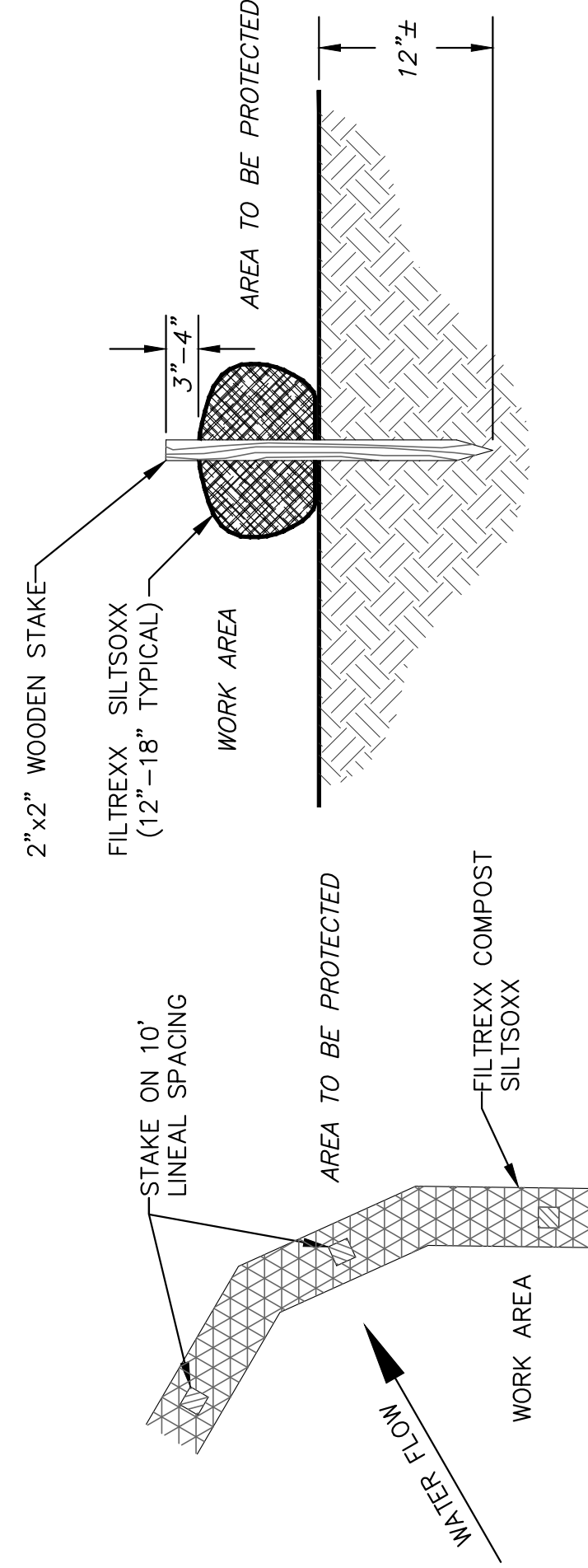
LEGEND

[Hatched Box]	DISTURBED AREA = 3.12 ACRES
[Dashed Line]	COMPOST FILTER SOCK
[Square with X]	TEMPORARY RESTROOM
[Arrow]	FLOW DIRECTION
[Box with CW]	CONCRETE WASHOUT PIT
[Hatched Box]	TRASH RECEPTACLE



GENERAL NOTES FOR SEDIMENTATION & EROSION CONTROL

1. THIS PLAN SHOWS THE LOCATION AND DETAILS FOR PRIMARY SEDIMENT CONTROLS TO BE CONSTRUCTED. THE CONTRACTOR IS RESPONSIBLE FOR CONTROLLING EROSION AND DISCHARGE OF SEDIMENT FROM THE SITE AT ALL TIMES DURING CONSTRUCTION. THE CONTRACTOR SHALL PROVIDE NECESSARY MEASURES DURING ALL PHASES OF HIS OPERATIONS REGARDLESS OF WHETHER THEY ARE SPECIFICALLY NOTED ON THIS PLAN AND SHALL MAINTAIN AND REPLACE CONTROLS AS NECESSARY DURING THE COURSE OF HIS OPERATIONS.
2. INITIAL SEDIMENT CONTROLS SHOWN ON THIS PLAN MUST BE INSTALLED PRIOR TO ANY OTHER WORK.
3. THE CONTRACTOR SHALL CLEAN STREETS BOTH INTERIOR AND ADJACENT TO THE SITE, AS NEEDED AFTER EACH RAINFALL, AND AT THE END OF EACH DAY OF CONSTRUCTION.
4. THE CONTRACTOR IS RESPONSIBLE FOR CONTROLLING DUST DURING CONSTRUCTION AND SHALL WATER CONSTRUCTION AREAS WHENEVER CONDITIONS WARRANT.
5. ALL DISTURBED AREAS NOT RECEIVING OTHER PERMANENT STABILIZATION SUCH AS PAVEMENT, SOIL, ETC., SHALL BE SEEDED AND MULCHED, AS SPECIFIED BELOW BEFORE TEMPORARY SEDIMENT CONTROLS CAN BE REMOVED AND PRIOR TO FINAL APPROVAL OF CONSTRUCTION.
 - A MINIMUM DEPTH OF 4" OF TOPSOIL (PRIOR TO COMPACTING) SHALL BE SPREAD ON AREAS TO BE SEEDED.
 - AFTER TOPSOIL IS SPREAD, LIME SHALL BE SPREAD AT THE RATE OF 800-900 POUNDS, EFFECTIVE NEUTRALIZING MATERIAL (ENM) PER ACRE.
 - FERTILIZER SHALL BE SPREAD AT THE RATE OF 400-500 POUNDS PER ACRE, AND SHALL BE 13-13-13 NITROGEN, PHOSPHORUS, AND POTASSIUM.
 - SEED MIX SHALL CONSIST OF 60-80 % KENTUCKY 31 TALL FESCUE AND 20-40 % ANNUAL RYE GRASS (GERMINATION SHALL BE AT LEAST 85 SPREAD AT THE RATE OF 400-500 POUNDS PER ACRE).
 - ALL AREAS TO BE SEEDED HAVING SLOPES LESS THAN 4:1 SHALL BE MULCHED WITH CEREAL GRAIN MULCH AT THE RATE OF 100 POUNDS PER 1000 SQUARE FEET (4500 POUNDS PER ACRE). CEREAL GRAIN MULCH SHALL MEET THE REQUIREMENTS OF SECTION 802 OF THE MISSOURI DEPARTMENT OF TRANSPORTATION SPECIFICATIONS FOR TYPE 1 MULCH. MULCH MAY BE APPLIED BY HAND; HOWEVER, IT MUST BE EVENLY SPREAD. TYPE 1 MULCH SHALL BE THOROUGHLY WETTED IMMEDIATELY AFTER APPLICATION.
 - WHERE SLOPES ARE 4:1 OR STEEPER, TYPE 3 MULCH (HYDROMULCH) MEETING THE REQUIREMENTS OF SECTION 802 OF THE MISSOURI DEPARTMENT OF TRANSPORTATION SPECIFICATIONS SHALL BE USED. TYPE 3 MULCH SHALL BE APPLIED AT THE RATE OF 2000 POUNDS PER ACRE.
 - PERMANENT SEEDING SEASON RUNS FROM MARCH 1ST TO JUNE 1ST AND AUGUST 15TH TO NOVEMBER 1ST. SEEDING AND MULCHING MUST BE DONE WHENEVER WORK IS COMPLETE REGARDLESS OF THE SEASON. WHENEVER SEEDING AND MULCH IS INSTALLED OUTSIDE OF THE PERMANENT SEEDING SEASON THE CONTRACTOR WILL BE RESPONSIBLE FOR REPLANTING AND MULCHING ANY AREAS WHERE GROWTH HAS NOT BECOME ESTABLISHED DURING THE NEXT PERMANENT SEEDING SEASON.
 - ALL AREAS MUST BE MAINTAINED BY THE CONTRACTOR FOR A MINIMUM OF 60 DAYS FOLLOWING INSTALLATION OR 60 DAYS FROM THE START OF THE FIRST PERMANENT SEEDING SEASON AFTER INSTALLATION.



- NOTES**
1. ALL MATERIAL TO MEET FILTREXX SPECIFICATIONS OR EQUAL.
 2. SILT SOXX COMPOST/SOIL/ROCK/SEED FILL TO MEET APPLICATION REQUIREMENTS.
 3. SILT SOXX DEPICTED IS FOR MINIMUM SLOPES. GREATER SLOPES MAY REQUIRE LARGER SOCKS PER THE ENGINEER.
 4. COMPOST MATERIAL TO BE DISPENSED ON SITE, AS DETERMINED BY THE ENGINEER.
 5. SILT SOXX TO BE INSTALLED PER MANUFACTURERS RECOMMENDATIONS.

SILT SOXX EROSION CONTROL
NOT TO SCALE

APPENDIX 4

Stormwater Pollution Prevention Plan (SWPPP)

TABLE ROCK STATE PARK

GRE: 4579

LAND DISTURBANCE PERMIT STORMWATER POLLUTION PREVENTION PLAN PERMITTED BY:

MISSOURI STATE OPERATING PERMIT NUMBER:

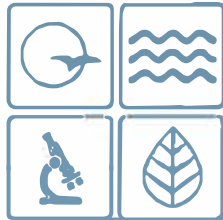
<h1>MOR100038</h1>

COUNTY LAND DISTURBANCE PERMIT NUMBER:

--

Contact Name	
Contact Cell Phone	
Project Name	
SWPPP Location	
Spill Kit Location	

APPENDIX 5



MISSOURI DEPARTMENT OF NATURAL RESOURCES

Michael L. Parson
Governor

Dru Buntin
Director

November 29, 2022

Caylen Cantrell
Table Rock State Park
5272 State Highway 165
Branson, MO 65616

RE: Table Rock State Park, MO5120169, Taney County, Review Number 5000157-22

Dear Caylen Cantrell:

Enclosed is approval on plans and specifications for a booster pump station and waterline extension to serve Campground 2 at Table Rock State Park, in Taney County, Missouri.

Please be advised this project may be required to obtain other permits from the Missouri Department of Natural Resources or local jurisdictions. It is your responsibility to ensure that any and all necessary permits for this project have been obtained.

NOTE: The minimum size of a water main for providing fire protection and serving fire hydrants shall be six inches in diameter.

NOTE: The proposed waterline will connect to an existing 4-inch main that will provide an available flow of 80 gallons per minute and a pressure of 54 psi.

NOTE: The Public Water System is responsible for notifying the well owner of their obligation to plug any abandoned well when a connection is made to a new customer or location previously served by a private well, pursuant to the requirements of Section 256.628 RSMo. The Public Water System is also responsible for providing the well owner with notification forms for the owner to complete. The Public Water System must submit these forms to the Department within 60 days of the connection.

NOTE: You, as the applicant, should be aware that you will need to obtain final construction approval from the Department for this project, once it has been constructed and completed. In order to do this, you will need to have your engineer complete the enclosed "Statement of Work Completed" form, or online at <https://dnr.mo.gov/document-search/public-drinking-water-construction-statement-work-completed-mo-780-2825>. This may require you to make additional arrangements with your engineer to provide this service to you. Once your engineer has completed this form for you, you should return it to this office. We will then make arrangements with our regional office staff to conduct a final inspection and issue a final construction approval.



Caylen Cantrell
Page 2

If you were adversely affected by this decision, you may be entitled to pursue an appeal before the Administrative Hearing Commission (AHC). To appeal, you must file a petition with the AHC within 30 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 must be directed to: Administrative Hearing Commission, United States Post Office Building, Third Floor, 131 West High Street, P.O. Box 1557, Jefferson City, MO 65102. Phone: 573-751-2422, fax: 573-751-5018, and website: www.oa.mo.gov/ahc.

If you have any questions concerning this construction permit approval or if you need any further assistance, please contact us at 573-751-5924, or contact the engineer by email at meagan.torrence@dnr.mo.gov. You may also request to set up an appointment referred to as a Compliance Assistance Visit (CAV). CAVs will assist with understanding regulatory requirements, help with achieving and maintaining compliance, and provide a continuing resource for technical assistance. To request a CAV, please contact your local regional office or fill out an online request. The regional office contact information can be found at the following website: <https://dnr.mo.gov/about-us/division-environmental-quality/regional-office>. The online CAV request can be found at <https://dnr.mo.gov/compliance-assistance-enforcement/request-visit>. Thank you.

Sincerely,

WATER PROTECTION PROGRAM



Brandon Bach, P.E.
Permits and Engineering Unit Chief
Public Drinking Water Branch

BB:mtm

Enclosure

c: Great River Engineering
Robert Simpson, DSP
Southwest Regional Office

DEPARTMENT OF NATURAL RESOURCES OF MISSOURI

APPROVAL ON PLANS AND SPECIFICATIONS FOR A BOOSTER PUMP STATION AND WATERLINE EXTENSION

Table Rock State Park
Taney County, Missouri

Review Number 5000157-22

INTRODUCTION

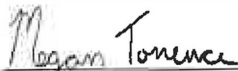
Detailed plans, specifications, and an engineering report dated September 12, and supplemental information dated November 17, 2022, for a waterline extension to serve Table Rock State Park, of Taney County, Missouri were submitted for review and approval by Great River Engineering, of Springfield, Missouri.

BRIEF DESCRIPTION

In general, these plans and specifications provide for a new booster pump station and waterline extension to serve Campground 2.

The new booster pump station will draw water from the existing 50,000-gallon storage tank and boost pressures throughout the campground. The pump station will consist of two 1.5 horsepower booster pumps with a capacity of 20 gallons per minute at 60 feet total dynamic head, variable frequency drives, and three 86-gallon pressure tanks. The pressure tanks will be NSF approved and listed in ANSI and/or NSF Standard 61. Piping, valves, meters, and other appurtenances will be provided as detailed in the plans and specifications.

Approximately 603 lineal feet of 4-inch Class 200 SDR-21 PVC pipe conforming to American Water Works Association (AWWA) standards will be installed. The necessary valves, fittings, hydrants, and other appurtenances conforming to AWWA standards will be provided as per detailed plans and specifications. Before being placed in service, the waterlines will be pressure tested, flushed, disinfected, and sampled for bacteriological analyses.



Megan Torrence

Drinking Water Permits and Engineering Unit

APPROVAL TO CONSTRUCT

The engineering plans and specifications described above were examined as to sanitary features of design which may affect the operation of the sanitary works, including size, capacities of the units, and factors which may affect the efficiency and ease of operation. Approval as regards these points is hereby given.

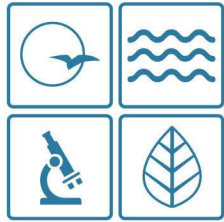
Approval is given with the understanding that final inspection and approval of the completed work shall be made by the Department of Natural Resources before same is accepted and placed in operation. If construction is not commenced two (2) years after the date of issue or there is a halt in construction of more than two years, the approval to construct will be void unless an extension of time has been granted by the department.

In the examination of plans and specifications, the Department of Natural Resources, Public Drinking Water Program does not examine the structural features of design or efficiency of mechanical equipment. This approval does not include approval of these features.

The Department of Natural Resources, Public Drinking Water Program reserves the right to withdraw the approval of plans and specifications at any time it is found that additional treatment or alterations are necessary to assure reasonable operating efficiency and to afford adequate protection to public health.

APPENDIX 6

Table Rock State Park
MOGSE0447, Taney County



MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Michael L. Parson
Governor

Dru Buntin
Director

December 8, 2022

Caylen Cantrell
Park Specialist III
Table Rock State Park
5272 State Highway 165
Branson, MO 65616

Dear Caylen Cantrell:

Pursuant to the Missouri Clean Water Law, we have issued and are enclosing a General Permit for Sewer Extension Construction to Table Rock State Park. Please review the requirements of your 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 Sections 644.051.6 and 621.250, RSMo. To appeal, you must file a petition with the Administrative Hearing Commission within 30 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 Administrative Hearing Commission. Contact information for the AHC is as follows: Administrative Hearing Commission, United States Post Office Building, 131 West High Street, P.O. Box 1557, Jefferson City, MO 65102, Phone: 573-751-2422, Fax: 573-751-5018, Website: www.oa.mo.gov/ahc.

Nothing in this permit removes any obligations to comply with 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, 573-751-1300.

Sincerely,

WATER PROTECTION PROGRAM

Cindy LePage, P.E., Chief
Engineering Section

CL:shs

Enclosure

c: Connie Walden, P.E.

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION



GENERAL PERMIT for SEWER EXTENSION CONSTRUCTION

The Missouri Department of Natural Resources hereby issues a permit to:

Construction Permit ID: MOGSE0447
Title of Project: TABLE ROCK STATE PARK - L
Owner: Caylen Cantrell
Address: 5272 ST HWY 165
BRANSON, MO 65616

The project will also include general site work appropriate to the scope and purpose of the project and will include all the necessary appurtenances to make a complete and usable collection system. The construction of this project will be in the vicinity of the county below and discharge to Receiving Permit ID below:

County: Taney Receiving Permit ID: MO0116041

for the construction of (described construction project):

Table Rock State Park - Construction of approximately 1,395 lf of 8-inch PVC SDR-35 gravity sewer lines with approximately 7 manholes flowing to an existing lift station. Construction of a low pressure sewer with grinder pumps and approximately 292 lf of 2-inch through 1.25-inch PVC SDR-21 force main. Both the gravity sewers and low pressure sewers will serve 93 PE and a DAF of 9,300 gpd. Construction will include the installation of 5 simplex grinder pumps.

Project is in the vicinity of State Park Dr and Boat Launch Road in Branson, Taney County and discharges to Hollister WWTF, MO-0116041. Brent Daniels, WWTP Supervisor, with the City of Hollister provided a signed Continuing Authority Form dated September 22, 2022.

Construction of such proposed facilities shall be in accordance with the provisions of the Missouri Clean Water Law, Chapter 644, RSMo, and regulation promulgated thereunder, or this permit may be revoked by the Department of Natural Resources (Department). As the Department does not examine structural features of design or the efficiency of mechanical equipment, the issuance of this permit does not include approval of these features.

This permit applies only to the construction of water pollution control components; it does not apply to other environmentally regulated areas.

December 08, 2022

Issue Date

A handwritten signature in black ink that reads "Chris Wieberg".

Chris Wieberg, Director
Water Protection Program

December 07, 2024

Expiration Date

APPLICABILITY

1. This permit authorizes the construction of gravity sewer extensions, force mains, and lift stations. Non-earthen flow equalization storage basins at lift stations and inline storage, which flows back into the lift station or collection system, are also included.
2. A site specific sewer extension construction permit may be required by the Department due to compliance and enforcement actions.
3. Projects located within an Approved Sewer Program as noted in the operating permit of the receiving wastewater treatment facility are not required to obtain a construction permit from the Department of Natural Resources (Department).
4. This permit does not apply to:
 - A. Earthen storage basins;
 - B. Exempt projects unless requested by the applicant or required by enforcement.

PREREQUISITES:

1. The General Sewer Extension Construction Permit application, appropriate fee, and documentation in accordance with 10 CSR 20-6.010(5)(G).
2. The plans and specifications each signed and sealed by a professional engineer registered in the State of Missouri in accordance with 10 CSR 20-8 and 10 CSR 20-6.010.
3. The Design Certification form or Engineering Report or Summary of Design signed and sealed by a professional engineer registered in the State of Missouri certifying the design of the system was prepared in accordance with 10 CSR 20-6 and 10 CSR 20-8.
4. A statement from the continuing authority, as defined in 10 CSR 20-6.010, accepting the wastewater for treatment and indicating the permitted treatment facility has the available capacity.
5. A statement from the continuing authority, as defined in 10 CSR 20-6.010, accepting the responsibility for operation and maintenance of these facilities.

PERMIT CONDITIONS:

1. This permit authorizes the activities and scope of work detailed in the plans and specifications submitted with the request.
2. The construction must be in accordance with the final plans and specifications approved by the Department.
3. State and Federal Law does not permit bypassing of raw wastewater; therefore steps must be taken to ensure that raw wastewater does not discharge during construction. If a sanitary sewer overflow or bypass occurs, report the appropriate information to the Department's regional office per 10 CSR 20-7.015(9)(E)2., or through the Online Bypass/SSO Reporting system found at <https://dnr.mo.gov/eservices.htm> under Water Protection.

PERMIT CONDITIONS: (continued)

4. Protection of drinking water supplies must meet the requirements of 10 CSR 23-3.010 .
 - A. There shall be no physical connections between a public or private potable water supply system and a sewer, or appurtenance thereto, which would permit the passage of any wastewater or polluted water into the potable supply.
 - B. Sewers shall be laid at least fifty feet (50') in a horizontal direction from any existing or proposed public water supply well or other water supply sources or structures.
5. Manholes shall be located with the top access at or above grade level.
6. In addition to the requirements for a construction permit, see 10 CSR 20-6.200 for land disturbance requirements to obtain a Missouri State Operating Permit to discharge stormwater. The permit requires Best Management Practices sufficient to control runoff and sedimentation to protect waters of the state. Land disturbance permits will only be obtained by means of the Department's ePermitting system available online at www.dnr.mo.gov/env/wpp/epermit/help.htm.

See www.dnr.mo.gov/env/wpp/stormwater/sw-land-disturb-permits.htm for more information.

7. A United States (U.S.) Army Corps of Engineers (COE) permit (404) and a Water Quality Certification (401) issued by the Department or permit waiver may be required for the activities described in this permit. This permit is not valid until these requirements are satisfied. If construction activity will disturb any land below the ordinary high water mark of Jurisdictional Waters of the U.S. then a 404/401 will be required. Since the COE makes determinations on what is jurisdictional, you must contact the COE to determine permitting requirements. You may call the Department's Water Protection Program at 573-751-1300 for more information.

See www.dnr.mo.gov/env/wpp/401/ for more information.

8. If this project eliminates a wastewater treatment facility under the jurisdiction of the Department, then a full closure plan shall be submitted with a Facility Closure Request Form, Form – MO 780-2512 to the Department's appropriate regional office for review and approval. In accordance with 10 CSR 20-6.010(12), the closure plan must meet the requirements outlined in Standard Conditions Part III, of the Missouri State Operating Permit. Closure shall not commence until the submitted closure plan is approved by the Department.
9. If this project is part of a project to resolve an enforcement action or is receiving funding from the Department, submit a statement of work complete following the completion of construction



MISSOURI DEPARTMENT OF NATURAL RESOURCES
 WATER PROTECTION PROGRAM
**APPLICATION FOR CONSTRUCTION PERMIT –
 SEWER EXTENSION**

FOR DEPARTMENT USE ONLY	
APP NO.	CP NO.
FEE RECEIVED	CHECK NO.
DATE RECEIVED	

NOTE ► PLEASE READ THE ACCOMPANYING INSTRUCTIONS BEFORE COMPLETING THIS FORM

1.0 APPLICATION INFORMATION (Note – If any of the questions in this section are answered NO, this application may be considered incomplete and returned.)

- 1.1 Is this a Federal/State funded project? YES N/A Funding Agency: State of Missouri Project #: X2216-01
- 1.2 Has the Department of Natural Resources approved the proposed project's engineering report*?
 YES Date of Approval: NO N/A
- 1.3 Is a copy of the appropriate plans* and specifications* included with this application? YES NO
- 1.4 Is a summary of design* included with this application? YES NO
- 1.5 Is the appropriate fee or JetPay confirmation included with this application? YES NO
 See Section 7.0

* Must be affixed with a Missouri registered professional engineer's seal, signature and date.

2.0 PROJECT INFORMATION

2.1 NAME OF PROJECT

Table Rock State Park

ADDRESS	CITY	STATE	ZIP CODE	COUNTY
5272 State Highway 165	Branson	MO	65616-0000	Taney County

2.2 Legal Description: ¼, ¼, ¼, Sec. 27, T 22 N, R 22 W

2.3 Project Components (check all that apply):

- Gravity sewers Pumping stations Force mains Alternative sewer system Other (Describe below.)

2.4 PROJECT DESCRIPTION

Construction of approximately 1,395 linear feet of 8-inch PVC gravity sewer main to serve 22 premium campsites. Construction of 5 yurts

2.5 DESIGN INFORMATION

A. Population or number of lots to be served by this extension: 66 persons

B. Estimated flow to be contributed by this extension: Design Average Flow: 9300 gpd Design Peak Hourly Flow: 1158 gph

C. Industrial Wastes: Type: Flow: gpd

D. Receiving Sewer: Size: 8 inches Capacity: 1395 gpm

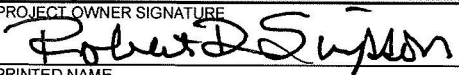
3.0 PROJECT OWNER

NAME	TELEPHONE NUMBER WITH AREA CODE	EMAIL ADDRESS	
Caylen Cantrell	417-334-4704		
ADDRESS	CITY	STATE	ZIP CODE
5272 State Highway 165	Branson	MO	65616-0000

4.0 CONTINUING AUTHORITY: A continuing authority is a company, business, entity or person(s) that will be operating the facility or ensuring compliance with the permit requirements. A continuing authority is not, however, an entity or individual that is contractually hired by the permittee to sample or operate and maintain the system for a defined time period, such as a certified operator or analytical laboratory. To access the regulatory requirement regarding continuing authority, 10 CSR 20-6.010(2), please visit <https://s1.sos.mo.gov/cmsimages/adrules/csr/current/10csr/10c20-6.pdf>. A continuing authority's name must be listed exactly as it appears on the Missouri Secretary of State's (SoS's) webpage: <https://bsd.sos.mo.gov/BusinessEntity/BESearch.aspx?SearchType=0>, unless the continuing authority is an individual(s), government, or otherwise not required to register with the SoS.

NAME	TELEPHONE NUMBER WITH AREA CODE	EMAIL ADDRESS	
Brad Allbritton / Taney County Regional Sewer District	(417) 546-7220	ballbritton@tcrsd.org	
ADDRESS	CITY	STATE	ZIP CODE
207 David Street	Forsyth	MO	65653

4.1 A letter from the continuing authority or the Continuing Authority and Receiving Wastewater Treatment Facility Acceptance form, if different than the owner, is included with this application. YES NO N/A

5.0 ENGINEER			
ENGINEER NAME / COMPANY NAME Great River Engineering		TELEPHONE NUMBER WITH AREA CODE 417-886-7171 ext. 331	EMAIL ADDRESS cwalden@greatriv.com
ADDRESS 2826 S. Ingram Mill Road	CITY Springfield	STATE Missouri	ZIP CODE 65804
6.0 RECEIVING WASTEWATER TREATMENT FACILITY			
NAME Hollister Wastewater Treatment Facility		TELEPHONE NUMBER WITH AREA CODE (417) 334-3330	EMAIL ADDRESS wwtpsupervisor@cityofhollister.com
MISSOURI STATE OPERATING PERMIT # MO-0116041		REMAINING CAPACITY (GPD) 1,400,000	
6.1 Has the receiving treatment facility agreed to accept the additional wastewater flow? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			
6.2 A letter from the receiving wastewater treatment facility, if different than the continuing authority, is included with this application. <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A			
7.0 Application Fee			
<input type="checkbox"/> Check Number		<input type="checkbox"/> JetPay Confirmation Number	
8.0 PROJECT OWNER: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.			
PROJECT OWNER SIGNATURE 			
PRINTED NAME Robert D Simpson		DATE 10/28/2022	
TITLE OR CORPORATE POSITION DESIGN ENGINEER		TELEPHONE NUMBER WITH AREA CODE 573-751-5380	EMAIL ADDRESS robert.simpson@dnr.mo.gov
Mail completed copy to: MISSOURI DEPARTMENT OF NATURAL RESOURCES WATER PROTECTION PROGRAM P.O. BOX 176 JEFFERSON CITY, MO 65102-0176			

SEWER EXTENSION DESIGN CERTIFICATION

Answer all questions yes, no, or N/A. Answer N/A only if the question is clearly not applicable to the design of the proposed sewer extension **OR** if a deviation was previously allowed by the Department in the approval of Standard specifications or Standard Detail Sheets.

9.0 SEWER EXTENSION CHECKLIST					
	REGULATION		YES	NO	N/A
1	8.110(9)(B)	Are detailed plans showing tributary area, boundaries, pertinent elevations, topography, existing and proposed facilities provided?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	8.110(3)(A)	Is the design flow based on actual flow data for an existing system?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	8.110(3)(B)	Are average design flows, peak hourly flows, and I&I contributions for new systems calculated.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	8.120(2)	Does the sewer exclude water from roofs, streets, groundwater from foundation drains, and combined wastewater?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	8.120(3)(C)	Is ASTM C969-17 leakage test specified to ensure water tight joint seals and appropriate exfiltration and infiltration rates?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	8.120(4)(A)	Are manholes located at all changes in grade, size or alignment, and all intersections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	8.120(3)(A)1	Are all sewer pipes constructed with a slope to obtain mean velocities of not less than 2 feet per second?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	8.120(3)(A)2	Is the pipe covered with at least 36" of soil or sufficiently insulated to prevent freezing?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	8.120(3)(A)	Is the pipe installation, embedment, and backfill designed to prevent damage to the pipe and its joints?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	8.120(3)(B)	Is deflection testing specified to ensure no pipe exceeds a deflection of 5% of the inside diameter?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	8.120(4)(C)	Are manholes at least 42 inches in diameter with a clear opening of 22 inches on sewer line larger than 8"?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	8.120(4)(C)	Where cleanouts are used at the end of a lateral instead of a manhole, are they a minimum diameter of 8 inches or larger and equal to the diameter for pipes < 8"?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	8.120(4)(E)	Are the manholes specified to be watertight, constructed, installed in accordance with the manufacturer's recommendations and procedures?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14	8.120(4)(F)	Do the specifications include a requirement for inspection and testing for manholes?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	8.120(5)(B)	Are sewers and manholes located at least 50 feet horizontally from any existing or proposed water supply well, sources, structures?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	8.120(5)(A)	Is the sewer free from physical connections to a potable water supply system with no water pipes coming in contact with a sewer manhole?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10.0 PRESSURE SEWERS, GRINDER PUMP, STEP AND STEG SEWER CHECKLIST					
	REGULATION		YES	NO	N/A
17	8.125(5)(A)1.	Does the cleaning velocity of ≥ 2 ft/s happen at least once per day?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	8.125(5)(A)2.	Is the diameter of the pressure sewer main pipe at least 1.5"?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	8.125(5)B	Are appurtenances compatible with the piping system?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	8.125(5)(C)	Do service line pipes have a minimum diameter of 1.25 in.?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	8.125(5)(D)1. A	Do simplex grinder pump stations service only a single equivalent dwelling unit (EDU)? i.e. 1 residence – 1 grinder pump station.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	8.125(5)(D)1. B	Are multiple unit pump stations owned, operated, maintained by an approved continuing authority?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	8.125(5)(D)3	Is there at least 70 gallons of storage in the grinder pump unit?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	8.125(5)(D)4	Do grinder pump stations have shutoff valves, check valves, and anti-siphon valves (where siphoning could occur) that are accessible from the ground surface?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	8.125(5)(D)7 8.130(3)(B)2	Are units serviceable and replaceable under wet conditions without electrical hazard and electrical equipment suitable for hazardous locations (National Electrical Code, Class I, Group D, Division 1 location)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	8.125(5)(D)8 8.125(6)(F)6	Are provisions in place to avoid interruption of service due to mechanical or power failure by providing standby power, storage capacity or interconnection with another disposal system?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	8.125(6)(D) 8.180(2)	Does each EDU have at least one septic tank with a minimum of 1,000 gallon capacity with 20% of tank volume dedicated to freeboard and ventilation?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
28	8.125(6)(F)	Are pump vaults designed with duplex pumps for STEP sewer systems with design flow of 1,500 gallons per day or greater?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
29	8.125(7)(A) 8.125(7)(C)	Is the minimum STEG sewerservice line at least 4" in diameter?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11.0 PUMP STATION CHECKLIST					
	REGULATION		YES	NO	N/A
30	8.130(2)(A) 8.140(2)(B)	Is the pump station designed to withstand the 100-year flood?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
31	8.130(3)(A)	Is the dry well completely separate from the wet well and is a suitable and safe means of access provided to each?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
32	8.130(3)(B)	If the design flow is 1,500 gpd or more, are at least 2 pumps or pneumatic ejectors provided?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33	8.130(3)(D)	Are valves located outside wet well unless integral to a pump or its housing?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
34	8.130(3)(F) 8.140(8)(J)	Do wet and dry wells have separate ventilation systems?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
35	8.130(3)(G)	Does all potable water brought to the pump station comply with 8.140 (7) D?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
36	8.130(6)	Is an alarm system provided with uninterrupted power?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
37	8.130(7)(A)	Is there 2 hours retention of the peak hourly flow for a design flow > 100,000 gpd or 4 hrs retention of the peak hourly flow for a design flow < 100,000 gpd?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
38	8.130(7)(B)	Is there an independent utility substation provided for emergency power that is capable of starting and operating the pump station at its rated capacity?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
39	8.130(8)(A)	Is the force main velocity of ≥ 2 ft/s maintained?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
40	8.130	Are there complete operation instructions for the pumping stations provided that include emergency procedures, maintenance schedules, special tools and spare parts that may be necessary?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

12.0 SUCTION LIFT PUMP AND SUBMERSIBLE PUMP STATION CHECKLIST					
	REGULATION		YES	NO	N/A
41	8.130(4)	Are the suction lift pumps of the self priming or vacuum priming type?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
42	8.130(4)(A)	Is the combined total of dynamic suction lift at the "pump off" elevation and required net positive suction head at design operating conditions less than or equal to twenty-two feet (22')?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
43	8.130(4)(B)	Are there dual vacuum pumps capable of removing air from the suction lift pump?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
44	8.130(5)(A)	Are submersible pumps readily removable and replaceable without personel entering, or disconnecting any pipe in the wet well?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

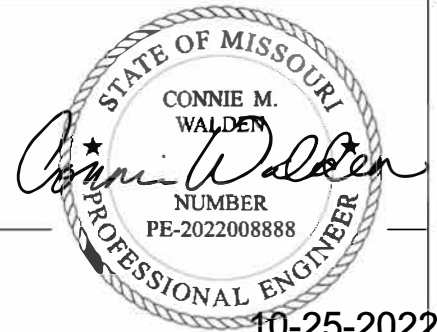
13.0 CERTIFICATION STATEMENT

I hereby certify that the design plans and specifications for this project, to the best of my knowledge, conform to the requirements listed above. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

I hereby certify that this plan, specification, and/or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the state of Missouri.

For any question answered "NO" provide explanation. Provide any useful comments on design for review engineer:

Missouri Professional Engineer's Seal:



Name: Connie Walden, PhD, PE
 Street Address: 908 Broadway Blvd.
 City: Kansas City

State: MO

ZIP Code: 64105

10-25-2022

Phone Number: 816-436-4440

Email: cwalden@greatriv.com

**INSTRUCTIONS FOR COMPLETING
APPLICATION FOR CONSTRUCTION PERMIT – SEWER EXTENSION**

All blanks must be filled in when the application is submitted to the Missouri Department of Natural Resources. This includes the **required signature**. The fee for a sewer extension construction permit is \$300.

In accordance with Missouri State law RSMo 644.051.3.(2), sewer extension projects installing up to a total of 1,000 linear feet of gravity sewer or force main with less than two pump stations are exempt from obtaining a construction permit. Since these projects are exempt, a construction permit will not be issued for this activity and completion of this form is not required.

Note: Use the form **Application for Construction Permit – Wastewater Treatment Facility Application for Construction Permit – Sewer Extension MO 780-1632**, if any wastewater treatment component(s) are to be constructed.

A land disturbance permit is required if construction will result in the disturbance of one or more acres of land. A land disturbance permit (MO-RA00000) is available through the department's ePermitting system at [ePermitting Splash Page](#). A permit fee in accordance with 10 CSR 20-6.011(2)(E) is required.

After receiving a complete application, the department enters the application information into the Missouri Clean Water Information System. You may search for the status of a construction permit online at [MoCWIS Application Search](#).

- 1.1 Check appropriate box. If the project is funded with federal or state monies, supply the funding agency name and project number.
 - 1.2 Check appropriate box and provide the date of department approval.
The department has developed a fact sheet to aid in the development of an approvable engineering report, [Engineering Report Guidance for Collection Systems, Fact Sheet--PUB2415](#). This document is available online at [Engineering Report Guidance for Collection Systems With a Design Flow of 22,500 Gpd or Greater](#). Engineering report exemptions are listed in 10 CSR 20-6.010(4)(B). Per 10 CSR 20-8.110(2), engineering reports must be approved by the department prior to the submittal of plans and specifications and a construction permit application.
 - 1.3 Check appropriate box. Provide a copy of the appropriate plans and specifications for department review when applying for a construction permit per 10 CSR 20-8.110 and 10 CSR 20-6.010. A Missouri registered professional engineering seal, signature and date is required on each sheet of the plans and the cover of the technical specifications. An electronic copy of the construction permit application and the information listed below in Portable Document Format (PDF) searchable format or department approved equivalent per 10 CSR 20-6.010(5)(G), along with one paper copy for projects not seeking department funding or two paper copies for projects seeking department funding under 10 CSR 20-4. If the project is relying on approved standard specifications from a particular municipality, provide the name of the community. The communities with department-approved standard specifications is available online at [Wastewater Construction Permits and Engineering Regulations](#)
 - 1.4 Check appropriate box. A summary of design shall accompany the plans and specifications when applying for a construction permit per 10 CSR 20-8.110. The department has developed a fact sheet to aid in the development of an acceptable summary of design, [Summary of Design Guidance, Fact Sheet--PUB2417](#). This document is available online at [Summary of Design Guidance for Wastewater Treatment Facilities - PUB2417](#).
 - 1.5 Check the appropriate box. Include fee with application per 10 CSR 20-6.011(2) and [Wastewater Treatment Facility Permit Fees -- PUB2564](#).
- Note:** The department returns incomplete construction permit applications and related engineering documents and the application forfeits the fees. See 10 CSR 20-6.011(5)(A). The applicant forfeits the fees when the applicant withdraws construction applications. See 10 CSR 20-6.011(5)(B).2.1. Provide the project name and location by street name or address.
- 2.1. Provide the project name and location by street name or address.
 - 2.2 Provide the project legal description. The department's mapping system is available online at [MAPit ARCGIS](#).
 - 2.3 Check all of the applicable boxes.
The department considers anything other than a gravity sewer system to be an alternative sewer system. Examples of these systems are grinder pump pressure sewers, septic tank effluent pump, or STEP, sewers, septic tank effluent gravity, or STEG, sewers or small diameter gravity sewers.
 - 2.4 Briefly describe the project by providing the following information:
 - A. Total number of manholes.
 - B. Size of sewers and the total linear feet of each size.
 - C. Number of lift stations and design average flow and peak hourly flow capacities of each lift station.
 - D. Size and length of force mains.
 - E. Alternative sewer size and length, plus the number of components (e.g. septic tanks, grinder pumps, etc.)
 - 2.5 Provide the project design information and when required in the units specified:
 - A. Provide the population or number of lots to be served by the proposed sewer extension.
 - B. Provide the estimated design flow information in accordance with 10 CSR 20-8.110(4)(C)4.A.
 - **Design average flow** – The design average flow is the average of the daily volumes to be received for a continuous 12 month period expressed as a volume per unit time. However, the design average flow for facilities having critical seasonal high hydraulic loading periods (e.g., recreational areas, campuses and industrial facilities) shall be based on the daily average flow during the seasonal period.
 - **Design peak hourly flow** – The design peak hourly flow is the largest volume of flow to be received during a one hour period expressed as a volume per unit time.
 - C. Provide the type and flow in gallons per day of industrial wastes received by the propose sewer extension.

- D. Provide the receiving sewer size in inches and capacity in gallons per minute.
- E. Check all of the applicable boxes.
- F. Provide an estimate of the number of onsite systems decommissioned as a result of the project.
- G: Provide estimated cost (design, materials, land, and labor) for installation of piping and pump station(s).

- 3.0 Project Owner – Provide the legal name, mailing address, phone number and email address of the owner of the regulated activity or discharge. The owner identified in this section and subsequently reflected on the certificate page of the operating permit should be the owner of the regulated activity/discharge being applied for and is not necessarily the owner of the real property on which the activity or discharge is occurring. Also provide Charter Number of Project Owner from Secretary of State or name of Registered agent to comply with 10 CSR 20-6.010(2)(E) which states: “Private corporations which are not incorporated under the laws of Missouri shall be represented by a registered agent in the state of Missouri before a construction permit or an operating permit will be issued by the department.”
- 4.0 Continuing Authority – A continuing authority is a company, business, entity, or person(s) that will be legally responsible for ensuring compliance with the permit requirements and provide continuous stable oversight of the permitted facility or activity. The Continuing authority should be a relatively permanent entity responsible for the ongoing operation, maintenance and modernization, when needed, of the permitted facility or activity. A continuing authority is not, however, an entity or individual that is contractually hired by the permittee to sample or operate and maintain the system for a defined time period, such as a certified operator or analytical laboratory. To view the regulatory requirement regarding continuing authority, 10 CSR 20-6.010(2), please visit [Department of Natural Resources Division 20-Clean Water Commission Chapter 6-Permits](#). A continuing authority's name must be listed exactly as it appears on the Missouri Secretary of State's (SoS's) webpage: [Missouri Secretary of State Business Entity Search](#), unless the continuing authority is an individual(s), government entity, or otherwise not required to register with the SoS. Provide charter number listed on SoS's webpage, if applicable. If the Continuing Authority is the same as the Project Owner, write “Same as above”.
- 4.1 Check appropriate box. Include a letter signed by the continuing authority (if not the same as the project owner) stating they will “accept, operate, and maintain” the sewer extension. The continuing authority may complete the “Continuing Authority and Receiving Wastewater Treatment Facility Acceptance” form in lieu of a letter. Download the department's form [Continuing Authority Receiving Wastewater Treatment Facility Acceptance-Mo 780-2584](#). If the continuing authority will not accept and agree to operate and maintain the sewer extension, this application will be considered incomplete.
- 5.0 Complete Engineer contact information.
- 6.0 Complete Receiving Wastewater Treatment Facility information. Include the Missouri State Operating Permit number and the available remaining capacity in gallons per day, or gpd.
- 6.1 Check appropriate box. The receiving wastewater treatment facility must be notified and agree to the proposed sewer extension and additional flow, prior to submitting a construction permit to the department. If the receiving wastewater treatment facility will not accept the wastewater, this application will be considered incomplete.
- 6.2 Check appropriate box. Include a letter from the receiving wastewater treatment facility (if not same as the continuing authority) acknowledging and accepting the additional flow from the proposed sewer extension.
- 6.3 Check appropriate box. The Certificate of Convenience and Necessity (CCN) is granted by the Public Service Commission to for-profit companies to provide sewer services. 10 CSR 20-6.010(2)(B)3 requires the CCN be granted prior to applying for a permit from the department.
- 7.0 Check the appropriate box and include check or confirmation number. Applicants can pay fees online by credit card or eCheck through a system called JetPay. See [Water Permit Fees](#). Clicking on the JetPay link you can make a one-time payment by selecting the “Water Protection Program” as the Payment Category and WP 04 Construction Permits as the Payment Type. The system then asks for Wastewater Permit Number (which is “construction”) and Facility/Project name (which is the name of this project given in question 2.0). The fee for sewer extension review is \$300.
- Per Section 37.001, RSMo, a transaction fee will be included. The transaction fee is paid to the third party vendor JetPay, not the Department of Natural Resources.
 - Be sure to select the correct fee type and corresponding URL to ensure your payment is applied appropriately. If you are unsure what type of fee to pay, contact the Water Protection Program's Budget, Fees and Grants Management Unit by phone at 573-522-1485 for assistance.
 - Upon successful completion of your payment, JetPay provides a payment confirmation. Submit this form with a copy of the payment confirmation if requesting a new permit or a permit modification.
 - If you are unable to make your payment online, but want to pay with credit card, you may email your name, phone number, and invoice number, if applicable, to WPPFEES@dnr.mo.gov. The Budget, Fees and Grants Management Unit will contact you to assist with the credit card payment. **Please do not include your credit card information in the email.**
 - Applicants can find fee rates for various activities in 10 CSR 20-6.011 and [Wastewater Treatment Facility Permit Fees-- PUB2564](#).
- 8.0 The owner of the construction project must sign the application per 10 CSR 20-6.010(5)(G). Mail the completed form, related construction documents and applicable fee (or JetPay receipt) to the department. Also provide the application, plans and specifications in PDF searchable format via external media drive or email if size allows. Email information to DNR.WPPEngineerSection@dnr.mo.gov.

9.0–13.0 Sewer Extension Checklist

This portion of the application is optional, but completing it is recommended because it can speed review. If designed properly, the engineer preparing the application should be able to answer “Yes” or “Not Applicable” (N/A) for each of the items. If an answer of “N/A” is necessary, section 13.0 provides a place to provide any explanation or useful comments. Section 13.0 also requires those completing the Sewer Extension Checklist (9.0 – 13.0) to properly sign, seal and date the checklist. If there are any questions concerning this form, contact the Department of Natural Resources, Water Protection Program at 800-361-4827 or 573-751-1300, or visit [Wastewater Construction Permits and Engineering](#).