PROJECT MANUAL

Water & Wastewater Systems Upgrade
W. E. Sears Youth Center
Poplar Bluff, Missouri

DESIGNED BY: S.H. Smith & Company, Inc.
901 Vine Street
Poplar Bluff, MO   63901

DATE ISSUED: 6/21/2019
PROJECT NO.:  H1610-01

FOR:  State of Missouri
Office of Administration
Division of Facilities Management,
Design and Construction
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:

Dominic Thompson, P.E.
Smith & Co. Engineers
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(Refer to Spec Section 015723 for SWPPP submittal & BMP requirements)

(W. E. Sears Youth Center is 6 mi N on Hwy 67 of the Poplar Bluff Hwy 60 / Hwy 67 intersection. From Hwy 67 / Sears Ln, go west on Sears Lane “blue-line” on map, park in the Admin Bldg lot “red-dot” on map, come into WESYC Admin Bldg entrance.)
SECTION 000115 – LIST OF DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

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

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END OF SECTION 000115
SECTION 001116 - INVITATION FOR BID

1.0 OWNER:
A. The State of Missouri  
Office of Administration,  
Division of Facilities Management, Design and Construction  
Jefferson City, Missouri

2.0 PROJECT TITLE AND NUMBER:
A. Water & Wastewater Systems Upgrade  
W. E. Sears Youth Center  
Poplar Bluff, Missouri
Project No.: H1610-01

3.0 BIDS WILL BE RECEIVED:
A. Until: 1:30 PM, Thursday, November 7, 2019
B. Place: Only electronic bids on MissouriBUYS shall be accepted: https://missouribuys.mo.gov. Bidder must be registered to bid.

4.0 DESCRIPTION:
A. Scope: The wastewater system upgrade scope consists of retrofitting existing lagoon cells to accommodate land application of effluent; and includes tree clearing, excavating/grading of berms, construction of a pumping system, force main piping, sprinkler system, and miscellaneous related items. The water system upgrade scope includes installation of drawdown tubing in existing Well #3, retrofitting existing Well #1 for continued use within the system; and includes re-working/adding new water line piping, valves, fittings; and other related demo/repair/work to complete the project all in accordance with the enclosed plans & specifications.
B. Estimate: $1,000,000.00 to $1,375,000.00
C. MBE/WBE/SDVE Goals: MBE 10.00%, WBE 10.00%, & SDVE 3.00%. NOTE: Only MBE/WBE firms certified by a State of Missouri public entity 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.

D. **NOTE: Bidders are provided new Good Faith Effort (GFE) forms on MissouriBUYS.

5.0 PRE-BID MEETING:
A. Place/Time: 10:30 AM; Wednesday, October 30, 2019; W. E. Sears Youth Center (Admin Bldg), 9400 Sears Ln, Poplar Bluff, MO.  
Directions: From Hwy 67, West on Sears Ln (1.4 mi N of Hwys 67 & 60 W intersection), park in WESYC main lot, go to Admin Bldg's entry lobby, sign-in at front desk.
B. Access to State of Missouri property requires presentation of a photo ID by all persons.

6.0 HOW TO GET PLANS & SPECIFICATIONS:
A. Request: View Only Electronic bid sets are available at no cost or paper bid sets for a deposit of $100 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: S.H. Smith & Company, Inc, Dominic Thompson, phone # 573-785-9621, fax # 573-785-2651
B. Project Manager: Ron Littich, phone # 573-751-8296, fax # 573-751-7277

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.
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, will be required to undergo a fingerprint background check and obtain a State of Missouri identification badge prior to beginning work on site. The Bidder should review the information regarding this requirement in Section 013513 – Site Security and Health Requirements prior to submitting a bid.

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 - http://oa.mo.gov/facilities/project-management.

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 will 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

(NOTE: See Article 7.D below for submittal restrictions.)

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 twelve (12) 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. Bids from an individual shall be signed as noted on the Bid Form.

B. Bids 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. Bids 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.

**7.0 - RECEIVING BID SUBMITTALS: Only bids submitted on MissouriBUYS shall be accepted; no hard copy bids shall be accepted.**

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.

B. Submittals will be received as shown in and required by the Bid Form. Submittals will be completed so as to include insertion of all amounts for alternate bids, unit prices and cost accounting data, etc. Failure to complete all required information may be cause for rejection of bid.

C. 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.
D. Bidders prices shall include all city, state and federal sales, excise and similar taxes which may be lawfully assessed in connection with his performance of work and purchase of materials to be incorporated in the work. THIS PROJECT IS NOT TAX EXEMPT.

E. The completed forms shall be without interlineations, alterations or erasures.

F. The Owner reserves the right to waive informalities in bid submittals and to reject any or all bids.

**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. In awarding the contract the Owner may take into consideration the bidder's skill, facilities, capacity, experience, responsibility, previous work record, financial standing and the necessity of prompt and efficient completion of work herein described. Inability of any bidder to meet the requirements mentioned above may be cause for rejection of his bid. However, no contract will be awarded to any individual, partnership or corporation, who has had a contract with the State of Missouri declared in default within the preceding twelve months.

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 low 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 at – [http://oa.mo.gov/facilities/vendor-links/contractor-forms](http://oa.mo.gov/facilities/vendor-links/contractor-forms).
Information regarding a Memorandum of Understanding which is one form of appropriate documentation located at [https://www.uscis.gov/e-verify/](https://www.uscis.gov/e-verify/). Submittal of this form and appropriate documentation is required before the award of any contract. In addition the contractor shall be responsible for compliance of these requirements by all subcontractors and suppliers at any tier associated with this contract.

10.0 – SERVICE-DISABLED VETERANS

A. For the purposes of these instructions, the terms “service-disabled veteran” and “service-disabled veteran business” have the same meanings as set forth in section 34.074, RSMo.

B. The State of Missouri has a goal of awarding three percent of all construction projects to service-disabled veterans. Furthermore, service-disabled veteran businesses doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places 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 any service-disabled veteran business’ bid amount(s) by three percent of the lowest bid amount(s). 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.

C. Any bidder who is qualified as a Missouri service-disabled veteran pursuant to Section 34.074, RSMo, must complete and submit with the bid the MISSOURI SERVICE DISABLED VETERAN BUSINESS form and provide the specified documentation in accordance with the instructions provided therein. This form can be obtained at: [http://oa.mo.gov/facilities/vendor-links/contractor-forms](http://oa.mo.gov/facilities/vendor-links/contractor-forms).

11.0 - 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.

12.0 - 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.

13.0 - 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:

SECTION 002213—SUPPLEMENTARY INSTRUCTIONS TO BIDDERS – MBE/WBE/SDVE INSTRUCTIONS

1.0 DEFINITIONS


2. "MINORITY":
   a. "Black Americans," which includes persons having origins in any of the black racial groups of Africa;
   b. "Hispanic Americans," which includes persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin regardless of race;
   c. "Native Americans," which includes persons who are American Indians, Eskimos, Aleuts, or Native Hawaiians;
   d. "Asian-Pacific Americans, "which includes persons whose origins are from Japan, China, Taiwan, Korea, Vietnam, Laos, Cambodia, the Philippines, Samoa, Guam, the U.S. Trust Territories of the Pacific, or the Northern Marianas; or
   e. "Asian-Indian Americans," which includes persons whose origins are from India, Pakistan or Bangladesh.

3. "MINORITY BUSINESS ENTERPRISE": A business concern which is at least fifty-one percent (51%) owned by one (1) or more minority as defined in 2. "MINORITY" above or in the case of any publicly-owned business, fifty-one percent (51%) of the stock of which is owned by one (1) or more minority as defined in 2. “MINORITY” above AND whose management and daily business operations are controlled by one (1) or more minority as defined herein.


5. "WOMEN BUSINESS ENTERPRISE": A business concern which is at least fifty-one percent (51%) owned by one (1) or more women or in the case of any publicly-owned business at least fifty-one percent (51%) of the stock of which is owned by one (1) or more women AND whose management and daily business operations are controlled by one (1) or more women.


7. "SERVICE-DISABLED VETERAN": Any individual who is service disabled as certified by the appropriate federal agency responsible for the administration of veterans’ affairs.

8. “SERVICE-DISABLED VETERANS ENTERPRISE”: A service disabled veteran business as defined by Section 34.074, RSMo, meaning a business concern which is at least fifty-one percent (51%) owned by one (1) or more service-disabled veterans or in the case of any publicly-owned business at least fifty-one percent (51%) of the stock of which is owned by one (1) or more service-disabled veterans AND whose management and daily business operations are controlled by one (1) or more service disabled veterans.

2.0 MBE/WBE/SDVE PROGRAM REQUIREMENTS

A. For bids where MBE, WBE and or SDVE goals are greater than zero percent (0%) as noted in the “Invitation for Bid,” the following provisions shall apply

1. MBE/WBE/SDVE Percentage Goals:
   a. The bidder shall have as a goal subcontracting not less than the percentages stated on the Bid Form for MBE, WBE and SDVE firms.

2. Computation of MBE/WBE/SDVE Percent Goal Participation:
   a. The total dollar value of the work granted to the MBE, WBE or SDVE by the successful bidder shall be counted towards the applicable goal of the entire contract.
   b. A bidder may count toward the MBE/WBE/SDVE goals only expenditures to certified MBE’s, WBE’s, or SDVE’s that perform a commercially useful function in the work of a contract. A MBE, WBE, or SDVE is considered to perform a commercially useful function when it is responsible for executing a distinct element of the work contract and carrying out its responsibilities by actually performing, managing and supervising the work or providing supplies or manufactured materials. A bidder who is a MBE, WBE or SDVE may count 100% of the contract towards the MBE, WBE or
SDVE goal. (NOTE: MBE firms who bid as general contractors are expected to obtain WBE and SDVE participation; WBE firms who bid as general contractors are expected to obtain MBE and SDVE participation; and SDVE firms who bid as general contractors are expected to obtain MBE and WBE participation to meet the project’s separate goals.)

c. Bidder may count toward its MBE/WBE/SDVE goals expenditures for materials and supplies obtained from certified MBE, WBE, or SDVE suppliers and manufacturers, provided that the MBE, WBE, or SDVE assumes the actual and contractual responsibility for the provision of the materials and supplies.

d. A bidder may count towards the MBE/WBE/SDVE goals that portion of the total dollar value of the work granted to a second or subsequent tier subcontractor or a supplier to any subcontractor at any tier, provided that the MBE, WBE, or SDVE properly assumes responsibility for the work as outlined in 2.A.2.b and 2.A.2.c above.

e. A bidder may count towards the MBE/WBE/SDVE goals that portion of the total dollar value 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.

3. Certification by bidder of MBE/WBE/SDVE Subcontractors:

a. The bidder shall submit with his bid 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 on the contract work.

b. The bidder may determine the status of certification of a proposed MBE or WBE subcontractor or supplier by referring to the Office of Equal Opportunity (OEO) MBE/WBE directory (https://apps1.mo.gov/MWB/CertifiedFirms/); and the eligibility of a SDVE subcontractor or supplier by referring to the Division of Purchasing and Materials Management SDVE directory (http://oa.mo.gov/purchasing/vendor-information/missouri-service-disabled-veteran-business-enterprise-sdve-information) or the Department of Veterans Affairs directory (https://www.vip.vetbiz.gov/). Additional information, clarifications, etc., regarding the listings in the Directory may be obtained by calling the Division at (573) 751-3339 and asking to speak to the Contract Specialist of record as shown in Section 007300, Supplementary Conditions.

c. If the proposed subcontractor is certified as a MBE/WBE firm by any other State of Missouri agency or any Missouri city or county government agency, the bidder shall so note and provide particulars. Other known State of Missouri entities providing certification are:

- Mountain Plains Minority Supplier Development Council 816-221-4200
- Human Relations Department, KCMO 816-274-1432
- Lambert International Airport 314-551-5000
- Metro (formerly Bi-State Development Agency) 314-982-1457
- St. Louis Development Corporation 314-622-3400 Ext. 362
- St. Louis Minority Business Council 314-241-1073
- SBA 8/St. Louis, MO 314-539-6600
- Missouri Department of Transportation 573-751-2859
- National Women Business Owners Corp. 561-848-5066

(Missouri firms only)

4. Waiver of MBE/WBE/SDVE Participation:

a. The bidder is required to make a good faith effort to locate and contract with MBE’s, WBE’s and SDVE’s. If a bidder has made a good faith effort to secure the required MBE’s, WBE’s and SDVE’s and has failed, he may submit with his bid the information requested in “MBE/WBE/SDVE Good
Faith Effort (GFE) Determination.” The Director will review the bidder’s actions as set forth in the bidder's Application for Waiver, the ability or success of other bidders to obtain MBE, WBE, or SDVE participation in their bids, and any other factors deemed relevant by the Director, to determine if a good faith effort has been made to meet the applicable percentage goals. If the bidder is judged not to have made 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 SDVE participation will be determined to be responsive to the MBE/WBE/SDVE participation goals of the contract regardless of the percent of MBE/WBE/SDVE participation, provided the bid is otherwise acceptable.

b. In reaching a determination of good faith, the Director may evaluate, but is not limited to, the following factors:

1. How subcontractors were contacted initially, the specific project information provided and the documentation to support that contact;
2. How project plans and specifications were provided to MBE/WBE/SDVE subcontractors;
3. The names, addresses, phone numbers, and dates of contact for MBE/WBE/SDVE firms contacted for specific categories of work;
4. Attempts to follow-up with MBE, WBE or SDVE subcontractors prior to bid to negotiate price, scope of work, or make other adjustments or clarifications;
5. Amount of bids received from any of these subcontractors;
6. Bid accepted from one of these subcontractors or reasons for rejecting bids;
7. The MBE, WBE, or SDVE suppliers contacted, date of contact, material or equipment, amounts of quotes;
8. The ability or success of other bidders to obtain the MBE/WBE/SDVE participation in their bids.

c. If MBE/WBE/SDVE goals have been identified on Section 004113-BID FORM, ALL bidders are required to submit all appropriate MBE/WBE/SDVE documentation before the stated time and date set forth in the “Invitation for Bid”. Failure to provide this information by the specified date and time will be grounds for rejecting the bid.

MBE/WBE/SDVE forms may be accessed at https://oa.mo.gov/facilities/vendor-links/contractor-forms. 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.”

d. The Director reserves the right to provide bidders the opportunity to correct or amplify the documented information received concerning MBE/WBE/SDVE goals. The additional information will be transmitted to Facilities Management Design and Construction within two (2) working days of a phone or facsimile or email request from the Director’s representative.

3.0 CONTRACTOR REQUIREMENTS

For contracts where there are MBE/WBE/SDVE participation goals as noted in the “Invitation for Bid,” the following provisions shall apply:

A. The Contractor is bound to subcontracting or obtaining materials in amounts not less than the dollar amount indicated in the awarded contract to MBE/WBE/SDVE (s) unless that amount is revised in writing by the Owner’s representative.

B. If the Contractor fails to meet or maintain the participation requirements contained in the Contractor’s bid, he must satisfactorily explain to the Director or his Designee why the requirement cannot be achieved and why meeting the requirement was beyond the Contractor's control.

C. If the Director finds the Contractor's explanation unsatisfactory, the Director may take any appropriate action including, but not limited to:
1. Declaring the Contractor ineligible to participate in any Facilities Management, Design and Construction contracts for a period not to exceed twelve (12) months; and

2. Directing that the Contractor be declared non-responsive to the “Invitation for Bid,” or in breach of this contract.

D. If a MBE, WBE, or SDVE is replaced during the course of this contract, the Contractor shall replace it with a similar MBE, WBE, or SDVE OR make a good faith effort to replace it with another MBE, WBE, or SDVE. All substitutions shall be approved by the Owners Representative.

E. The Contractor shall provide the Owner with regular reports on its progress in meeting its MBE/WBE/SDVE obligations. As a minimum, the dollar-value of work completed by each MBE, WBE, or SDVE subcontractor during the preceding month and as a cumulative total shall be reported with each monthly application for payment. A final report shall include the total dollar-value of work completed by each MBE, WBE, and SDVE subcontractor during the total contract.
The MBE/WBE Directory for goods and services is maintained by the Office of Equal Opportunity (OEO). The current Directory can be accessed at the following web address:

[https://apps1.mo.gov/MWBCertifiedFirms/](https://apps1.mo.gov/MWBCertifiedFirms/)

Please note that you may search by MBE, WBE, or both as well as by region, location of the business by city or state, as well as by commodity or service.

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

[https://oa.mo.gov/sites/default/files/sdvelisting.pdf](https://oa.mo.gov/sites/default/files/sdvelisting.pdf)

[https://www.vip.vetbiz.va.gov](https://www.vip.vetbiz.va.gov)
THIS AGREEMENT, 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, on behalf of the Department of Social Services, Division of Youth Services.

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: Water & Wastewater Systems Upgrade
W. E. Sears Youth Center
Poplar Bluff, Missouri

Project Number: H1610-01

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 180 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.

State of Missouri
Construction Contract

Project Name: Water & Wastewater Systems Upgrade
W. E. Sears Youth Center
Poplar Bluff, Missouri

Project Number: H1610-01

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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: $ TOTAL CONTRACT AMOUNT: ($CONTRACT AMOUNT)

UNIT PRICES: The Owner accepts the following Unit Prices: see ATTACHMENT A (4 pages)
For changing specified quantities of work from those indicated by the contract drawings and specifications, upon written instructions of Owner, the following unit prices shall prevail. The unit prices include all labor, overhead and profit, materials, equipment, appliances, bailing, shoring, shoring removal, etc., to cover the finished work of the several kinds of work called for. Only a single unit price shall be given and it shall apply for either MORE or LESS work than that shown on the drawings and called for in the specifications or included in the Base Bid. In the event of more or less units than so indicated or included, change orders may be issued for the increased or decreased amount.

ARTICLE 5. PREVAILING WAGE RATE
It is understood and agreed by and between the parties that not less than the prevailing hourly rate of wages shall be paid for work of a similar character 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 in the locality in which the work is performed, both as determined by the Department of Labor and Industrial Relations or as determined by the court on appeal, to all workmen employed by or on behalf of the Contractor or any subcontractor, exclusive of maintenance work. Only such workmen as are directly employed by the Contractor or his subcontractors, in actual construction work on the site shall be deemed to be employed.

When the hauling of materials or equipment includes some phase of the construction other than the mere transportation to the site of the construction, workmen engaged in this dual capacity shall be deemed to be employed directly on the project and entitled to the prevailing wage.

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

Contract documents shall consist of the following component parts:

1. Division 0, with executed forms
2. Division I
3. Executed Construction Contract Form
4. The Drawings
5. The Technical Specifications
6. Addenda
7. Contractor's Proposal as accepted by the Owner

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

APPROVED:

Mark Hill, P.E., Acting Director  
Division of Facilities Management,  
Design and Construction

Contractor’s Authorized Signature

DELETE IF PRIVATE OR PARTNERSHIP

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

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

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 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 hereafter be 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 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

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<thead>
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<th>SPECIFIED PRODUCT</th>
<th>SUBSTITUTION REQUEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME, BRAND</td>
<td></td>
</tr>
<tr>
<td>CATALOG NO.</td>
<td></td>
</tr>
<tr>
<td>MANUFACTURER</td>
<td></td>
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<tr>
<td>VENDOR</td>
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</tbody>
</table>

PREVIOUS INSTALLATIONS

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>ARCHITECT/ENGINEER</th>
<th>LOCATION</th>
<th>DATE INSTALLED</th>
</tr>
</thead>
</table>

SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

```markdown
- ...
- ...
- ...
- ...
- ...
- ...
```
### REASON FOR SUBSTITUTION

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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

☐ YES  ☐ NO  

**IF YES, EXPLAIN**

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

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

☐ YES  ☐ NO

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

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

**BIDDER/CONTRACTOR** | **DATE**
--- | ---

### REVIEW AND ACTION

☐ Resubmit Substitution Request with the following additional information:

________________________________________________________________________

☐ Substitution is accepted.

☐ Substitution is accepted with the following comments:

________________________________________________________________________

☐ Substitution is not accepted.

**ARCHITECT/ENGINEER** | **DATE**
--- | ---
KNOW ALL MEN BY THESE PRESENT THAT: hereinafter called “Subcontractor” who heretofore entered into an agreement with hereinafter called “Contractor”, for the performance of work and/or furnishing of material for the construction of the project entitled

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

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

DOES HEREBY:

1. ACKNOWLEDGE that they have been PAID IN FULL all sums due for work and materials contracted or done by their Subcontractors, Material Vendors, Equipment andFixture 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
## MBE/WBE/SDVE Progress Report

**SUBMIT WITH ALL INVOICES:** (PLEASE CHECK APPROPRIATE BOX BELOW)
- ☐ CONSULTANT
- ☐ CONSTRUCTION
- ☐ FINAL

### Project Title

### Project Location

### Firm

### Total Contract Amount

$0.00

### The Percentage and Dollar Amount of This Project That Are to Be MBE/WBE/SDVE as Indicated in the Original Contract:

<table>
<thead>
<tr>
<th>MBE</th>
<th>WBE</th>
<th>SDVE</th>
<th>Item of Work</th>
<th>Total Amount of Subcontract</th>
<th>$ Amount &amp; % Complete (Paid-to-Date)</th>
<th>Consultant/Subconsultant or Contractor/Subcontractor/Supplier Name, Address, Contact, and Phone Number</th>
</tr>
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<tbody>
<tr>
<td>☐</td>
<td>☐</td>
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<td>MBE</td>
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<td>SDVE</td>
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</tr>
</tbody>
</table>

**ORIGINAL:** Attach to ALL Progress and Final Payments
Before me, the undersigned Notary Public, in and for the County of ________________________________

State of ______________________________ personal appearance ______________________________________________________________________

(Name) of the ______________________________ 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

STATE

COUNTY (OR CITY OF ST. LOUIS)

SUBSCRIBED AND SWORN BEFORE ME, THIS DAY OF YEAR

MY COMMISSION EXPIRES

NOTARY PUBLIC NAME (TYPED OR PRINTED)

USE RUBBER STAMP IN CLEAR AREA BELOW
GENERAL CONDITIONS

INDEX

ARTICLE:

   1.1. Definitions
   1.2. Drawings and Specifications
   1.3. Compliance with Laws, Permits, Regulations and Inspections
   1.4. Nondiscrimination in Employment
   1.5. Anti-Kickback
   1.6. Patents and Royalties
   1.7. Preference for American and Missouri Products and Services
   1.8. Communications
   1.9. Separate Contracts and Cooperation
   1.10. Assignment of Contract
   1.11. Indemnification
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2. Owner/Designer Responsibilities

3. Contractor Responsibilities
   3.1. Acceptable Substitutions
   3.2. Submittals
   3.3. As-Built Drawings
   3.4. Guaranty and Warranties
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5. Construction and Completion
   5.1. Construction Commencement
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   5.3. Project Completion
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6. Bond and Insurance
   6.1. Bond
   6.2. Insurance

7. Termination or Suspension of Contract
   7.1. For Site Conditions
   7.2. For Cause
   7.3. For Convenience
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

A. 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.


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.


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.


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
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
die 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

A. 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

A. 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.
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 therefrom 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 includes 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
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.

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 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 said partial payment shall thereupon become the sole property of Owner. This provision shall not be construed as relieving Contractor from sole responsibility for care and protection of materials and work upon which payments have been made or restoration of any damaged work or as a waiver of the right of Owner to require fulfillment of all terms of this contract.

D. Materials delivered to the work site and not incorporated in the work will be allowed in the Application and Certification for Payment on the basis of one hundred (100%) percent of value, subject to the 5% retainage providing that they are suitably stored on the site or in an approved warehouse in accordance with the following requirements:

1. Material has previously been approved through submittal and acceptance of shop drawings conforming to requirements of Article 3.2 of General Conditions.
2. Delivery is made in accordance with the time frame on the approved schedule.
3. Materials, equipment, etc., are properly stored and protected from damage and deterioration and remain so - if not, previously approved amounts will be deleted from subsequent pay applications.
4. The payment request is accompanied by a breakdown identifying the material equipment, etc. in sufficient detail to establish quantity and value.

E. The Contractor shall be allowed to include in the Application and Certification for Payment, one hundred (100%) of the value, subject to retainage, of major equipment and material stored off the site if all of the following conditions are met:

1. The request for consideration of payment for materials stored off site is made at least 15 working days prior to submittal of the Application for Payment including such material. Only materials inspected will be considered for inclusion on Application for Payment requests.
2. Materials stored in one location off site are valued in excess of $25,000.
3. That a Certificate of Insurance is provided indicating adequate protection from loss, theft conversion or damage for materials stored off site. This Certificate shall show the State of Missouri as an additional insured for this loss.
4. The materials are stored in a facility approved and inspected, by the Construction Representative.
5. Contractor shall be responsible for, Owner costs to inspect out of state facilities, and any delays in the completion of the work caused by damage to the material or for any other failure of the Contractor to have access to this material for the execution of the work.

F. The Owner shall determine the amount, quality and acceptability of the work and materials which are to be paid for under this contract. In the event any questions shall arise between the parties, relative to this contract or specifications, determination or decision of the Owner or the Construction Representative and the Designer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected in any manner or to any extent by such question.

G. Payments Withheld: The Owner may withhold or nullify in whole or part any certificate to such extent as may be necessary to protect the Owner from loss on account of:

1. Defective work not remedied. When a notice of noncompliance is issued on an item or items, corrective action shall be undertaken immediately. Until corrective action is completed, no monies will be paid and no additional time will be allowed for the item or items. The cost of corrective action(s) shall be borne by the Contractor.
2. A reasonable doubt that this contract can be completed for the unpaid balance.
3. Failure of the Contractor to update as-built drawings monthly for review by the Construction Representative.
4. Failure of the Contractor to update the construction schedule.
When the Construction Representative is satisfied the Contractor has remedied above deficiencies, payment shall be released.

H. Final Payment: Upon receipt of written notice from the Contractor to the Designer and Project Representative that the work is ready for final inspection and acceptance, the Designer and Project Representative, with the Contractor, shall promptly make such inspection. If the work is acceptable and the contract fully performed, the Construction Representative shall complete a final acceptance report and the Contractor will be directed to submit a final Application and Certification for Payment. If the Owner approves the same, the entire balance shall be due and payable, with the exception of deductions as provided for under Article 5.4.

1. Where the specifications provide for the performance by the Contractor of (certain tests for the purpose of balancing and checking the air conditioning and heating equipment and the Contractor shall have furnished and installed all such equipment in accordance with the specifications, but said test cannot then be made because of climatic conditions, such test shall may be considered as required under the provisions of the specifications, Section 013300 and this contract may be substantial. Full payment will not be made until the tests have been made and the equipment and system is finally accepted. If the tests are not completed when scheduled, the Owner may deduct 150% of the value of the tests from the final payment.

2. The final payment shall not become due until the Contractor delivers to the Construction Representative:
   a) A complete file of releases, on the standard form included in the contract documents as "Final Receipt of Payment and Release Form", from subcontractors and material suppliers evidencing payment in full for services, equipment and materials, as the case may require, if the Owner approves, or a consent from the Surety to final payment accepting liability for any unpaid amounts.
   b) An Affidavit of Compliance with Prevailing Wage Law, in the form as included in this contract specifications, properly executed by each subcontractor, and the Contractor
   c) Certified copies of all payrolls
   d) As-built drawings

3. If any claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such a claim including all costs and a reasonable attorney's fee.

4. Missouri statute requires prompt payment from the Owner to the Contractor within thirty calendar days and from the Contractor to his subcontractors within fifteen calendar days. Failure to make payments within the required time frame entitles the receiving party to charge interest at the rate of one and one half percent per month calculated from the expiration of the statutory time period until paid.

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

ARTICLE 6 -- INSURANCE AND BONDS

ARTICLE 6.1 -- BOND

A. Contractor shall furnish a performance/payment bond in an amount equal to 100% of the contract price to guarantee faithful performance of the contract and 100% of the contract price to guarantee the payment of all persons performing labor on the project and furnishing materials in connection therewith under this contract as set forth in the standard form of performance and payment bond included in the contract documents. The surety on such bond shall be issued by a surety company authorized by the Missouri Department of Insurance to do business in the state of Missouri.

B. All Performance/Payment Bonds furnished in response to this provision shall be provided by a bonding company with a rating of B+ or higher as established by A.M. Best Company, Inc. in their most recent publication.

ARTICLE 6.2 – INSURANCE

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

B. Minimum Scope and Extent of Coverage
1. General Liability

Commercial General Liability, ISO coverage form number or equivalent CG 00 01 ("occurrence" basis), or I-SO coverage form number CG 00 02, or ISO equivalent. If ISO equivalent or manuscript general liability coverage forms are used, minimum coverage will be as follows:

Premises/Operations; Independent Contractors; Products/Completed Operations; personal Injury; Broad Form Property Damage including Completed Operations; Broad Form Contractual Liability Coverage to include Contractor's obligations under Article 1.11 Indemnification and any other Special Hazards required by the work of the contract.

2. Automobile Liability

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

3. Workers' Compensation and Employer's Liability

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

4. Builder's Risk or Installation Floater Insurance

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

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

C. Minimum Limits of Insurance

1. General Liability

Contractor

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

$2,000,000 annual aggregate

2. Automobile Liability

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

3. Workers' Compensation and Employers Liability

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

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

D. Deductibles and Self-Insured Retentions

All deductibles, co-payment clauses, and self-insured retentions must be declared to and approved by the Owner. The Owner reserves the right to request the reduction or elimination of unacceptable deductibles or self-insured retainments, 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 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
A. 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 therefor, 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: Dominic Thompson
   S.H. Smith & Company, Inc
   901 Vine Street, Poplar Bluff, MO 63901
   Telephone: 573-785-9621; Fax: 573-785-2651
   Email: domt@shsmithco.com

   Construction Representative: Tim Deal
   Division of Facilities Management, Design and Construction
   709 MO Blvd (Simpson Bldg - upper level)
   Jefferson City, MO 65109
   Telephone: 573-751-7095; Fax: 573-522-1763
   Email: Timothy.Deal2@oa.mo.gov

   Project Manager: Ron Littich
   Division of Facilities Management, Design and Construction
   301 West High Street, Room 730, Jefferson City, Missouri 65102
   Telephone: 573-751-8296; Fax: 573-751-7277
   Email: Ronald.Littich@oa.mo.gov

   Contract Specialist: Kelly Copeland
   Division of Facilities Management, Design and Construction
   301 West High Street, Room 730, Jefferson City, Missouri 65102
   Telephone: 573-522-2283; Fax: 573-751-7277
   Email: Kelly.Copeland@oa.mo.gov

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

4.0 FURNISHING CONSTRUCTION DOCUMENTS:
   A. The Owner will furnish the Contractor with approximately 5 complete sets of drawings and specifications at no charge.
   B. The Owner will furnish the Contractor with approximately 5 sets of explanatory or change drawings at no charge.
   C. The Contractor may make copies of the documents as needed with no additional cost to the Owner.

5.0 ILLEGAL IMMIGRATION REFORM AND IMMIGRANT RESPONSIBILITY ACT
   The Contractor understands and agrees that by signing a contract for this project, they certify the following:
   A. The Contractor shall only utilize personnel authorized to work in the United States in accordance with applicable federal and state laws. This includes but is not limited to the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) and INA Section 274A.
   B. If the Contractor is found to be in violation of this requirement or the applicable laws of the state, federal and local laws and regulations, and if the State of Missouri has reasonable cause to believe that the Contractor has knowingly employed individuals who are not eligible to work in the United States, the state shall have the right to cancel the contract immediately without penalty or recourse and suspend or debar the contractor from doing business with the state.
   C. The Contractor agrees to fully cooperate with any audit or investigation from federal, state or local law enforcement agencies.

6.0 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. 26

Section 012
BUTLER 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
Taylor Burks, Director
Division of Labor Standards

Filed With Secretary of State: ____________________________ March 8, 2019

Last Date Objections May Be Filed: April 8, 2019

Prepared by Missouri Department of Labor and Industrial Relations
<table>
<thead>
<tr>
<th>OCCUPATIONAL TITLE</th>
<th>** Date of Increase</th>
<th>Basic Hourly Rates</th>
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<td>Groundman</td>
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*The Division of Labor Standards received less than 1,000 reportable hours as required by RSMo 290.257.4(b). Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center, in accordance with RSMo 290.257.2.

**Annual Incremental Increase
<table>
<thead>
<tr>
<th>OCCUPATIONAL TITLE</th>
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<th>Basic Hourly Rates</th>
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<td>Group IV</td>
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</table>

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 less than 1,000 reportable hours as required by RSMo 290.257.4(b). Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center, in accordance with RSMo 290.257.2.

**Annual Incremental Increase
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 includes the retrofitting of the existing lagoon cells to accommodate land application of the systems waste water, to include: wastewater pumping system, sprinkler system, force main piping, berm construction and other miscellaneous items to complete the project as specified in the project plans and specifications. The water upgrades include the installation of drawdown tubing in the existing Well #3 retrofitting the existing Well #1 for use within the system, which includes adding new water lines, valves, and fitting, as well as other miscellaneous items to complete the project as specified in the project plans and specification.

1. Project Location: 9400 Sears Ln, Poplar Bluff, MO 63901.

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 6/21/2019 were prepared for the Project by Dominic Thompson, P.E.

C. The Work consists of the retrofitting of the existing lagoon cells to accommodate land application of the systems waste water, to include: wastewater pumping system, sprinkler system, force main piping, berm construction and other miscellaneous items to complete the project as specified in the project plans and specifications. The water upgrades include the installation of drawdown tubing in the existing Well #3 retrofitting the existing Well #1 for use within the system, which includes adding new water lines, valves, and fitting, as well as other miscellaneous items to complete the project as specified in the project plans and specification.

D. The Work will be constructed under a single prime contract.

1.3 DESIGNER’S ESTIMATE OF CONSTRUCTION COSTS

A. $998,900.00 to $1,373,000.00.

1.4 ACCEPTANCE OF WORK

A. Upon completion of all operations, the Contractor shall request the Owner’s Representative to perform an inspection for acceptance. All work must be completed in strict accordance with Plans and Specifications prior to final acceptance.

Where, in the opinion of the Owner’s Representative, inspected work does not comply with the requirements of the Plans and Specifications, the Contractor shall replace rejected work at no additional cost to the Owner.

B. The one-year warranty period required by Section 007213 – General Conditions, Article 3.4 – Guaranty and Warranties is required for this project.
1.5 INSURANCE

A. The “Builders Risk” portion of the required insurance as stated in Section 007213 – General Conditions, Article 6.2 is required for this project.

1.6 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor’s use of the premises limited only by the Owner’s right to perform work or to retain other contractors on portions of the Project.

B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
   1. Owner Occupancy: Allow for Owner occupancy and use by the public.
   2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner’s employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

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

1.7 OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate owner usage. Perform the Work so as not to interfere with the Owner’s operations.

B. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.
   1. The Designer will prepare a Certificate of Partial Occupancy for each specific portion of the Work to be occupied prior to substantial completion.
   2. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy, the Owner will operate and maintain mechanical and electrical systems serving occupied portions for the building.
   3. Upon occupancy, the Owner will assume responsibility for maintenance and custodial service for occupied portions for the building.

END OF SECTION 011000
SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.
   1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Contract Change.

B. Types of allowances include the following:
   1. Weather allowances.

C. Related Sections include the following:
   1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Contract Changes for allowances.
   2. Division 1 Section "Unit Prices" for procedures for using unit prices.

1.3 WEATHER ALLOWANCE

A. Included within the completion period for this project are a specified number of “bad weather” days (see Schedule of Allowances).

B. The Contractor’s progress schedule shall clearly indicate the bad weather day allowance as an “activity” or “activities”. In the event weather conditions preclude performance of critical work activities for 50% or more of the Contractor’s scheduled workday, that day shall be declared unavailable for work due to weather (a “bad weather” day) and charged against the above allowance. Critical work activities will be determined by review of the Contractor’s current progress schedule.

C. The Contractor’s Representative and the Construction Representative shall agree monthly on the number of “bad weather” days to be charged against the allowance. This determination will be documented in writing and be signed by the Contractor and the Construction Representatives. If there is a failure to agree on all or part of the “bad weather” days for a particular month, that disagreement shall be noted on this written document and signed by each party’s representative. Failure of the Contractor’s representative to sign the “bad weather” day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the “bad weather” day determination contained in that document.

D. There will be no modification to the time of contract performance due solely to the failure to deplete the “bad weather” day allowance.
E. Once this allowance is depleted, a no cost Contract Change time extension will be executed for “bad weather” days, as defined above, encountered during the remainder of the Project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALLOWANCES

A. Weather Allowance: Included within the completion period for this project are thirty (30) “bad weather” days.

END OF SECTION 012100
SECTION 012200 – UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Unit Prices.

B. Related Sections include the following:

1. Division 1 Section "Allowances" for procedures for using Unit Prices to adjust quantity allowances.

2. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Contract Changes.

1.3 DEFINITIONS

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

1.4 PROCEDURES

A. Unit Prices include all necessary material plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of Unit Prices. Methods of measurement and payment for Unit Prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of Work in-place that involves use of established Unit Prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of Unit Prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each Unit Price.

PART 2 - EXECUTION

2.1 LIST OF UNIT PRICE
A. Unit Price 1 – Mobilization/Demobilization
   1. Description: All labor, equipment and materials necessary for the movement of personnel, equipment, supplies, and incidentals to and from the project site and any other items necessary to provide a complete and functional project
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) Lump Sum of Mobilization/Demobilization is to be included in the Base Bid.

B. Unit Price 2 – Clearing & Grubbing
   1. Description: Clearing & Grubbing according to Division 31 Section 311000 "Site Clearing"
   2. Unit of Measurement: Acre (AC).
   3. Quantity in Base Bid: Sixteen and Eight-Tenths (16.8) acres of Clearing and Grubbing to be included in the Base Bid.

C. Unit Price 3 – Sludge Removal and Disposal
   1. Description: all labor, equipment and materials necessary to remove and dispose of sludge from lagoon cell and any other items necessary to provide a complete and functional project according to the plans and Missouri Department of Natural Resources Regulations
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) Lump Sum of Sludge Removal and Disposal to be included in the Base Bid.

D. Unit Price 4 – Lagoon Modifications
   1. Description: all labor, equipment and materials necessary for reshaping and compaction of the lagoon cells and aggregate road. This item also consists of digging required for bentonite installation, finish grading as required for placement of bentonite liner, effluent pipe installation, and any other items necessary to provide a complete and functional project according to the plans and Section 333400 "Lagoon Earthwork and Structures" and Section 312000 “Excavating and Backfilling Trenches.”
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) Lump Sum of Lagoon Modifications to be included in the Base Bid.

E. Unit Price 5 – Pump Station Improvements:
   1. Description: all labor and materials needed to construct the main pump station as shown on the drawings including but not limited to bypass and temporary pumping, constructing the new wetwell, installing new pump bases, pumps, wetwell piping, guide rails, installing new valve vault, valves, and appurtenances, installation of control panel, installing new control panel, wiring, and conduit, float switches, other electrical appurtenances, new pressure gauge, air release valve, factory assistance and startup, testing, daily cleanup, and any and all other items needed to provide a complete and functional pump station as shown on the drawings and described in Division 33 Section 333200 "Sanitary Sewer Pumping Station."
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) Lump Sum of Pump Station Improvements to be included in the Base Bid.
F. Unit Price 6 – Bentonite Seal:
   1. Description: All labor, equipment and materials associated with the installation of a bentonite seal as outlined in Division 33 Section 333400 “Lagoon Earthwork and Structures”.
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) Lump Sum of Bentonite Seal to be included in the Base Bid.

G. Unit Price 7 – Rip-Rap Lined Levees:
   1. Description: All labor, equipment and materials associated with the installation of a Rip-Rap as outlined in Division 33 Section 333400 “Lagoon Earthwork and Structures”.
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) Lump Sum of Rip-Rap Lined Levees to be included in the Base Bid.

H. Unit Price 8 – 6” Force Main:
   1. Description: All labor, equipment and materials necessary for the installation of 6” Force Main piping, including attaching to existing valve box, attachment to Influent Structure, new air release valve, new gate valves and any other items necessary to provide a complete and functional project according to the plans and Division 31 Section 312000 “Excavating and Backfilling Trenches” and Division 33 Section 333000 “Sanitary Sewerage.”
   2. Unit of Measurement: Linear Feet (LF).
   3. Quantity in Base Bid: Four Thousand Seventy-Six (4,076) linear feet of 6” Force Main to be included in the Base Bid.

I. Unit Price 9 – Modification of Existing Manhole:
   1. Description: All labor, equipment and materials necessary for the installation of a concrete influent transfer structure, including; piping, valves, valve stems, valve boxes, concrete splash pads, and grating over the end of the pipes and any other items necessary to provide the transfer of waste from gravity system to new cell no. 1 in order to provide a complete and functional project according to the plans and Division 31 Section 312000 “Excavating and Backfilling Trenches,” Division 33 Section 333400 “Lagoon Earthwork and Structures,” Section 333000 “Sanitary Sewerage,” 033000 “Cast-in-Place Concrete”.
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) lump sum of Modification of Existing Manhole to be included in the Base Bid.

J. Unit Price 10 – Emergency Overflow Structure:
   1. Description: All labor, equipment and materials necessary for the construction of the Emergency Overflow Structure and any other items necessary to provide a complete and functional project according to the plans and specifications; ” Section 310000 “Earthwork”; 033000 “Cast-in-Place Concrete”.
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) Lump Sum of Emergency Overflow Structure is to be included in the Base Bid.
K. Unit Price 11 – Temporary Treatment:
   1. Description: All labor, equipment and materials necessary for the temporary treatment of sewage during construction. This item should include any required pumping and temporary bypass piping and any other items necessary to provide a complete and functional project according to the plans and Missouri Department of Natural Resources Regulations. The contractor shall submit temporary treatment plan to Engineer prior to construction.
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) Lump Sum of Temporary Treatment is to be included in the Base Bid.

L. Unit Price 12 – Electrical Work:
   1. Description: All labor, equipment, framing for equipment mounting and materials necessary for completing the site electrical work, including; wiring, conduit, electrical service, power panels, disconnect switches, main control panel, control wiring, power, receptacles, switches, conduit and any other items necessary to provide a complete and functional project according to the plans and Division 26 Section 260000 “Electrical Materials and Methods”
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) Lump Sum of Electrical Work is to be included in the Base Bid.

M. Unit Price 13 – Sprinklers and Stand:
   1. Description: All material, including the sprinklers, concrete stand, all necessary fittings, fencing around sprinkler structure, labor, and any other items necessary to provide a complete and functional project as outlined on the plans and specifications and in Division 33 Section 333000 “Sanitary Sewerage”.
   2. Unit of Measurement: Each (EA).
   3. Quantity in Base Bid: Twenty-five (25) each Sprinklers and Stands are to be included in the Base Bid.

N. Unit Price 14 – Force Main Drainage Structure:
   1. Description: All material, including all necessary fittings, perforated pipe, geotextile fabric, rock filter bed, labor, and any other items necessary to provide a complete and functional project as outlined on the plans and specifications in Division 33 Section 333000 “Sanitary Sewerage”.
   2. Unit of Measurement: Each (EA).
   3. Quantity in Base Bid: Eight (8) each Force Main Drainage Structures are to be included in the Base Bid.

O. Unit Price 15 – Berm Construction:
   1. Description: all labor, equipment and materials necessary for the construction of the earthen berm around the boundary of the application area and any other items necessary to provide a complete and functional project according to the plans and specifications and in Division 31 Section 310000 “Earthwork”.
   2. Unit of Measurement: Linear Feet (LF).
   3. Quantity in Base Bid: Four Thousand Sixty-Four (4,064) linear feet of Berm Construction Installed are to be included in the Base Bid.
P. Unit Price 16 – Seeding & Mulching
   1. Description: Clearing & Grubbing according to Division 31 Section 312500 “Permanent Erosion Control and Landscaping”
   2. Unit of Measurement: Acre (AC).
   3. Quantity in Base Bid: Sixteen and Eight-Tenths (16.8) acres of Seeding and Mulching are to be included in the Base Bid.

Q. Unit Price 17 – Fencing:
   1. Description: all labor, equipment and materials necessary for placing fencing, gates and any other items necessary to provide a complete and functional project according to the plans and Section 323100 “Chain-Link Fencing and Gates”. Removal and relocation of existing fences during construction shall be incidental to the project.
   2. Unit of Measurement: Linear Feet (LF).
   3. Quantity in Base Bid: Four Thousand Seventy-Four (4,074) linear feet of Fencing Installed are included in the Base Bid.

R. Unit Price 18 – Well No. 3 Drawdown Gauge:
   1. Description: All labor, equipment and materials necessary for the installation of a drawdown gauge in the existing well no. 3 and any other items necessary to provide a complete and functional project.
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) lump sum of Well No. 3 Drawdown Gauge Installed is to be included in the Base Bid.

S. Unit Price 19 – Retrofitting Well No. 1
   1. Description: All labor, equipment and materials necessary to complete the capping of existing Well No. 2 piping and the retrofitting of piping, valves, and any other appurtenances required to construct the necessary components as shown on the plans to allow the smooth transition from operating well to ground monitoring and any other items necessary for the retrofitting of Well No. 1 to provide a complete and functional project as shown on the plans, specifications and Missouri Department of Natural Resources Regulations.
   2. Unit of Measurement: Lump Sum (LS).
   3. Quantity in Base Bid: One (1) Lump Sum of Retrofitting Well No. 1 is to be included in Base bid.

END OF SECTION 012200
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract Modifications.

B. Related Sections include the following:
   1. Division 1, Section 012100 "Allowances" for procedural requirements for handling and processing Allowances.
   2. Division 1, Section 012200 "Unit Prices" for administrative requirements for using Unit Prices.
   3. Division 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 Contract Change 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 Contract Change 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 Contract Change Detailed Breakdown form. Subcontractors may use the appropriate Contract Change 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 **CONTRACT CHANGE PROCEDURES**

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

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

**PART 3 - EXECUTION**

3.1 **REFERENCED FORMS**

A. The following forms below can be found on our website at:

   https://oa.mo.gov/facilities/vendor-links/contractor-forms

   1. Request for Information
   2. Designer’s Supplemental Instructions
   3. Request for Proposal
   4. Contract Change
   5. Contract Change Detailed Breakdown – SAMPLES
   6. Contract Change Detailed Breakdown – General Contractor (GC)
   7. Contract Change Detailed Breakdown – Subcontractor (SUB)

**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 013200, Paragraph 3.2 "Construction Progress Schedule" for preparing and submitting the Contractor's Construction Schedule.
   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 ten (10) work days of receiving notice to proceed, 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 Contract Changes**
   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 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 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.

   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 011300 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.

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

       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 - EXECUTION

2.1 REQUIRED SUBMITTALS

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

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<th>SECTION</th>
<th>DESCRIPTION</th>
<th>TYPE OF SUBMITTAL</th>
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<td>Construction Schedule</td>
<td>Sample: X</td>
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<td>OSHA 10 hr Construction Safety Certifications for all (Gen/Sub) On-Site Workers</td>
<td>Test report: X</td>
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<td>SWPPP</td>
<td>Inspection Report: X</td>
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<td>013513</td>
<td>Health and Safety Plan</td>
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END OF SECTION 013300
SECTION 013513.22 – SITE SECURITY AND HEALTH REQUIREMENTS (DYS)

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. Submit names, date of birth, and social security numbers for all personnel for security clearance checks.
   2. Schedule of proposed shutdown of utilities, roadways, etc.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL RULES OF THE FACILITY

A. The Contractor shall be aware that the youth center residents are circulating upon the grounds at all times. The Contractor shall take necessary steps to prevent the residents from having contact with equipment, tools, or wok areas.

B. Prior to commencing with any work, the Contractor shall consult with the Construction Representative and facility representative regarding aspects of prosecution of this work in relation to resident’s safety.

C. Materials, tools, and construction apparatus shall be kept inaccessible to residents during non-working hours. During working hours, these items shall be under the Contractor’s observation or in personal possession at all times.

D. The Facility will not be responsible for the Contractor’s tools, equipment, or materials. The Contractor shall report any missing tools or materials to the facility immediately.

E. No firearms or other weapons, explosives, intoxicating beverages, narcotics or other controlled substances shall be carried on or used on the Youth Center property.

F. No prescription drugs above one day’s supply shall be carried on the Youth Center property.

G. Construction personnel shall not fraternize with the youths.

H. All Contractor’s vehicles shall be locked at all times and shall have keys removed from the vehicles.

I. Any vehicle or individual will be subject to search at any time while on the Facility grounds.

J. The Facility reserves the right to refuse admission to any individual they feel may be detrimental to the security of the Facility.
K. Smoking is not permitted in State-operated buildings. Smoking on grounds shall be in accordance with the local facility regulations.

3.2 ACCESS TO THE SITE

A. The Contractor shall coordinate with the Construction Representative and Facility Representative to establish the procedures for the controlled entry of construction personnel, equipment, and materials into the work area.

B. The Contractor shall establish regular working hours with Facility officials. Normal working hours for this facility are 8:00AM to 5:00PM, Monday through Friday. Working hour changes or overtime are to be reported and approved (24) hours ahead of time. Emergency overtime is to be reported as soon as it is evident that overtime is needed. All work after dark must receive special approval.

C. All construction personnel shall be identified to the Facility, and when the Facility feels it is necessary, they will be issued identification cards.

3.3 DISRUPTION OF UTILITIES

A. The Contractor shall give (72) hours written notice to the Construction Representative and Facility Representative before disconnecting electric, gas, water, fire protection, or sewer service to any building.

B. The contractor shall give (72) hours written notice to the Construction Representative and Facility Representative before closing any access drives and shall make temporary access available if possible. Do not obstruct streets, walks, or parking.

3.4 FIRE PROTECTION, SAFETY AND HEALTH CONTROLS

A. The Contractor shall be responsible and take all necessary precautions to guard against and eliminate possible fire hazards. On site burning is prohibited.

B. Store all flammable or hazardous materials in proper container located outside the buildings or offsite, if possible.

C. Provide and maintain in good order, during construction, all fire extinguishers as required by the National Fire Protection Association. In areas of flammable liquids, asphalt, or electrical hazards, extinguishers of the 15-pound carbon dioxide type or 20-pound chemical type shall be provided.

D. Do not obstruct streets or walks without permission from the Construction Representative and Facility Representative.

E. Construction personnel shall not exceed the facility speed limit of 15mph unless otherwise posted.

F. Take all necessary reasonable measures to reduce air and water pollution by any material or equipment use during construction. Keep volatile wastes in covered containers. Do not dispose of volatile wastes or oils in storm or sanitary drains.

G. Keep project neat, orderly, and in a safe condition at all times. Immediately remove all hazardous waste. Do not allow rubbish to accumulate. Provide on-site containers for collection of rubbish and dispose of it at frequent intervals during progress of work.

END OF SECTION 013513.22
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. Sanitary facilities, including drinking water
   4. Storm and sanitary sewer

C. Support facilities include, but are not limited to, the following:
   1. Field offices and storage sheds
   2. Temporary roads and paving
   3. Dewatering facilities and drains
   4. Temporary enclosures
   5. Temporary project identification signs and bulletin boards
   6. Waste disposal services
   7. Rodent and pest control
   8. Construction aids and miscellaneous services and facilities

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

E. Contractor shall give Owner a minimum of 1 week notice of any and all interruptions to water service.
   1. Water service interruptions shall not be longer than 24 hours without written approval from Owner.
   2. There shall be no planned service interruptions one day preceding, during or one day following any state observed holidays.
   3. Contractor shall schedule all planned service interruptions to occur at the beginning of the work week.
      a. Work week generally defined to begin on Monday.
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

   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 sheds.

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.
   1. Water service shall not be interrupted more than necessary to allow for installation of temporary piping and appurtenances required to allow for continual operation of water service.
   2. Contractor shall maintain water service throughout the duration of the project.

H. Open-Mesh Fencing: Provide 0.120” (3mm) thick, galvanized 2” (50mm) chainlink fabric fencing 6’ (2m) high with galvanized barbed-wire top strand and 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. 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.

G. 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.

H. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.

   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each Facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

   1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.

   2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

   3. Obtain easements to bring temporary utilities to the site where the Owner’s easements cannot be used for that purpose.

   4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Designer. Neither the Owner nor Designer will accept cost or use charges as a basis of claims for Contract Change.
B. Temporary Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
   1. Sterilization: Sterilize temporary water piping prior to use.

C. Temporary Water Service: The Owner will provide water for construction purposes from the existing building system. All required temporary extensions shall be provided and removed by the Contractor. Connection points and methods of connection shall be designated and approved by the Construction Representative.

D. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
   1. Install electric power service underground, except where overhead service must be used.
   2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125V, AC 20ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

E. Temporary Electric Power Service: The Owner will provide electric power for construction lighting and power tools. Contractors using such services shall pay all costs of temporary services, circuits, outlet, extensions, etc.

F. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.
   1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

G. Temporary 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.

H. 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.

I. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.
3.3 SUPPORT FACILITIES INSTALLATION

A. General: Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.
   1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip office as follows:
   1. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase.
   2. Equip with a water cooler and private toilet complete with water closet, lavatory, and medicine cabinet unit with a mirror.

C. Storage facilities: Install storage sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere onsite.

D. Storage Facilities: The Contractor shall provide his own security. Specific locations for storage and craning operations will be discussed at the Pre-Bid Meeting and the Pre-Construction Meeting.

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

F. Construction Parking: Contractors must be prepared to discuss their storage and parking needs at the Pre-Bid Meeting.

G. Maintain the site, excavations, and construction free of water.

H. 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.

I. 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.

J. Rodent Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures are regular intervals so the Project will be free of pests and their...
residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

K. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Designer.

B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonable predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations”.
   1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each usable stairwell.
   2. Store combustible materials in containers in fire-safe locations.
   3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
   4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

C. Permanent Fire Protection: At the earliest feasible date in each area of the Project complete installation of the permanent fire-protection facility including connected services and place into operation and use. Instruct key personnel on use of facilities.

D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting including flashing red or amber lights.

E. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.
   1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.
   2. Provide plywood fence, 8’ (2.5m) high, framed with (4) 2”x4” (50mm x 100mm) rails, and preservative-treated wood posts spaced not more than 8’ (2.5m) apart.

F. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

   1. Storage: Where materials and equipment must be stored and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
G. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near the site.

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

END OF SECTION 015000
SECTION 015723 - TEMPORARY STORM WATER POLLUTION PREVENTION / EROSION CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Installation of temporary water pollution control measures to prevent discharge of pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage, or other harmful material from the project.

B. Other related documents.

1.2 GENERAL

A. The Contractor shall manage his operations to control water pollution in accordance with this specification and applicable State regulations. Construction of permanent drainage facilities and other contract work, contributing to control of erosion, shall be scheduled at the earliest practicable time.

B. The Contractor shall furnish, install, maintain, and remove temporary erosion control measures. The Contractor shall prevent silt or polluted storm water discharge from the site.

C. The Owner’s Representative may require installation of additional erosion control facilities, by the Contractor, if in the sole opinion of the Owner’s Representative, the Contractor’s efforts are inadequate.

1.3 DEFINITIONS

A. General Permit: The General Permit for storm water discharges associated with construction activity (Land Disturbance General Permit No. MO-R100038) issued to FMDC as a blanket permit by the Missouri Department of Natural Resources, Water Pollution Program.

B. Storm Water Pollution Prevention Plan (SWPPP): A plan required by the General Permit that includes site map(s), an identification of construction/contractor activities that could cause pollutants in the storm water, and a description of measures or practices to control these pollutants.

C. Best Management Practice (BMP): Any program, technology, process, siting criteria, operating method, measure, or device that controls, prevents, removes, or reduces pollution.

D. Temporary Berm: A temporary ridge of compacted soil, with or without a shallow ditch, constructed at the top of slopes or transverse to the centerline of a slope. The berm diverts storm runoff to temporary outlets to discharge water with minimal erosion.

E. Temporary Slope Drain: A temporary facility used to carry water down a slope.

F. Ditch Check: An obstruction placed at frequent intervals across ditches, creating small ponds to cause sediment to settle and be contained.

G. Sediment Basin: An excavated or dammed storage area to trap and store sediment and prevent the discharge of silt.

H. Temporary Seeding and Mulching: Placement of a quick ground cover to reduce erosion in areas expected to be re-disturbed.

I. Straw Bales: Standard agricultural bales used to filter the flow of water, trap, deposit sediment, and/or divert water.
J. **Silt Fence:** A geotextile barrier fence to contain sediment by removing suspended particles from water passing through the fence.

K. **Temporary Pipe:** Conduit utilized to carry water under haul roads, silt fences, etc., and prevent equipment from direct contact with water when crossing an active or intermittent stream.

L. **Sediment Removal:** Removal of accumulated sediment to restore the efficiency of sediment control features.

1.4 **SUBMITTALS**

A. The Contractor shall submit his proposed “Erosion Control Plan” for review and approval by the Owner’s Representative. Approval of the plan does not relieve the Contractor of his contractual responsibility to prevent the discharge of pollutants into the receiving drainage ways.

B. The Contractor shall review the Storm Water Pollution Prevention Plan (SWPPP) provided by the Designer, make appropriate field corrections to the document, and submit final corrected copies of the SWPPP to the Owner and facility.

1.5 **RELATED SECTIONS**

A. Section 310000 – Earthwork.

B. Section 311000 – Site Clearing.

C. Section 312200 – Excavating & Backfilling Trenches.

PART 2 - PRODUCTS

2.1 **MATERIALS**

A. Temporary slope drains: Stone, concrete or asphalt gutters, half-round pipe, metal pipe, plastic pipe or flexible rubber pipe.

B. Ditch Checks:

1. Rock ditch checks: 2” to 3” clean gravel or limestone.
2. Straw bale ditch checks: Rectangular wheat straw bales in good condition. Other foliage may be substituted for straw in accordance with MoDOT 802.2.1.
3. Silt fence ditch checks: Geotextile meeting the requirements of this specification.

C. Riprap for Temporary Erosion Control: Type 1 Rock Blanket conforming to MoDOT 611.32.

D. Pipe: Corrugated metal (16 Ga.) or ADS N12 Corrugated Plastic.

E. Temporary Seeding:

1. December 1 to March 1: 50 lbs oats/acre.
2. March 1 to December 1: 50 lbs cereal rye or wheat.
3. Mulch shall be wheat straw.

F. Wire Supported and Self Supporting Silt Fence:

1. Geotextile Fabric
a. Fibers used in geotextiles shall consist of longchain synthetic polymers, composed of at least 85 percent by weight polyolefins, polyesters, or polyamides. They shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including selvages.
b. The geotextile shall be free of any treatment or coating which might adversely alter its physical properties after installation.
c. Geotextile shall be furnished in 36” width rolls.
d. Geotextile rolls shall be furnished with suitable wrapping for protection against moisture and extended ultraviolet exposure.
e. Each roll shall be labeled or tagged to provide product identification sufficient for inventory.
f. Rolls shall be stored in a manner, which protects them from the elements.
g. Geotextile shall conform to the following:

**TABLE 1**

**PHYSICAL REQUIREMENTS**1 FOR

**TEMPORARY SILT FENCE GEOTEXTILES**

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Wire Fence Supported Requirements</th>
<th>Self Supported Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength, Lbs.</td>
<td>ASTM D4632</td>
<td>90 Minimum2</td>
<td>90 Minimum2</td>
</tr>
<tr>
<td>Elongation at 50% Minimum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile Strength (45 Lbs.)</td>
<td>ASTM D4632</td>
<td>N/A</td>
<td>50 Maximum</td>
</tr>
<tr>
<td>Filtering Efficiency, %</td>
<td>VTM-513</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Flow Rate gal/ft/min</td>
<td>VTM-513</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Ultraviolet Degradation at 500 hrs.</td>
<td>ASTM D4355</td>
<td>Minimum 70%</td>
<td>Minimum 70%</td>
</tr>
</tbody>
</table>

Notes:  
1. All numerical values represent minimum average roll value.
2. When tested in any principal direction.

2. Posts: Wood, steel or synthetic posts may be used. Posts shall have a minimum length of 36” plus embedment depth (24” min.). Posts shall have sufficient strength to resist damage during installation and to support applied loads.
3. Support Fence: Wire or other support fence shall be at least 24” high and strong enough to support applied loads.
4. Prefabricated Fence: Prefabricated fence systems may be used provided they meet all of the above material requirements.

2.2 **CERTIFICATION AND SAMPLING:**

A. The Contractor shall furnish a manufacturer’s certification, stating the material conforms to the requirements of these specifications.

B. The certification shall include, or have attached, typical results of tests for the specified properties, representative of the materials supplied.

C. The Owner’s Representative reserves the right to sample and test any material offered for use.
PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The Owner’s Representative may limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, or fill operations.

B. The Owner’s Representative may direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams, other watercourses, lakes, ponds, or other areas of water impoundment. Work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, use of temporary mulches, seeding or other control devices or methods to control erosion.

C. The Contractor shall incorporate permanent erosion control features at the earliest practicable time.

D. The Contractor at no additional cost shall provide temporary pollution control measures needed to control erosion during normal construction practices to the Owner.

E. Contractor shall designate trained and knowledgable personnel to coordinate all SWPPP activities, and identify these personnel to the Owner’s Representative during construction. Missouri Department of Natural Resources offers training classes in Erosion Control free of charge in Jefferson City. Contact for training: David Goggins at (573) 751-2556.

F. The SWPPP is a living document. As the conditions of the site changes, the SWPPP should be updated by the Contractor.

G. The SWPPP is subject to random inspection by the Owner. The SWPPP should be kept up to date by the Contractor and available for inspection at any time.

H. If Contractor determines that any BMP should need modification, the changes shall be dated and documented, and all necessary field changes performed.

3.2 LIMITATION OF AREA DISTURBED:

A. The Contractor’s operations shall be scheduled to install permanent erosion control features immediately after clearing and grubbing, and grading.

B. The surface area of erodible earth material exposed at one time by clearing and grubbing, excavating, fill, or borrow shall not exceed 200,000 square feet without written approval of the Owner’s Representative.

C. The Owner’s Representative may limit the area of clearing and grubbing, excavation, borrow, and embankment operations commensurate with the Contractor’s capability and progress in completing the finish grading, mulching, seeding, and other such permanent pollution control measures current.

D. The Contractor shall respond to seasonal variations. If required by weather, temporary erosion control measures shall be taken immediately.

3.3 RIVERS, STREAMS, AND IMPOUNDMENTS:

A. Construction operations in rivers, streams, and impoundments shall be restricted to areas, which must be entered for the construction of temporary or permanent structures.

B. Rivers, streams, and impoundments shall be promptly cleared of falsework, piling, debris, or other obstructions as soon as practical.

C. Frequent fording of live streams with construction equipment will not be permitted.
D. Temporary bridges or other structures shall be used when the Contractor’s operations include cycling of equipment across streams, rivers, or impoundments.

E. Mechanized equipment shall not be operated in flowing streams except as required to construct channel changes and temporary or permanent structures.

3.4 BORROW AND WASTE AREAS

A. Material pits other than commercially operated sources and material spoil areas shall be subject to pollution control measures of this specification. An offsite location does not relieve the Contractor of his contractual obligation to prevent the introduction of silt or other pollutants into receiving waterways.

3.5 CONFLICT WITH FEDERAL, STATE OR LOCAL LAWS, RULES OR REGULATIONS

A. In case of conflict between these requirements and pollution control laws, rules, or regulations or other Federal, State or local agencies, the more restrictive laws, rules, or regulations shall apply.

3.6 TEMPORARY BERMS

A. Temporary berms shall be constructed at the top of newly constructed slopes and / or transverse to grade to divert runoff and prevent erosion until permanent controls are installed and / or slopes are stabilized. Two types of temporary berms will be utilized under conditions listed below:

1. Type “A” Berm: At the end of each day’s operations on embankments.
2. Type “B” Berm: At shut down of embankment operations for the winter season or discontinuation of work at the direction of, or with concurrence of the Owner’s Representative.

B. Interceptor berms transverse to centerline may be used when temporary berms are installed on grades in excess of 1 percent and at locations where water is to be carried down the fill slope by temporary or permanent slope drains.

C. Construction Requirements:

1. Type A Berms shall be constructed to the approximate dimensions indicated on the drawings. Berms shall be machine compacted with a minimum of one pass over the entire width with a bulldozer tread, grader wheel, or other approved method.
2. Type “B” Berms shall be constructed to the approximate dimensions indicated on the drawings. These berms shall be machine compacted with a minimum of three passes over the entire width with a bulldozer tread, grader wheel, or other approved method.
3. Type “A” and Type “B” Berms must drain to a compacted outlet at a slope drain. The top width of these berms may be wider and the side slopes flatter on transverse berms to allow equipment to pass over these berms with a minimal disruption.

3.7 TEMPORARY SLOPE DRAINS

A. General:

1. Temporary slope drains are required to concentrate water flowing down a slope prior to installation of permanent facilities. Slope drains shall be placed at approximately 500-foot intervals or as directed by the Owner’s Representative.

B. General Requirements

1. The Contractor shall install a temporary silt fence in locations shown on the drawings, around inlets that accept flow carrying silt, and other locations necessary to prevent the discharge of silt from the site.
2. Installation shall conform to the drawing detail.
3. Fence construction shall be adequate to handle the stress from hydraulic and sediment loading.

C. Construction Requirements:
1. Temporary slope drains shall be anchored to prevent disruption by the force of the water flowing in the drain.
2. The inlet end shall be constructed to channel water into the drain.
3. The outlet ends of these temporary slope drains shall have some means of dissipating the energy of this water to reduce erosion downstream.
4. Unless otherwise directed by the Owner’s Representative, temporary slope drains shall be removed when no longer necessary and the site restored to match the surroundings.

3.8 DITCH CHECKS

A. General:
1. Rock ditch checks may be used on ditches with grades of 4 percent or less.
2. Straw bale ditch checks may be used on all ditches.
   a. The silt fence fabric may be eliminated for grades of 2 percent or less.
3. Silt fence ditch check may be used on all ditches.
4. A straw bale ditch check or a silt fence ditch check may be used in lieu of a sediment basin for drainage areas less than two acres. The basin shall have a volume of 1,815 CF per acre of contributing drainage area.

B. Construction Requirements:
1. Construct rock ditch checks in accordance with the drawing detail.
   a. Achieve complete coverage of the ditch or swale and insure the center of the check is lower than the edges.
2. Construct straw bale ditch checks in accordance with the drawing detail.
3. Construct silt fence ditch checks in accordance with the drawing detail.

C. Maintenance:
1. Inspect ditch checks for sediment accumulation after each rainfall.
2. Sediment shall be removed when it reaches one-half of the original height.
   a. Regular inspections shall insure that the center of a rock check is lower than the edges. Correct erosion caused by high flows around the edges of the check immediately.

3.9 SEDIMENT BASIN

A. General
1. Sediment basins are used for drainage areas of two (2) to five (5) acres or for a roadway ditch exceeding 1,000 consecutive feet in length. Break larger drainage areas or longer ditches into smaller areas.

B. Construction Requirements:
1. The area where a sediment basin is to be constructed shall be cleared of vegetation.
2. Construct the inlets of sediment basins with a wide cross-section and a minimum grade to prevent turbulence and allow deposition of soil particles.
   a. The minimum depth is 2'; the maximum depth is 6'.
   b. The minimum width is 5'; the maximum width is 20'.
   c. The minimum length is 25'; the maximum length is 200'.
   d. The minimum volume shall be 1,815 CF per acre of drainage area.

3. Sediment basins shall remain in service until all disturbed areas draining into the structure have been stabilized.
4. When use of sediment basin is discontinued, backfill all excavations and compact fill. Fill material shall be removed and the existing ground restored to the original or plan grade.
5. Maintenance
6. When the depth of sediment reaches 1/3 of the depth of structure in any part of the pool, all accumulation shall be removed.
7. Removed sediment shall be disposed of in locations that the sediment will not erode into the construction areas or into natural waterways. The same holds true for excavated material removed during construction of the sediment basin.

3.10 TEMPORARY SEEDING AND MULCHING

A. General
   1. This item is applicable to all projects.
   2. Seeding and/or mulching shall be a continuous operation on all cut slopes, fill slopes, and borrow pits during the construction process. All disturbed areas shall be seeded and mulched within five (5) working days after the last construction activity in all locations where necessary to eliminate erosion.

B. Construction Requirements:
   1. Permanent seeding and mulching following temporary seeding will be performed during the favorable seeding seasons only.
   2. Temporary seeding mixtures and planting season:
      a. December 1 to March 1: 50 lbs. oat grain per acre
      b. March 1 to December 1: 50 lbs. (cereal rye or wheat) per acre
   3. Temporary mulch, fertilizer, and lime for seeding:
      a. Fertilizer and mulch for temporary seed mixtures shall be applied in accordance with Section 02921.
      b. Fertilizer shall be applied at the rate specified for permanent seeding.
      c. Lime will not be required for temporary seeding.

3.11 STRAW BALES

A. General
   1. Install at the bottom of embankment slopes less than 10' high to divert runoff from sheet flow and intercept some of the sediment in the sheet flow.
   2. Install as ditch checks in small ditches and drainage areas.
   3. Install on the lower side of cleared areas to catch sediment from sheet flow.

B. Construction Requirements:
1. Bales of straw shall be utilized to control erosion, trap sediment, and divert runoff.

2. Bales must be adequately braced from behind.

3.12 SILT FENCE

A. General

1. Install along the toe of fills over 10' in height, along the right-of-way line, parallel to streams or around an inlet to prevent sediment from entering the pipe system.

B. General Requirements:

1. The Contractor shall install a temporary silt fence in locations shown on the drawings, around inlets that accept flows containing silt, and other locations necessary to prevent the discharge of silt from the site.

2. Installation shall conform to the detail at the end of this section.

3. Fence construction shall be adequate to handle the stress from hydraulic and sediment loading.

C. Installation

1. Geotextile at the bottom of the fence shall be buried as indicated on the detail.

2. The trench shall be backfilled and the soil compacted over the geotextile. The geotextile shall be spliced together as indicated on the detail.

3. Post Installation

   a. Post spacing shall not exceed 8' for wire support fence installation or 5' for self supported installations.
   
   b. Posts shall be driven a minimum of 24" into the ground. Where rock is encountered, posts shall be installed in a manner approved by the Owner's Representative.
   
   c. Closer spacing, greater embedment depth and/or wider posts shall be used in low areas, soft, or swampy ground to ensure adequate resistance to applied loads.

4. When support fence is used, the mesh shall be fastened securely to the upstream side of the post.

   a. The mesh shall extend into the trench a minimum of 2" and extend a maximum of 36" above the original ground surface.

5. When self-supported fence is used, the geotextile shall be securely fastened to fence posts.

6. Maintenance

   a. The Contractor shall maintain the integrity of silt fences as long as they are necessary to contain sediment runoff.
   
   b. The Contractor shall inspect all temporary silt fences immediately after each rainfall and at least daily, during prolonged rainfall.
   
   c. The Contractor shall immediately correct deficiencies.
   
   d. The Contractor shall make a daily review of the location of silt fences in areas where construction activities have changed the natural contour and drainage runoff to ensure that the silt fences are properly located for effectiveness.
   
   e. Where a single fence is not adequate to handle the volume of silt or flows are not completely intercepted, additional silt fences shall be installed.

7. The Contractor shall remove and dispose of sediment deposits when the deposit approaches one-half the height of the fence.

8. The silt fence shall remain in place until the upstream surface is stabilized. Upon removal, the Contractor shall remove the silt fence, dispose of excess silt, and restore the disturbed area in accordance with Section 02921.
3.13 TEMPORARY PIPE

A. General:
   1. The Contractor shall install temporary pipes and fill at locations, to be crossed by the Contractor’s equipment, which carry a concentrated flow during rain events.

B. Construction Requirements:
   1. All temporary pipes shall be installed in the same manner as permanent pipe is installed on the project to assure that the water does not cause erosion around the pipe.
   2. Material to backfill the pipe should be placed in 6” lifts and mechanically compacted. Compaction testing will not be required.

3.14 SEDIMENT REMOVAL

A. General
   1. Sediment deposits shall be removed when:
      a. The deposits reach approximately one-half the height of a ditch check, straw bale barrier or silt fence.
      b. The sediments have reduced the ponded volume of sediment basins to one-third of the original volume.
      c. Requested by the Owner’s Representative.

B. Sediment removed from erosion control features shall be deposited in a location where it will not erode into construction areas or watercourses.

END OF SECTION 015723
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 impending 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 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.


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. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.

D. 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 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

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

B. Referenced Sections include the following:
   1. None.

C. Referenced Standards include the following:
   1. ACI SP 66 - ACI Detailing Manual; American Concrete Institute; 1994.
   6. ACI CP 1 - Technician Workbook for ACI Certification of Concrete Field Testing Technician – Grade I; American Concrete Institute; 2002.
   7. ACI 301 - Specifications for Structural Concrete; American Concrete Institute; 1999.
   8. ACI 117 - Standard Tolerances for Concrete Construction and Materials; American Concrete Institute; 1990.
19. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete; American Concrete Institute; 1991.
20. ACI 374R - Guide to Formwork for Concrete; American Concrete Institute; 2001.
21. ACI 309R - Guide for Consolidation of Concrete; American Concrete Institute; 1996.
22. ACI 306.1 - Standard Specification for Cold Weather Concreting; American Concrete Institute; 1990.
23. ACI 305R - Hot Weather Concreting; American Concrete Institute; 2000.

1.2 DEFINITIONS
A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.3 SUBMITTALS
A. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
   1. Indicate amounts of mix water to be withheld for later addition at Project site.
B. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

1.4 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.
   1. Manufacturer must be certified according to the National Ready Mixed Concrete Association's Certification of Ready Mixed Concrete Production Facilities.
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.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. 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”.

1.5 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials.


C. 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.

D. 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 3/4 inch to the plane of the exposed concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 82, as drawn.

C. Deformed-Steel Wire: ASTM A 496.

2.3 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.

2.4 CONCRETE MATERIALS
A. Portland Cement: ASTM C 150, Type I/II.
   1. Fly Ash: ASTM C 618, Class C or F.

B. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
   1. Class: Severe weathering region, but not less than 3S.

C. Water: Potable and complying with ASTM C 94.

2.5 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.


2.6 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. Water: Potable.

2.7 RELATED MATERIALS

A. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.8 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.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Footings and Foundation Walls: Proportion normal-weight concrete mix as follows:

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. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash: 25 percent.

F. Maximum Water-Cementitious Materials Ratio: 0.45 for concrete exposed to deicers or subject to freezing and thawing while moist.
G. 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:
   1. Air Content: 6 percent for 3/4-inch- nominal maximum aggregate size.

H. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

I. Admixtures: Use admixtures according to manufacturer’s written instructions.

2.9 FABRICATING REINFORCEMENT

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

2.10 CONCRETE MIXING

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

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until 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.

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.
   1. Do not use rust-stained steel form-facing material.

F. 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.

G. Chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer’s written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

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

3.3 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

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.

3.5 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. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.6 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. 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. 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.

F. 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.

3.7 FINISHING FORMED SURFACES

A. Remove forms and form ties, repair surface defects, and patch any cones or depressions caused by forms or form ties prior to finishing surface.

B. Rubbed Finish: Apply the following to smooth-formed finished concrete:
1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

C. 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.

3.8 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 Work.

3.9 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 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.

3.10 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 ½ 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. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor will engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements 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.

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/C 31M; cast and laboratory 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. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at age indicated.

C. 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.

D. Test results shall be reported in writing to Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.
E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by 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 260000 – ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY
   A. This Section includes the following:
      1. Electrical Service
      2. Conduit
      3. Outlet boxes
      4. Junction and pull boxes
      5. Wiring and Cable.
      6. Wall switches.
      7. Receptacles.
      8. Device plates and covers
     10. Motor starters
     11. Disconnect switches
     12. Surge protection devices
     13. Grounding and bonding
   B. Referenced Standards include the following:
      1. ANSI/UL 651-Specifications for Rigid PVC Conduit.
      2. NEMA - National Electric Manufacturers Association.
      3. NEC - National Electrical Code

1.2 DEFINITIONS
   A. AWG - American Wire Gauge.

1.3 SUBMITTALS
   A. Product Data: provide detailed product data for all products specified, including manufacturer, manufacturer’s catalog number, type or class and wiring diagram.
   B. Shop Drawings: provide detailed shop drawings showing locations and sizes of conduit and wire; provide wiring diagrams for all panels and controls.

1.4 QUALITY ASSURANCE
   A. All electrical products shall be selected and installed in accordance with the requirements of the latest edition of the National Electric Code (NEC), and all applicable local codes and ordinances.
   B. Products shall be tested, approved and labeled by Underwriter's Laboratories, Inc. (U.L.). All fixtures shall carry the U.L. label.
   C. All electrical equipment and materials shall be new and within one year of manufacture, complying with all the latest codes and standards. No used, re-sold through third party, re-built, refurbished and/or re-manufactured electrical equipment or materials shall be furnished on this project.

1.5 ELECTRICAL SERVICE
   A. Contractor shall coordinate with local power company provider for the installation of a new 60Amp- 277/480 Volt, 3 phase, 4-wire electrical service for pump station.
B. Contractor shall provide and install all metering equipment, service conduits, wire and/or cable, transformer pads, protective transformer barrier and all related service electrical apparatus required and not furnished and/or installed by local power company provider for complete electrical service installation.

1.6 DELIVERY AND STORAGE
A. Deliver materials to site in unopened cartons or bundles as appropriate, clearly identified with manufacturer's name, Underwriter's or other approved label, grade or identifying number.

PART 2 - PRODUCTS

2.1 CONDUIT
A. Conduit above ground shall be schedule 80 PVC conforming to National Electrical Code and bearing U.L. Label, and painted with two coats of white, water based, outdoor latex paint:
   1. PVC: ANSI/UL Standard 681
B. Conduit within buildings shall be thin wall or rigid.
   1. Thin Wall conduit fittings shall be compression type.
C. Buried conduit shall be PVC schedule 40, PVC schedule 80, or rigid metal.
D. Conduit in concrete slabs shall be PVC schedule 40, PVC schedule 80, or rigid metal conduit with minimum 2” of cover.
E. Flexible metal conduit: Steel or aluminum liquid-tight, interlocking single-strip type with overall molded jacket to exclude moisture.
   1. Fittings: clamp on or screw-in type fittings.
   2. Connectors: galvanized steel with integral insulating throat.
   3. Used for flexibility only to rotating machinery, equipment, or lighting fixtures.
   4. Not to exceed 6’ in length.
   5. Shall not be used in damp or wet locations
F. Liquid-tight Flexible Conduit: Flexible metal conduit with PVC jacket.
   1. Fittings: listed for use for liquid-tight flexible metal conduit with PVC jacket.
   2. Connectors: listed for use for liquid-tight flexible metal conduit with PVC jacket.
   3. Used for flexibility only to rotating machinery, equipment, or lighting fixtures.
   4. Not to exceed 6’ in length.
   5. Shall be used in damp or wet locations.
G. Fittings and conduit bodies: NEMA FB 1. (Inside) and NEMA 4x stainless steel (outside).
H. Supports and Attachments:
   1. Clamps, straps and supports: steel or malleable iron. (inside) and stainless steel (outside).
   2. Hanger rods: 1/4-inch minimum, hot dip galvanized.
I. Bushing and locknuts: shall be made of galvanized malleable iron and shall have sharp, clean-cut threads.
J. Conduit sealer: Shall be UL Listed, asbestos free, gray in color, permanently soft, nontoxic compound which will adhere to clean dry surfaces, will not harm polyethylene sheath conductors, will not adversely affect other plastic materials or corrode metals, and has temperature rating of -20°F to 350°F.
K. Conduit Hubs: Shall be NEMA Type 4X stainless steel with captive o-ring gasket, insulated throat, NPL male thread, UL Listed.
2.2 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
B. Cast Boxes: NEMA FB 1, Type FD, aluminum. Provide gasketed cover by box manufacturer.
C. Outlet Boxes In Dry Locations: galvanized, Sherardized, or electro-plated sheet steel.
   1. Use 4-inch square by 1-1/2-inch deep, or larger, boxes unless otherwise shown or required by code to accommodate the number of conductors required.
   2. Provide box covers and rings of type to suit installation conditions.
   3. Outlets exposed to the weather: Type FS or FD for switches, receptacles and similar devices and type SE or GS for lighting fixtures.
   4. Use gang type outlet where devices are shown close together unless otherwise noted.
D. Outlets In Damp Or Wet Locations: FS or FD cast metal outlets with cast metal covers and gasketed hinged door for switches or receptacles. Type GS cast metal outlets for fixtures unless a cast outlet is furnished as part of the fixture.
E. Supports: channel type hangers or bar type hangers.

2.3 JUNCTION AND PULL BOXES

A. Inside:
   1. Boxes: Provide machine screw attached cover type, Hubbell, Circle A-W Products, or approved equal.
   2. Flush Mounted Boxes: Equipped with covers which overlap box sides 3/4 inch.
   3. Surface Mounted Boxes: Equipped with covers of same size as box.
   4. Pull Boxes: Provide boxes as required to comply with NEC for conduit routes selected by the Subcontractor to accommodate conditions which influence routes.
   5. Hinged Access Doors: Provided where boxes would otherwise be inaccessible.
B. Outside:
   1. Junction boxes: NEMA 4X fabricated from 14 gauge type 304 stainless steel with external mounting feet, cover and outside of enclosure shall be smooth grained finish.
   2. Pull boxes: High density polyethylene construction suitable for in-ground installations with polymer concrete lid, hex head stainless steel lid fastening bolts, and lid marked “ELECTRIC”.

2.4 WIRE AND CABLE

   1. Control Circuits: No. 14 AWG or larger.
   2. Home run circuits over 50 feet from Panelboard to first outlet: No. 10 AWG or larger.
   3. Other Circuits: No. 12 AWG or larger.
B. Conductors No. 10 AWG and smaller may be solid or stranded.
C. Conductors No. 8 AWG and larger shall be stranded.
D. Insulation: Power and lighting conductors shall be 600 volt of type indicated below:
   1. Power and lighting conductors: THWN or THHN.
   2. Wet locations: THWN.
   3. Cables in contact with ground: UF or USE.
   4. Feeders to panelboards: THWN or THHN
E. Color coding:
   1. No. 8 AWG and smaller: colored insulation.
2. Larger than No. 8 AWG: one-inch colored cloth or plastic colored adhesive tape on each end of cable. Wrap tape not less than two full turns around conductor.

3. Colors:
   a. Phase A - 480/277 (Brown), 208/120 (Black).
   b. Phase B - 480/277 (Yellow), 208/120 (Red).
   c. Phase C - 480/277 (Purple), 208/120 (Blue).
   d. Neutral - 480/277 (Gray), 208/120 (White).

4. Any conductor intended solely for equipment grounding purposes shall be green in color. Conductors white or gray in color shall be used only for the grounded neutral conductors.

F. Cable Connectors:
   1. Shall be watertight NEMA 4X stainless steel strain relief mesh type, with an N.P.T. and PG threaded body, internal neoprene bushing, and UL listed.

2.5 WALL SWITCHES

A. Single pole, three, and four-way wall switches for lighting circuits: Industrial grade AC switch with toggle handle, rated 20A and 120-277VAC.
   1. Handle color: Gray.
   2. Wall switches shall be Bryant, General Electric, Leviton or approved equal.

2.6 RECEPTACLES

A. Industrial grade, 20A, 125V, 2-pole, 3-wire, NEMA 5-20R duplex for multi-outlet 20A branch circuits or where only one receptacle is connected to a 20A branch circuit. Bryant, General Electric, Leviton or approved equal.
   1. Color: Gray
   2. Receptacles shall be Bryant, General Electric, Leviton or approved equal.

2.7 DEVICE PLATES AND BOX COVERS

A. Wall plates and box covers shall match the type of box and device it is to be mounted on.
   1. Interior Wall plates: stainless steel unless noted otherwise on drawings.
   2. Exterior wall plates: Weatherproof gasketed cast metal with hinged gasketed device cover.
   3. Box covers shall be zinc galvanized, corrosion protected, and UL listed.

B. Use jumbo size plates for devices installed in masonry walls if required for complete cover of opening.

2.8 PANELBOARDS

A. Bus and Hardware: Panel boards shall be completely factory assembled fully rated dead front safety type for the short circuit current available and equipped with fully rated neutral bus. Service panelboards shall include combination neutral and equipment grounding bus suitable for bolting to enclosure. Feeder panels shall include fully sized insulated neutral bus and uninsulated equipment ground bus suitable for bolting to enclosure, type, size and number of bolt on branch circuit breakers as required for complete installation. Panelboards shall be designed with 20% spare breaker capacity.

B. Circuit Breakers: U.L. listed magnetic molded case circuit breakers, bolt on type, integral thermal and instantaneous magnetic trip in each pole with common trip handle for all poles rated for the load connected and minimum of 10,000 amperes interrupting capacity.

C. Cabinets (boxes): shall meet the requirements of the “Enclosures for Electrical Equipment” of the Underwriters’ Laboratories and the following:
   1. Minimum size: 20-inches wide by 4 ½-inches deep by sufficient height to enclose main and branch circuit breakers, buses, equipment and wire gutter.
2. Box Material: Code-gauge galvanized or galvanized-annealed steel, unless noted otherwise.
3. Front Material: cold rolled furniture steel, rustproof, unless noted otherwise.
4. Finish: ANSI-61 light grey baked enamel, unless noted otherwise.

D. Enclosure: NEMA Type as indicated on plans or in specifications, or as required by NEC for type of environmental location.
   1. Enclosures shall be NEMA 1, NEMA 12, NEMA 3R, NEMA 4, or NEMA 4X.
   2. NEMA 1, 12 or 3R enclosures shall be painted with the manufacturer’s standard light gray ANSI 61 paint.
   3. NEMA 4 or 4X shall be stainless steel, non-painted.
   4. Door-in-door construction: full-length butt or piano hinge and latch; doors over 30-inches in height shall have a 3-point latch.

2.9 FULL VOLTAGE MAGNETIC MOTOR STARTERS

A. All full voltage magnetic motor starters and associated controls shall be provided with engraved laminated nameplate per Section 3.8 of this Division
B. All full voltage magnetic motor starters shall be AC general-purpose, Class A, magnetic controller for induction motors rated in horsepower as indicated, unless specified or noted otherwise.
C. Contacts: Provide silver, cadmium oxide alloy, double break, non-welding contacts which will not require filing, dressing or cleaning throughout the life of the control equipment.
D. Provide starter types as specified or noted on drawings.
E. Coils: Pressure molded, 120 volts, 60 hertz, unless specified or noted otherwise. Provide integral control transformer, unless noted otherwise.
F. Overload Relay: Provide bimetal overload relays in all three phases for three phase full voltage starters, in ungrounded phases for single-phase full voltage starters and in all six legs for two-speed full voltage starters. Provide overload relays of the hand reset, trip-free variety so that blocking the reset mechanism in the reset position will not prevent the motor controller from dropping out if the motor is overloaded. Capability to field convert overload relays from hand to automatic reset is unacceptable.
G. Auxiliary Contacts: Provide each starter with the required auxiliary contacts for the control functions indicated and required, including the holding interlock and pilot light interlocks plus two additional contacts, field convertible to normally closed or normally open NEMA ICS 2 controls. Provide capability to add auxiliary contacts without removing existing wiring or removing the controller from its enclosure.
H. Selector Switches: HAND/OFF/AUTO for single-speed motors in front cover as required. Hand position shall bypass automatic controls but not safety interlocks.
I. Indicating Lights: RUN; green for single-speed motors; FAST/SLOW; green/amber for two-speed motors (push to test type) in front cover. Operate pilot lights by separate interlock not placed across the holding coil.
J. Control Power Transformers: Provide integral 120 volt secondary control transformer with both primary and secondary fuses for each controller, unless specified or noted otherwise.
K. Enclosure: NEMA Type as indicated on plans or in specifications, or as required by NEC for type of environmental location.
   1. Enclosures shall be NEMA 1, NEMA 12, NEMA 3R, NEMA 4, or NEMA 4X.
   2. NEMA 1, 12 or 3R enclosures shall be painted with the manufacturer’s standard light gray ANSI 61 paint.
   3. NEMA 4 or 4X shall be stainless steel, non-painted.

2.10 REDUCED VOLTAGE MOTOR STARTERS
A. Shall be Solid State Motor Starters for induction motors rated in horsepower as indicated, unless specified or noted otherwise.

B. Provide accessible terminals for wiring directly from the front of the starter.

C. Contacts: Provide silver, cadmium oxide alloy, double break, non-welding contacts which will not require filing, dressing or cleaning throughout the life of the control equipment.

D. Provide starter types as specified or noted on drawings.

E. Coils: Pressure molded, 120 volts, 60 hertz, unless specified or noted otherwise. Provide integral control transformer.

F. Overload Relay: Provide ambient compensated overload relays in all three phases, loss of phase protection, under and overcurrent protection, and extra-quick-trip overload relay. Provide overload relays of the hand reset, trip-free variety so that blocking the reset mechanism in the reset position will not prevent the motor controller from dropping out if the motor is overloaded.

G. Auxiliary Contacts: Provide each starter with the required auxiliary contacts for the control functions indicated and required, including the holding interlock and pilot light interlocks plus two additional contacts, field convertible to normally closed or normally open NEMA ICS 2 controls. Provide capability to add auxiliary contacts without removing existing wiring or removing the controller from its enclosure.

H. Selector Switches: mounted in front cover as required.

I. Indicating Lights: RUN; green for single-speed motors; FAST/SLOW; green/amber for two-speed motors (push to test type) in front cover. Operate pilot lights by separate interlock not placed across the holding coil.

J. Control Power Transformers: Provide integral 120 volt secondary control transformer with both primary and secondary fuses for each controller, unless specified or noted otherwise.

2.11 DISCONNECT SWITCHES

A. Shall be NEMA classification as shown on drawings, Heavy Duty rated and meet or exceed NEMA Standard KSI.

B. Shall be horsepower rated.

C. Shall have the following features:
   1. Switch mechanism shall be the quick-make, quick-break type.
   2. Copper blades, visible in the OFF position.
   3. An arc chute for each pole.
   4. External operating handle shall indicate ON and OFF position and shall have lock-open padlocking provisions.
   5. Mechanical interlock shall permit opening of the door only when the switch is in the OFF position, defeatable by a special tool to permit inspection.
   6. Fuse holders for the sizes and types of fuses specified.
   7. Electrically operated switches shall only be installed where shown on the drawings.
   8. Solid neutral for each switch being installed in a circuit which includes a neutral conductor.
   9. Ground Lugs: One for each ground conductor.
   10. Fused switches shall be furnished complete with fuses.

D. Enclosures: NEMA Type as indicated on plans or in specifications, or as required by NEC for type of environmental location.
   1. Enclosures shall be NEMA 1, NEMA 12, NEMA 3R, NEMA 4, or NEMA 4X.
   2. NEMA 1, 12 or 3R enclosures shall be painted with the manufacturer’s standard light gray ANSI 61 paint.
   3. NEMA 4 or 4X shall be stainless steel, non-painted.

2.12 SURGE PROTECTION DEVICES (TRANSIENT VOLTAGE SURGE SUPPRESSION)
A. Provide surge protection device (SPD) designed for the specific type voltage and phase of electrical service as shown on drawings, or identified in specifications. Provide SPD on supply (line side) of main service disconnect and transfer switch (from generator), load side of OCPD for motor control centers, motor starters, VFD’s, and PLC’s.

B. UL 1449 Listed-Latest Edition

C. Provide suppression for both normal mode (L-N) and common mode (L+N+G).

D. Minimum surge current rating as required per phase and neutral.

E. Minimum short circuit rating as required by Article 285.6 of the National Electric Code.

F. Normal discharge current of 20Ka

G. Shall meet the general, installation, and connection requirements of Article 285 of the latest edition of the NEC.

PART 3 - EXECUTION

3.1 GENERAL

A. Install all electrical components including conduit, wiring, panels and other electrical equipment in accordance with latest edition of the NEC or all applicable local codes and ordinances.

B. Coordinate installation of conduit, panels and other electrical equipment with block wall installation, plumbing and other work to ensure that the work will not interfere with each other.

3.2 CONDUIT INSTALLATION

A. All wires shall be installed in continuous conduit or wiring raceways from the panels to outlets, switches, and equipment. Size raceways per NEC Chapter 9-Tables 1 through 5 and Tables C.1, through C.12, unless shown otherwise on the drawings.

B. All conduit, raceways, junction boxes and device back boxes shall be run concealed, except as shown or noted otherwise and may be exposed in unfinished areas.

1. Where exposed, run parallel with walls or structural elements.

C. Install vertical conduit to outlets and outlet boxes within walls.

D. Install horizontal conduit out of site, anchored to walls above panel ceilings or attached to joists or trusses above ceilings.

E. Securely fasten conduits at intervals of not more than 7-feet, or as required by NEC, with suitable clamps and fasteners to provide a mechanically rigid and secure installation. Space conduit supported by concrete structure at least 1/4-inch using malleable straps or framing channels.

F. Support conduits on each side of bends and not more than three feet from an enclosure where a straight run of conduit ends.

G. Provide flexible metal conduit to suspended lighting. Provide liquid-tight flexible conduit from outlet to final connection to transformers and rotating or vibrating equipment. Flexible conduit shall not exceed six feet in any application.

H. Empty conduit in which wire is to be installed by others shall have pull lines installed with no less than 24 inches of slack at either end. Mark each end with the location of other end.
I. Where conduits enter boxes, rigidly clamp the conduit to the box using listed conduit connector and insulated bushing. Threaded conduit shall be secured to box with locknut on the inside and locknut on the outside and insulated bushing; the conduit shall enter the box squarely.

J. Conduits which enter into a panelboard, motor control center, control panel, disconnect switch, transfer switch, junction box, or any other electrical enclosure from underground or from outside a building shall be sealed at point of entry into the enclosure in accordance with article 300.5(G) of the NEC. Sealants shall be identified for use with the cable and/or conductor insulation, shield, or other components.

3.3 BOX INSTALLATION

A. Install electrical boxes as shown on the drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.

B. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

C. Locate and install boxes to allow access. Where installation is inaccessible, coordinate with locations and sizes of required access doors. Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaries.

D. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.

E. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface-finish thickness if required.

F. Do not install flush mounting boxes back-to-back in walls; provide minimum 6 inch separation.

G. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

H. Use adjustable steel channel fasteners for hung ceiling outlet box. Do not fasten boxes to ceiling support wires.

I. Support boxes independently of conduit, except for cast boxes that are connected to two rigid metal conduits, both supported within 12 inches of box. Fasten boxes with screws or support with hangers.

J. Use multiple-gang boxes where two or more devices are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

K. Use gang box with plaster ring for single device outlets.

L. Use cast outlet box in exterior locations exposed to the weather and wet locations.

M. In masonry walls, locate boxes so as to limit cutting more than one masonry unit corner. Coordinate masonry cutting to achieve neat openings for boxes.

N. Provide listed knockout closures for unused openings.

O. Coordinate mounting heights and locations of outlets mounted above counters, benches, and back splashes.

3.4 PANELBOARD INSTALLATION

A. Install panelboards plumb in conformance with NEMA PB 1.1. Where surface mounted, provide suitable supports and rack all branch circuit conduits.

B. Install ½" steel spacers behind panel where mounted on concrete wall.

C. Install top of trim 78 inches above finished floor unless otherwise noted.

D. Nameplate: provide neatly typed list on the inside front panel of each panelboard giving the circuit number, size and the location/type of electrical devices, fixtures, and equipment served.
3.5 WIRE INSTALLATION
A. All wiring shall be installed in appropriate raceways or conduit and in compliance with the National Electric Code, latest edition.
B. Splices and taps in conductors and to lighting fixtures shall be screw on pressure cable type, with integral insulation unless noted otherwise on drawings. Cover soldered and bolted splices with high-grade rubber tape and a layer of friction tape, then paint with black insulating paint or use listed and approved covering device in lieu of taping.

3.6 DEVICE AND OUTLET INSTALLATION
A. Install devices and wall plates flush and level. Plates shall be plumb and with all edges in continuous contact with adjacent finished surfaces.
B. Install wall switches 48 inches above floor, OFF position down.
C. Install convenience receptacles 16 inches above floor, 12 inches above counters with grounding receptacle pole on top.
D. Install specific use receptacles at heights, shown on construction drawings or as approved by the Engineer.
E. Provide weatherproof cover plates on flush mounted devices where shown, gasketed, type and configuration to suit flush device and its orientation.
F. Install blank and device cover plates on switches, receptacles and boxes.
G. Provide GFCI protected 20Ampere receptacles in accordance with NEC - "Ground Fault Protection for Personnel".

3.7 GROUNDING AND BONDING
A. Install a grounding electrode system in accordance with N.E.C. Article 250 and as required by the local inspecting authority.
B. Install a green bonding jumper between the outlet box and the receptacle grounding terminal on all flush mounted receptacles.
C. An insulated ground wire shall be installed in all feeder and branch circuit raceways. Ground wire shall be sized in accordance with NEC Article 250.122
D. Grounding bushings shall be utilized on each conduit which is not bonded to a grounded enclosure by means of properly installed conduit nuts, one on each side of the enclosure panel and properly tightened such as to cut through the panel paint and make bare metal to metal contact.
E. Ground all step down transformers in accordance with NEC Article 250.30 for Grounding Separately Derived Alternating Current Systems.
   1. The bonding jumper shall be directly connected to a grounding electrode.
   2. Transformer case shall be bonded to the grounding electrode conductor, but shall not be used as the grounding electrode.
   3. Grounding electrode conductor shall be protected within conduit.
F. Install grounding bonding jumper across all building expansion joints, conduit, busway, and cable tray expansion fittings.

3.8 IDENTIFICATION FOR ELECTRICAL SYSTEMS
A. Nameplates shall be provided on all major equipment, including the following:
   a. Primary switches
b. Circuit breakers and switches in distribution panels

c. Panelboards

d. Motor starters

e. Motor controls

f. Motor control centers

g. Transformers

h. Contactors

B. Nameplates shall be plastic laminate, white face with black engraved letters, numbers, etc., attached with stainless steel screws.

C. Provide “Arc Flash Warning” label on face of all switchboards, panelboards, control centers disconnect switches, meter socket enclosures, and motor control centers as required by Article 110.16 of the NEC.

3.9 PROTECTION OF EQUIPMENT

A. Care shall be taken to avoid damage to equipment or electrical components of any kind. All equipment shall be protected from dust and moisture prior to and during construction.

B. Contractor shall repair or replace any damaged equipment, including scratches or defects in finish to the satisfaction of the Owner.

END OF SECTION 260000
SECTION 260200 – CONTROL PANEL

PART 1 - GENERAL

1.1 SUMMARY

A. Work under this section shall include the furnishing of all labor, materials, tools, equipment, and other items necessary for the supply and installation of the control panel as specified herein.

B. The control panel manufacturer shall provide an enclosure that can be free standing. Mounted to a post and beam structure or a wall without field modifications to the enclosure that would compromise the rating of the enclosure.

C. The control panel installer shall provide the mounting hardware and fittings necessary to ensure that the enclosure is mounted securely, and that such openings made to the enclosure for conduit or any other entry are of the same NEMA rating as the enclosure so as not to compromise such rating.

1.2 SUBMITTALS

A. The Control Panel Supplier shall furnish a submittal package to the Engineer for approval prior to fabrication. Submittals shall include proposed layout drawing(s) detailing appurtenances and escutcheon plates, a one-line diagram of panels and interconnecting wiring and a circuit diagram of each panel and shall include a bill of materials with catalog cuts.

B. Upon engineer's approval of shop drawings, the contractor shall submit equipment "Installation, Operation, and Maintenance Manuals" (I.O.M). The I.O.M. manuals shall detail all components and include installation instructions, start-up procedures, and normal operation and maintenance procedures.

PART 2 - PRODUCTS

2.1 CONTROL SYSTEM

A. The control system shall consist of a lockable NEMA 4X enclosure suitable for (outdoor/indoor) use.

B. The enclosure shall be as manufactured by English Electric (Vynckier), Hammond Manufacturing, Hoffman Engineering, Stahlin (Robroy Industries) Wiegmann Manufacturing, Tanco, Inc., Eurobex, or equivalent.

C. Refer to the Technical Data Sheet for number of motors, horsepower of each motor, and electrical information.

D. The enclosure assembly shall comply with UL 508 standards for safety and shall be assembled in such a manner that if required it could be UL inspected and listed as such without any modifications.

E. Control voltage shall be 120 volts AC, and shall be derived from a primary and secondary fused isolating control power transformer (CPT). The CPT shall have a minimum excess capacity of 15% and shall have a grounded secondary. Glass or ceramic tube fuses are unacceptable. Control power transformers shall be as manufactured by Fern Electric (Cincinnati) Types A-D and N, G.E. Type IP, Hammond Types MH or MT, Sola Hevi-Duty Type E or Type Y, and Westinghouse types MTA or MTC or equal.

F. Selector switches, pilots, and push buttons (if applicable) shall be of modular design, with field replaceable contact sets and lamps. These devices shall be AEG Type D22/D30, Allen-Bradley Bulletin 800-H or 800-F or 800-T, Cutler-Hammer Type 1025OT, GE Type CR104, Idec Type TWTD, Square-D Class 9001 Types K or T, Telemechanique Type XB3 or equal. Any type used must be UL listed. Component recognized units shall not be acceptable.

G. Fuse blocks/holders and fuses shall not be sized to carry in excess of 80% of their rating and shall be manufactured by Bussman Division, Cooper Industries; Power Fuse Division, Littel Fuse; Ferraz-Shawmut, Marathon Special Products or equal.

H. All internal components shall be legibly and permanently marked and coincide with the drawings and bill of materials. All external devices shall have engraved escutcheons plates affixed above the device with high quality 2-sided tape or stainless steel screws.
I. All control wiring shall be 18 awg (min.) type MTW. All neutral or grounded conductors shall have white insulation. In a case where white is not available for a particular use, the wire shall be coded at each end by wrapping with white electrical tape. All such coded non-white neutral conductors shall also be coded every 610mm (24 inches), when applicable, with white tape wrap. All control wires shall be numbered at both ends with a suitable, high quality, permanent wire numbering product. Control wires 100mm (4 inches) or less may be numbered at one end only. Individual wire numbering tapes or other products, which unravel or easily fall off are not acceptable. Wire marking shall be as manufactured by Thomas & Betts (T&B) Shur-Code, the 3M company Scotch Code wire marking systems, or Brady Datab, Laser Tab, Omni-grip, Brady, Panduit, or Sleeve wire marking systems.

J. Enclosure interconnect control and power wiring shall terminate in permanently marked terminals or blocks, with one (1) wire per terminal, unless the device is designed for multiple terminations. Barrier strips are acceptable only if covers are also provided and wires are terminated in a SEMS self-lifting type pressure pad or listed crimp terminal. There shall be at least 10% extra unmarked terminals provided in each enclosure. Jumpering of adjacent terminals shall be accomplished with terminal manufacturer supplied jumpers intended specifically for use with that product.

K. Acceptable terminal blocks are Entrelec Series 5000, Buchanan 300 and 600-volt medium to heavy-duty sectionals, Marathon Special Products 3/8" and 7/16" 600 volt sectionals, Schlegal Elektrokontakt IK, and WAGO Cage-Clamp 2xx series, Allen Bradley 1492-J Series, or equal. The acceptable barrier type strips are Kulka 601 or larger series, or Marathon 200HB, 300, 400 series.

L. Disconnect equipment shall be Allen-Bradley Bulletin 194R or 1494R, Cutler-Hammer File C362, Selzer Series H or S switches, Square-D Class 9422, Westinghouse Type DS and Visi-Flex, or Allen-Bradley OS Series or OES Series.

M. Main breakers, if used in lieu of a listed fused switch, shall be UL listed F, J, or K frame units with minimum 22k AIC symmetrical interrupt rating at operating voltage. Supplementary breakers, such as control and motor branch circuit protection devices, if used in lieu of listed fuses, shall be any UL listed unit with minimum interrupt rating of 5k AIC symmetrical at the operating voltage.

N. Motor controllers (starters) shall be IEC rated magnetic, rated with a minimum of 1 size hp higher. Acceptable units are Allen-Bradley 100-C Series and Allen-Bradley 100-D Series.

O. Plug-in (standard 8- or 11-pin octal) or can-type timing/relay/logic devices shall be as manufactured by Diversified, Eagle Signal, Idec, Infitec, NCC, SSAC, R&K, Allen-Bradley, or Motor Saver.

P. Enclosure shall contain the power distribution and logic components, and any indicating devices. It shall be door-in-door type, with the outer door pad-lockable. Inner door shall be interlocked by the disconnecting means. No devices shall be mounted on the outer door. All indicating devices shall be visible without shutting off power.

Q. The indoor swing-out door shall have mounted on and include but not be limited to:
   1. Thru-door operated fusible main disconnect switch or main circuit breaker operator handle, clearly indicating and pad-lockable in the "off" position with inner-door interlock.
   2. A 4-digit plus 10ths, non-resettable hour meter for each motor. Battery operated types not acceptable.
   3. A circuit wiring print pocket on the inside of outer door.

R. Mounted on the side of the main enclosure shall be (but not limited to) the following NEMA 4 devices installed such that the wiring for the devices is behind the closed inner door:
   1. There should be a green pilot light to indicate which motor is running.
   2. There should be a red pilot light for each motor to indicate overload (OL) relay trip. Pilot to remain lit until OL Reset button pressed.
   3. There should be a one push button to test all pilot lights.

S. Enclosure internal to include but not be limited to the following:
   1. Main fused disconnect switch or breaker as mentioned above, with operating mechanism. If fused, switch fuses shall be included and be the rejection type.
   2. Full-voltage magnetic starter(s) with overload relay. Starters may be of the IEC design but shall be sized and rated to NEMA standards. Overload elements (heaters) in each ungrounded phase, to be direct-heated bi-metal design and must be sensitive/reactive to single phasing condition (running loss of phase).
Overload relay must be field adjustable for manual or automatic reset. The contactors shall have field-replaceable power pole contacts.

3. Individual motor branch circuit, short-circuit, and over-current protective devices shall be provided in accordance with NEC section 430. Such devices may consist of listed rejection type fuses, inverse-time thermal magnetic, or instantaneous-trip circuit breakers sized in accordance with NEC tables 430-150 and 430-152.

4. Also acceptable would be UL type 508 combination starters consisting of a combination short-circuit/over-current/running overload protection device, and a magnetic contactor of suitable capacity. Such combinations shall have been evaluated and listed by UL for this purpose.

T. The main breaker or fuse arrangement may serve as the backup SC/OC protection for motor grouping.

U. Control Power Transformer (CPT).

1. Plug-in (octal) style logic devices required for function as outlined in this document. Include as standard a phase-monitor (PM) wired after the main fuses or breaker to sense loss of phase, improper phase sequence, and low line voltage or imbalance. The PM should be of the automatic reset type with adjustable dropout voltage. PM sensed condition to lock out all motor function and automatically restart when condition returned to normal.

V. Terminals with adequate current rating for line and field connections as required.

W. Motor starting and stopping operators and the individual motor safety/service disconnect switches.

X. Individual motor safety/service disconnect switch operators, clearly indicating, pad-lockable in the "off" position.

Y. Hand - Off - Auto selector switches for each motor. System must re-start automatically subsequent to loss and restoration of power.

Z. Individual motor safety/service switches, on/off, horsepower rated, 3-pole, UL listed.

AA. Terminals are required for 120V AC control circuitry.

BB. Heavy-duty terminals for motor power/disconnect if the switches are not a feed-thru top accessible type. Connections shall be able to be made without removing the switch.

CC. Timer control for each motor is required.

2.2 SPARE PARTS

A. The panel builder shall include at least one complete set of spare fuses for each fuse-holder in the control. At least one spare lamp shall be included for each pilot, and 2 spare SS/PB contacts of each unique block combination shall be provided.

B. If the contactors DO NOT have field replaceable contact sets, one spare contact shall be included for every four starters in the enclosure.

C. If the contactors DO have replaceable contacts, one complete spare set of power pole contacts and one spare operating coil shall be provided for every four starters in the enclosure.

PART 3 - EXECUTION

3.1 GENERAL

A. The control panel shall be protected during fabrication and installation from ingress of metal chips, debris or other foreign material from entering the components whereby such ingress would degrade or otherwise cause failure.

B. All internal wiring shall be neatly bundled or routed in wire duct or channels.

C. The contractor shall provide a method of protecting the panel until start-up and any marks shall be refinished to the approval of the engineer.
3.2 CONTROL PANEL

A. Application Type:
   1. Wastewater Treatment

B. Enclosure Type:
   1. NEMA 4X

C. List of Motors:

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<th>Phase</th>
<th>Cycle (Hz)</th>
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D. Features:
   1. Main Disconnect.
   2. ON (RUN)-OFF AUTO Switch.
   3. Non-resettable hour meter.
   4. Timer Control.
   5. Once push button to test all pilot lights.
   7. Pump motors shall not operate simultaneously in either Hand (ON) or Auto Mode.

END OF SECTION 260200
PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Rough grading of site according to site grading plan in project plans.
2. Preparing subgrade for slabs-on-grade, walks, pavements, lawns, and plantings.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
9. Finish grading for areas as designated on plans.

B. Related Sections include the following:

1. Section 015723 – Temporary Storm Water Pollution Prevention / Erosion Control.
2. Section 311000 – Site Clearing.

C. Referenced Standards include the following:

1. SAE J1179 - Hydraulic Excavator and Backhoe Digging Forces; Society of Automotive Engineers; Current Publication.
2. SAE J732 - Specification Definitions-Loaders; Society of Automotive Engineers; Current Publication.
4. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System); American Society for Testing and Materials; Current Publication.
5. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); American Society for Testing and Materials; Current Publication.
17. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; American Society for Testing and Materials; Current Publication.

1.2 UNIT PRICES
A. Excavating Soil Material:
   2. Includes: Excavating to required elevations, loading and placing materials in stockpiles.
   3. Does not include: Over-Excavating, payment will not be made for over-excavated work nor for replacement materials.
B. General Fill:
   1. Applies to unit price for compacted fill.
   3. Includes: Excavating existing soil or acquiring satisfactory soil from off site, stockpiling, scarifying substrate surface, placing where required, and compacting.
C. Granular Fill:
   1. Applies to unit price for granular fill.
   3. Includes: Obtaining material and hauling to site, stockpiling, scarifying substrate surface, placing where required, and compacting.
D. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following:
   1. 24 inches outside of concrete forms other than at footings.
   2. 12 inches outside of concrete forms at footings.
   3. 6 inches outside of minimum required dimensions of concrete cast against grade.
   4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
   5. 6 inches beneath bottom of concrete slabs on grade.
E. Unit prices for rock excavation include replacement with approved materials.

1.3 DEFINITIONS
A. Backfill: Soil materials used to fill an excavation.
B. Base Course: Layer placed between the subbase course or subgrade and asphalt or concrete pavement.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Cut: Soil materials removed from its existing location on-site to lower existing grades to plan grades.

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. Additional Excavation: Excavation below subgrade elevations as directed by Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
   3. 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. Embankment Fill: Fill placed within a dam or levee embankment footprint.

I. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
   1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-wide, short-tip-radius rock bucket; rated at not less than 120-hp flywheel power with bucket-curving force of not less than 25,000 lbf and stick-crowd force of not less than 18,700 lbf; measured according to SAE J-1179.
   2. Bulk Excavation: Late-model, track-mounted loader; rated at not less than 210-hp flywheel power and developing a minimum of 45,000-lbf breakout force; measured according to SAE J-732.

J. 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.

K. 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.

L. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

1.4 SUBMITTALS

A. Material Test Reports: Reports shall be submitted 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, one for each 10,000 cubic yards of soil material placed.

B. Material specifications and samples of proposed geotextiles, if geotextiles are required.

C. Material specifications and samples of proposed additives, if required.
D. Blasting plan approved by authorities having jurisdiction, for record purposes, if rock excavation by blasting is required.

E. Seismic survey agency report, for record purposes, if rock excavation by blasting is required.

1.5 QUALITY ASSURANCE

A. Comply with applicable requirements of NFPA 495, "Explosive Materials Code."

B. 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.

C. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.

2. Seismographic monitoring services during blasting operations.

1.6 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.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GM, GC, CL, SC, SW, and SM, or a combination of these group symbols as limited by project geotechnical reports or as limited elsewhere in these specifications; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups ML, MH, CH, OL, OH, and PT, or a combination of these group symbols or as specifically described elsewhere in these specifications, unless expressly allowed by these specifications.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

2. Unsatisfactory soils also include satisfactory soils that are specifically excluded elsewhere in these specifications.

D. Fill and Backfill:

1. Use satisfactory soil materials for un-improved areas such as lawns and landscaped areas.
2. Use Type 1 Aggregate Base Course as specified in the Missouri Department of Transportation Standard Specifications for improved areas such as pavements and sidewalks.

E. Structural Fill and Backfill: Satisfactory soil materials, conforming to the following requirements: limited to soil classification groups GW, GP, GM, SW, SP and SM; crushed stone or natural and crushed sand and gravel.

F. Dam and Levee Embankment Fill: Satisfactory soil materials, conforming to the following requirements: limited to CL, CH, or SC only; with liquid limit not to exceed 60.

G. Subbase: Type I Aggregate Base Coarse as specified in the Missouri Department of Transportation Standard Specifications.

H. 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.

2.2 ACCESSORIES

A. Filter Fabric: 6 oz. non-woven geotextile inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids. Material shall have a puncture strength greater that 95-psi as determined by ASTM D 4833.

B. 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.
5. Apparent Opening Size: No. 30; ASTM D 4751.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 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.
3.3 **EXPLOSIVES**
A. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.
   1. Do not damage adjacent structures, property, or site improvements or weaken the bearing capacity of rock subgrade when using explosives.

3.4 **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.

3.5 **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 formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.6 **EXCAVATION FOR WALKS AND PAVEMENTS**
A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.7 **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 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.

3.8 **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.
3.9 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.

3.10 Backfill

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, dampproofing, 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.

3.11 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 and pavements, steps and ramps, building slabs, and footings and foundations, Type 1 aggregate base course as specified in the Missouri Department of Transportation Standard Specifications.

3.12 Moisture Control

A. 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.

3.13 Compaction of Backfills and Fills

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.

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. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent.

3.14 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 ½ inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of ½ inch when tested with a 10-foot straightedge.

3.15 SUBBASE, BASE COURSE, AND SHOULDERS

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 698.
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 698.

3.16 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. Proceed with subsequent earthwork only after test results for previously completed work complies 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 perform the required tests and shall provide test reports to the Project Engineer within 24 hours of the completion of the tests. A Professional Engineer shall certify all test reports. Tests will be performed at a minimum of the following locations and frequencies:

1. Two initial gradation tests for each type of embedment or backfill material and one additional gradation test for each additional 500 tons of each material.
2. Two Standard Proctor compaction tests (ASTM D-698) for each type of material.

3. In place field density tests according to ASTM D 2922:
   a. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
   b. Trench Backfill: At the first 50 lineal feet of embayment material placed. This testing is to provide a demonstration of the compactive effort required to achieve the specified density. Certified tests shall be conducted once a week and/or once every 500 feet of trench.

E. The Engineer shall have the authority to order additional certification tests at any time if he feels the compactive effort is not being duplicated, or materials are not meeting these specifications.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
   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, 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.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Engineer.
   1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 310000
SECTION 311000 – SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY
   A. This Section includes the following:
   B. Protecting existing trees and vegetation to remain.
   C. Removing trees and other vegetation.
   D. Clearing and grubbing.
   E. Topsoil stripping.

1.2 REFERENCED SECTIONS INCLUDE THE FOLLOWING:
   A. Section 015723 - Temporary Storm Water Pollution Prevention / Erosion Control.

1.3 REFERENCED STANDARDS INCLUDE THE FOLLOWING:
   A. No Standards referenced in this Section.

1.4 DEFINITIONS
   A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.

1.5 MATERIALS OWNERSHIP
   A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.6 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 permission from Owner and authorities having jurisdiction.
      2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
   B. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.
   C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
   D. Notify utility locator service for area where Project is located before site clearing.
PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 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.

3.2 TREE PROTECTION

A. 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.
B. Do not excavate within drip line of trees, unless otherwise indicated.
C. 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 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.
D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Engineer.
   1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
   2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 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.

3.4 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 respraying deeper topsoil.

3.5 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 312000 – EXCAVATING & BACKFILLING TRENCHES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Trenching for piped and buried utilities.
   2. Backfilling of trenches.

B. Related Sections include the following:
   1. Section 015723 – Temporary Storm Water Pollution Prevention / Erosion Control.
   2. Section 311000 – Site Clearing.

C. Referenced Standards include the following:
   2. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using
      Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); American Society for Testing and Materials; 2000a.
   3. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the
   4. ASTM D 1586 - Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils;
   5. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber
   6. ASTM D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe of Sewers
      and Other Gravity-Flow Applications; 2000.
   7. ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil
      Classification System); American Society for Testing and Materials; 2000.
   8. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear
      Methods (Shallow Depth); American Society for Testing and Materials; 2001.
   9. ASTM D 2937 - Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method;
  10. ASTM D 3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing
      and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; American
  11. ASTM E 329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of
  12. ASTM E 548 - Standard Guide for General Criteria Used for Evaluating Laboratory Competence;

1.2 UNIT PRICES

A. Embedment Material:
   1. Measurement method: linear foot of pipe or utility material installed.
   2. Unit prices for embedment materials shall be included in unit price for pipe materials.
B. Backfill Material:
   1. Measurement method: linear foot of pipe or utility material installed.
   2. Unit prices for backfill materials shall be included in unit price for pipe materials.

C. Rock Excavation:
   1. Measurement method: cubic yard of rock, measured in original position, but not to exceed a depth of 6 inches beneath the bottom of the pipe and a width equal to the nominal pipe diameter plus 24 inches.
   2. Unit prices, where applicable, for rock excavation include the cost of replacement with approved materials. Refer to paragraph 3.4.A.

1.3 DEFINITIONS

A. Bedding: Material placed from the excavated subgrade material to the flow line of the pipe.

B. Haunching: Material placed from the flow line of the pipe to the spring line of the pipe.

C. Embedment: Includes bedding, haunching, and initial backfill.

D. Backfill: Material used to fill the excavation of a trench.
   1. Initial Backfill: Material placed from the spring line of the pipe to a minimum of 12 inches above the top of the pipe or as shown on the Plans.
   2. Final Backfill: Material placed from the top of initial backfill to the top of the trench or to the bottom of an improved surface.

E. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

F. Improved Surface: Any existing or proposed surface including roads, parking lots, curbs, slabs, sidewalks or other manmade surface courses designated to receive vehicular or pedestrian traffic or other loading; does not include lawns or landscaped areas, which are not designed or designated to receive traffic loading.

G. NPS: Nominal Pipe Size.

H. Spring Line: The elevation equal to the horizontal centerline of a pipe.

I. Subgrade:
   1. Surface or elevation at the bottom of an excavation.
   2. The top surface of backfill immediately below pavement base, subbase, drainage fill, or topsoil materials.

J. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for trench and pit excavation that cannot be removed by excavating equipment without systematic drilling, ram hammering, ripping, sawing or blasting, when permitted.

1.4 SUBMITTALS

A. Material Test Reports: Submit from a qualified testing agency indicating and interpreting test results for compliance with Section 3.18 and the following:
   1. Soil Classifications.
   2. Gradation Tests.
   3. Moisture-Density Relations (Proctor).
4. In-Place Field Density Tests.

B. Flowable Backfill Mix Design: Include mix proportions by weight and laboratory trial mix results or field test data.

1. Indicate amounts of mix water to be withheld for later addition at Project site.

1.5 QUALITY ASSURANCE

A. Comply with applicable requirements of NFPA 495, "Explosive Materials Code" or local requirements, whichever is more restrictive.

B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures shall perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent or nearby properties.

2. Seismographic monitoring services during blasting operations.

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

1.6 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 24 hours notice to property owner and Engineer’s permission.

3. Contact utility-locator service for area where Project is located before excavating.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Shall be free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, organic materials, and other deleterious matter and as specified below:

1. Embedment: ASTM D 2487 soil classification groups GW, GP, SW, SP and with fines content (% passing No. 200 sieve) not to exceed 5%.

2. Final Backfill: ASTM D 2487 soil classification groups CL, ML-CL, GC, SC, ML, MH, GW, GP, GM, SM, SP and SM, a combination of these group symbols, as limited elsewhere in these specifications.

C. Unsatisfactory Soils:


2. Final Backfill: ASTM D 2487 soil classification groups CH, OL, OH, and PT.

3. Unsatisfactory soils include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
D. Granular Embedment Material: Embedment material shall conform to Class IA, IB, or II as specified in ASTM D 2321 and as follows:

1. Class IA materials shall conform to the following gradation requirements:

<table>
<thead>
<tr>
<th>Sieve</th>
<th>% Passing</th>
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<tbody>
<tr>
<td>1 ½&quot;</td>
<td>100</td>
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<tr>
<td>3/4&quot;</td>
<td>65-100</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>47-77</td>
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<tr>
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<td>0-10</td>
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<tr>
<td>#200</td>
<td>0-5</td>
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</tbody>
</table>

a. Pre-approved Class IA materials include the following:
   1) No pre-approved materials

2. Class IB materials shall conform to the following gradation requirements:

<table>
<thead>
<tr>
<th>Sieve</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½&quot;</td>
<td>100</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>65-100</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>47-80</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>33-71</td>
</tr>
<tr>
<td>#4</td>
<td>0-50</td>
</tr>
<tr>
<td>#200</td>
<td>0-5</td>
</tr>
</tbody>
</table>

a. Pre-approved Class IB materials include the following:
   1) Grade 5 Aggregate for Drainage, as specified in Missouri Standard Specifications for Highway Construction (1999) Section 1009.

3. Class II materials shall conform to the following gradation requirements:

<table>
<thead>
<tr>
<th>Sieve</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 ½&quot;</td>
<td>100</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>65-100</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>47-100</td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>33-100</td>
</tr>
<tr>
<td>#4</td>
<td>0-100</td>
</tr>
<tr>
<td>#200</td>
<td>0-5</td>
</tr>
</tbody>
</table>

a. Pre-approved Class II materials include the following:
   1) Type 4 Aggregate for Base, as specified in Missouri Standard Specifications for Highway Construction (1999) Section 1007.
   2) Type 1 Aggregate for Base and Type 5 Aggregate for Base, as specified in Missouri Standard Specifications for Highway Construction (1999) Section 1007, may be used PROVIDED that the production of the product is controlled to provide a Maximum of 5% by weight of material passing a No. 200 sieve.

4. Use of a material not pre-approved may be acceptable only after obtaining written approval from the Engineer prior to use. The following is the minimum required information to be submitted to the Engineer for approval:

a. Name, address and phone number of Supplier
b. Name of material (include respective ASTM class designation)
c. Grain Size Analysis Tests, according to ASTM C 136.
d. Representative samples of the material(s) (1 cubic foot minimum).
2.2 CONCRETE

A. Concrete: ASTM C 94, and the following:
   1. Cement: ASTM C 150, Type I/II,
   3. Coarse Aggregate: ASTM C33, #57 or 67

B. Flowable Backfill Portland Cement Mix Design: 40-psi minimum and 80 psi maximum compressive strength.
   1. Air entrainment admixtures may be used as approved by the Engineer.

C. Concrete Fill or Encasement Portland Cement Mix Design: 3000-psi minimum compressive strength.
   1. Air entrainment admixtures may be used as approved by the Engineer.

2.3 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:
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Potable Water systems.
   5. Green: Sanitary Sewer systems.

B. Locator Wire: No. 12 vinyl-coated copper wire placed on top of pipe and inserted into valve boxes.

2.4 STEEL CASING

A. Steel casing shall be new welded steel pipe with minimum yield strength of 35,000 psi. The minimum wall thickness of steel casing shall be as shown on the following table:

<table>
<thead>
<tr>
<th>Carrier Pipe Nominal I.D. (in)</th>
<th>Minimum Casing I.D. (in)</th>
<th>Steel Casing Pipe Wall Thickness (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Highway and Field Borings</td>
</tr>
<tr>
<td>Maximum O.D. of Carrier Pipe plus 6 inches</td>
<td>0.250</td>
<td>0.312</td>
</tr>
<tr>
<td>8</td>
<td>0.281</td>
<td>0.375</td>
</tr>
<tr>
<td>10</td>
<td>0.281</td>
<td>0.375</td>
</tr>
<tr>
<td>12</td>
<td>0.312</td>
<td>0.348</td>
</tr>
<tr>
<td>15</td>
<td>0.344</td>
<td>0.563</td>
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<tr>
<td>18</td>
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<td>0.563</td>
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<tr>
<td>21</td>
<td>0.375</td>
<td>0.625</td>
</tr>
<tr>
<td>24</td>
<td>0.438</td>
<td>0.625</td>
</tr>
<tr>
<td>27</td>
<td>0.438</td>
<td>0.719</td>
</tr>
<tr>
<td>36</td>
<td>0.500</td>
<td>0.750</td>
</tr>
</tbody>
</table>
PART 3 - EXECUTION

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

3.2 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 lower and maintain water level below pipe flowline and to convey ground water away from excavation work areas. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES
A. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to Project site or using explosives on Project site.
   1. Do not damage adjacent structures, property, or site improvements or weaken the bearing capacity of rock subgrade when using explosives.

3.4 EXCAVATION FOR UTILITY TRENCHES
A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions shall be unclassified excavation.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil or granular materials.
B. The Contractor shall not open more trench in advance of pipe laying than is necessary to expedite the work. Four hundred (400) feet shall be the maximum length of open trench on any line under construction.
C. Excavate trenches to indicated grades, alignments, depths, and elevations.
   1. Minimum depth of trench excavation shall be such that there is three feet of fill above the top of the pipe.
D. Use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts or other existing property, utilities or structures above or below ground. In all such locations, hand excavation methods shall be used.

3.5 UNAUTHORIZED EXCAVATION
A. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.
3.6 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.

3.7 TRENCH WIDTH
   A. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit.
   B. Excavate trench walls vertically from trench bottom to 6 inches higher than top of pipe or conduit, unless otherwise indicated.
   C. The minimum trench width shall be as follows where trench walls are stable:
      1. NPS up to 24 inches: outside diameter of pipe plus 16 inches, but not less than 18 inches.
      2. NPS greater than 24 inches: outside diameter of pipe plus 24 inches.
      3. Where trench walls must be supported, increase the trench width sufficiently to allow the same amount of clearance as required above.
   D. Where unstable native soil conditions exist, the minimum trench width shall be as follows:
      1. NPS up to 10 inches: three times the pipe diameter.
      2. NPS greater than 10 inches: three times the pipe diameter, or the pipe diameter plus four feet, whichever is greater.

3.8 FOUNDATIONS
   A. If Engineer determines that unsatisfactory soil is present and that foundations are required, continue excavation and replace with timber, concrete or other material as directed by the Engineer. Additional excavation and replacement material such as timber, concrete, or other foundation will be paid for according to Contract provisions for changes in the Work.

3.9 GROUNDWATER BARRIERS
   A. Where native soils consist of low permeable soils such as clays or bedrock, construct groundwater barriers to minimize the flow of groundwater though the finished trench. Native soils consisting of high permeable soils such as sands may not require groundwater barriers if approved in writing from the Engineer.
   B. Groundwater barriers shall be constructed as follows:
      1. Materials: Groundwater Barrier Materials meet soil classification GC, SC, CL, OR ML-CL. Material may be finely divided suitable job excavated material, free from stones, organic matter and debris.
      2. Frequency: Construct Groundwater Barriers at a minimum of 1,000-foot intervals. Where 1,000-foot interval falls within an improved surface, construct groundwater barrier to less than the 1,000-foot interval outside of the improved surface.
      3. Depth: Groundwater barriers shall be compacted the full depth of granular embedment material from the subgrade or foundation to an elevation one foot above the top of the granular embedment material, but not less than four (4) feet.
      4. Width: shall extend the full width of the trench.
      5. Thickness: shall be a minimum of four (4) feet thick measured along the length of the pipe.
### 3.10 TRENCH BOTTOMS AND BEDDING

**A.** Pressure piping: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
3. Where rock or other unyielding bearing material exists at the trench bottom, over excavate a depth equal to one forth the outside pipe diameter but not less than 6 inches deeper than elevation required to allow for bedding course. Place and compact bedding material on trench bottom and where indicated. Shape bedding material to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

**B.** Gravity piping: Excavate trench bottom to a depth equal to one forth the outside pipe diameter, but not less than 6 inches below the required flow line elevation to allow for bedding. Place and compact bedding on trench bottom. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

2. If compaction of the bedding material can not be obtained due to natural unyielding or poor subgrade material, a foundation course may be required. Cease work and notify Engineer immediately to inspect the subgrade and recommend further action.

### 3.11 HAUNCHING

**A.** Carefully compact, as required, haunching material under pipe, bring up evenly on both sides of the pipe and along the full length of pipe to the spring line of the pipe to avoid damage or displacement of piping.

**B.** Pressure piping: use the following materials:

1. When bedding is not required; compacted satisfactory soil embedment material.
2. When bedding is required; Granular Embedment Material, compacted as required.

**C.** Gravity piping haunching material shall be as follows:

1. Granular Embedment Material, compacted as required.

### 3.12 BACKFILL GENERAL

**A.** Place and compact backfill in excavations promptly, but not before completing the following:

1. Survey placed or constructed underground utilities as required for record documents.
2. Remove trash and debris.
3. Remove temporary shoring and bracing, and sheeting.
4. Where compacted backfill is required, place the material in horizontal layers less than eight (8) inches in depth of loose measure.
5. Moisture content shall be such that the required degree of compaction can be obtained.
6. Compact each layer by hand, machine tampers, or by other suitable equipment to the required compaction.

B. Fill voids with approved initial backfill materials while shoring and bracing, and as sheeting is removed.

C. Install warning tape directly above utilities as specified elsewhere in these specifications, 12 inches below finished grade and 6 inches below improved surfaces.

3.13 INITIAL BACKFILL

A. Initial backfill shall be carefully placed and compacted as required to 12 inches above the top of the pipe to prevent damage to the pipe.

B. Unimproved surfaces: Use the following materials for initial backfill under unimproved surfaces:
   1. Pressure piping: Satisfactory Soil Embedment Material, compacted as required.
   2. Gravity piping: Granular Embedment Material, compacted as required.

C. Improved surfaces: Use the one of the following materials for initial backfill under improved surfaces:
   1. Granular Embedment Material, compacted as required.
   2. Flowable backfill.

3.14 FINAL BACKFILL

A. Unimproved surfaces: Use satisfactory soil backfill.

B. Improved surfaces: Use the one of the following materials for initial backfill under improved surfaces:
   1. Granular embedment material, compacted.
   2. Flowable backfill.

3.15 COMPACATION REQUIREMENTS

A. Bedding and Haunching: Compact embedment materials for bedding and haunching to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Satisfactory soil embedment material: 90%.
   2. Granular embedment material: 90%.

B. Backfill under unimproved surfaces: Compact embedment and backfill materials for initial and final backfill to be placed under unimproved surfaces to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Initial backfill:
      a. Satisfactory soil embedment material: 85%.
      b. Granular embedment material: 85%.
      c. Compaction of initial backfill under unimproved surfaces may be waived by the Engineer for part or the entire project. Compaction shall be required unless written approval has been obtained from the Engineer.
   2. Final backfill: adequate compactive effort shall be applied to satisfactory soil material to ensure no substantial settlement of the final backfill.

C. Backfill under improved surfaces: Compact embedment and backfill materials for initial and final backfill to be placed under improved or proposed improved surfaces to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Granular Embedment Material: 95%.
D. Groundwater Barriers: Compact groundwater barrier materials under unimproved surfaces to not less than the following Percentages of maximum dry unit weight according to ASTM D 698:

1. Groundwater Barrier Material: 90%.

E. Class IA Granular Embedment Material shall not require compaction.

F. Waiving of Compaction Testing Requirements: Class IB Granular Embedment Material compaction testing may be waived if gradation analyses reveals that the material is sufficiently open graded and that compactive efforts by either mechanical or hand compaction operations do not produce an effective increase in percent compaction. Materials proposed to be waived for compaction testing shall be approved by the Engineer prior to use on this project. The following materials have been pre-approved and do not require compaction testing:

1. No materials have been pre-approved.

G. Initial Compaction Testing shall be performed on each compacted embedment and backfill material layer within the first fifty (50) linear feet of pipe installed. This testing procedure is to provide a demonstration of the compactive effort required to achieve the specified density. Repeat this testing for each new embedment or backfill material used throughout the project.

H. Periodic Compaction Testing shall be provided on each compacted embedment and backfill material a minimum of once per week and/or once every 3,000 feet of trench being excavated. The Engineer shall have the authority to order additional tests at anytime if he feels the compactive effort is not being properly duplicated, or to reduce the frequency of testing if the compactive effort has been adequately duplicated.

3.16 FLOWABLE BACKFILL

A. All required submittals shall be approved by the Engineer prior to use of Flowable backfill.

B. Flowable backfill may be used in lieu of compacted granular embedment material for initial and final backfill under improved surfaces.

C. Flowable Backfill shall not be placed in lifts greater than three (3) feet in depth. Additional layers shall not be placed until the flowable backfill has lost sufficient moisture to be walked on without indenting more than two inches. Any damage resulting from placing flowable backfill in layers that are too thick or from not allowing sufficient time between placement of layers shall be repaired at the Contractor’s expense.

D. Flowable backfill shall be sufficiently consolidated. Consolidation may be achieved by using vibration or other approved methods.

E. Provisions shall be made to allow bleed water to drain from the excavation.

3.17 GRADING

A. General: Uniformly grade disturbed 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 trenches and to prevent ponding. Finish subgrades to match pre-existing elevations.
3.18 DIRECTIONAL BORING

A. Boring shall be by an approved bore method from ditch line to ditch line, or as shown on the plans or approved by Engineer.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: The Contractor shall 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 backfill layer. Proceed with subsequent earthwork only after test results for previously completed work complies with requirements.

C. Testing agency shall perform tests to ensure that embedment and backfill materials and their placement comply with specified requirements. The following tests shall be required and reported to Engineer:

1. Soil Classification: One initial soil classification test, ASTM D 2487 for each type of satisfactory soil embedment or backfill material and one additional test for each 10,000 cubic yards placed of each material.
   a. Initial Soil Classification test shall be reported to the Engineer and approved prior to use of material on project.

2. Gradation Test: One initial gradation test, ASTM D 422 for each type of granular embedment or backfill material and one additional test for each 10,000 cubic yards placed of each material.
   a. Initial gradation tests shall be reported to the Engineer and approved prior to use of material on project.

3. Moisture-Density Relations (Proctor): One standard proctor compaction test, ASTM D 698, for each type of material proposed, and one additional test for each 10,000 cubic yards placed of each material.

4. In place field density tests of embedment and compacted backfill shall be made as specified elsewhere in this section and according to ASTM D 2922.

D. Sample material tests such as soil classification, gradation and proctor tests shall be conducted no more than 15 days prior to submittal to the Engineer for approval. When material sample submittals are required, the testing agency shall obtain a sample of adequate size, split the sample by approved methods, perform testing on portions of the sample and return a portion of the sample to the Contractor for submittal to the Engineer.

E. Material samples shall be clearly labeled and shall be submitted along with the written reports of testing conducted on that sample. Test reports conducted prior to the Work shall not be accepted unless the material is pre-approved and current certification is provided indicating that the material meets all requirements of the certifying agency.

F. Testing Agency shall prepare and submit written reports at least once a week. Reports shall detail the material tested, the location test, the lift or elevation of material tested, the percent compaction and moisture content. Test results shall be submitted to the Contractor and Engineer.

G. When testing agency reports that embedment and backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained.

1. A written notice of failure to meet compaction shall be given to the Contractor and Engineer within 24 hours of said test. The report shall detail the location of work, type of material, and the tested percent compaction and moisture content.
3.20 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 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, re-compact, and seed & mulch.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, reconstruct surfacing, and seed & mulch.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Transport surplus satisfactory soil to designated storage areas on Owner's property or to an offsite property as approved by Engineer and written authorization of property owner. Stockpile or spread soil on owners property as directed by Engineer.
   1. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 312000
SECTION 312500 – PERMANENT EROSION CONTROL AND LANDSCAPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Seeding
   2. Mulching

B. Referenced Sections include the following:
   1. Section 015723 – Temporary Storm Water Pollution Prevention / Erosion Control.
   2. Section 311000 – Site Clearing.

C. Referenced Standards include the following:

1.2 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.

1.3 SUBMITTALS

A. Tree Planting Plan: Submit detailed layout and arrangement of proposed tree plantings.

B. Material Certificates for the following:
   1. Seed
   2. Mulch Overspray
   3. Erosion Control Blankets

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
   1. Installer’s Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
1.6 SCHEDULING

A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

B. Season: Plant seed/seedlings during seasons that will best ensure permanent establishment of grass/trees.

1. Cool season grasses: If planting is performed during the months of June, July, October or November, plant only 75 percent of the specified quantity of seed and then overseed during the months of August, September, December, January or February. If planting is performed during the months of December through May, August, or September, all seed may be planted at one time. Contractor will still be responsible for overseeding areas that may not establish.

1.7 LAWN MAINTENANCE

A. Begin maintenance immediately after each area is planted and continue until plants are established, but for not less than the following periods:

1. Seeded Lawns: 60 days following completion of seeding activities.
   a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.

B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the requirements of the Missouri Seed Law. The percentages for purity and germination or pure live seed shall conform to Missouri Standard Specification for Highway Construction Section 805.

B. Seed Species Mixes: State-certified seed of grass species, as follows:

1. Tall Fescue Mix:
   a. 55 lbs/acre Tall Fescue
   b. 15 lbs/acre Annual Rye
   c. 5 lbs/acre White Clover

2. Native Grasses Mix:
   a. 30 lbs/acre Wheat
   b. 8 lbs/acre Tall Fescue
   c. 6 lbs/acre Big Bluestem
   d. 6 lbs/acre Little Bluestem
   e. 3 lbs/acre Sideoats Grama
   f. 6 lbs/acre Indiangrass
   g. 1 lbs/acre Switchgrass
2.2 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
   a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

2.3 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:

1. Class: Class T, with a minimum 99 percent passing through No. 8 sieve and a minimum 75 percent passing through No. 60 sieve.
2. Application Rate: 1000 lb per acre, or other application rate based on a soil analysis, as approved by the ENGINEER.

2.4 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. Tall Fescue Mix:
   a. Nitrogen: 80 lbs per acre.
   b. Phosphoric acid: 160 lbs per acre.
   c. Potash: 160 lbs per acre.
2. Native Grass Mix:
   a. Nitrogen: 40 lbs per acre.
   b. Phosphoric acid: 80 lbs per acre.
   c. Potash: 80 lbs per acre.

2.5 MULCHES

A. Vegetative Mulch with an Overspray for Seeded Areas

1. Mulch: Prairie hay (any combination of Big Bluestem, Little Bluestem, Indeangrass, Sideoats Grama, native wildflowers) or straw (from oats, ry, wheat or barley). Mulch shall be clean and bright, relatively free of foreign material and dry enough to spread properly. Mulch shall be free of prohibited weed seed as stated in the Missouri Seed Law and shall be relatively free of all other noxious and undesirable seed.
2. Overspray: Virgin wood cellulose fibers or recycled slick paper conforming to requirements of Section 802 of Missouri Standard Specifications for Highway Construction. Material must not contain any germination-inhibiting or growth-inhibiting substances. Overspray shall be green in color after application and shall be evenly dispersed and suspended when agitated in water. Fibers shall not be water soluble.
B. Embedded Mulch for Seeded Areas
   1. Mulch, as specified in 2.5(A)(1) above, embedded into the soil by use of a disk-type roller having flat serrated disks spaced not more than 10 inches.

2.6 EROSION-CONTROL BLANKETS
   A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer’s recommended steel wire staples, 6 inches long.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine areas to receive grass and trees for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
   B. 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.

3.3 SUBGRADE PREPARATION
   A. Limit subgrade preparation to areas to be planted.
   B. Newly Graded Subgrades: Remove stones larger than 2-inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner’s property. Apply 3 inches (plus/minus 1 inch) of topsoil on all newly graded subgrades to be planted. Incorporate topsoil by disking to a depth of 5 inches from the final surface.
      1. Apply fertilizer and lime to topsoil before disking.
         a. Delay mixing fertilizer with soil if planting will not proceed within a few days.
         b. Mix lime with dry soil before mixing fertilizer.
      2. If planting soil mix is used, spread mix to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
         a. Spread approximately one-half the thickness of planting soil mix over loosened subgrade. Mix thoroughly into top 2 inches of subgrade. Spread remainder of planting soil mix.
   C. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus ½ inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
   D. Restore areas if eroded or otherwise disturbed after finish grading and before planting.
3.4 SEEDING

A. Application: Use the seed species mix as defined in Paragraph 2.1 of this Section for each of the following applications:

1. Within 20 feet of Edge of Pavement: Tall Fescue Mix.
2. Residential or commercial lawns: Tall Fescue Mix.
3. Natural fields or pastures: Native Grasses Mix.
4. Cultivated fields or grazing pastures: as approved by property owner and Engineer to minimize conflicts with exiting or proposed crop.

B. Sow seed with spreader or seeding machine (hydraulic seeding methods not allowed). 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.

C. Sow seed at the rates given in Paragraph 2.1.B of this Section.

D. Rake seed lightly into top 1/8 inch of topsoil and roll lightly.

E. Protect seeded areas with slopes steeper than 3H:1V with embedded mulch or erosion-control blankets installed and stapled according to manufacturer's written instructions.

F. Protect seeded areas with slopes steeper than 6H:1V by use of embedded mulch or vegetative mulch with overspray.

3.5 SATISFACTORY ESTABLISHMENT OF GRASSES

A. Grasses

1. At end of maintenance period, a healthy, uniform, close stand of grass shall have been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
2. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.6 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

C. Remove temporary erosion-control measures, as required, after grass establishment period.

END OF SECTION 312500
SECTION 323100 – CHAIN LINK FENCING AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   2. Galvanized steel framework.
   4. Signs.

B. Referenced Sections include the following:
   1. None.

C. Referenced Standards include the following:
   1. ACI 301 - Specifications for Structural Concrete; American Concrete Institute; 1999.
   2. ASTM A 53 - Specifications for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
   3. ASTM A 121 - Specifications for Zinc-Coated (Galvanized) Steel Barbed Wire.
   4. ASTM A 392 - Specifications for Zinc-Coated Steel Chain Link Fence Fabric.
   5. ASTM A 824 - Specifications for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence.
   8. ASTM C 387 - Specifications for Packaged, Dry, Combined Materials for Mortar and Concrete.
   10. ASTM F 567 - Practice for Installation of Chain Link Fence.

1.2 DEFINITIONS

A. CLFMI: Chain Link Fence Manufacturers Institute.

B. Zn-5-Al-MM Alloy: Zinc-5 percent aluminum-mischmetal alloy.
1.3  SUBMITTALS

A. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes for the following:
   1. Fence and gate posts, rails, and fittings.
   2. Chain-link fabric, reinforcements, and attachments.
   3. Gates and hardware.
   4. Barbed wire.

B. Shop Drawings: Show locations of fence, each gate, posts, rails, and tension wires and details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, elevations, sections, gate swing and other required installation and operational clearances, and details of post anchorage and attachment and bracing.

1.4  QUALITY ASSURANCE

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

B. Source Limitations for Chain-Link Fences and Gates: Obtain each color, grade, finish, type, and variety of component for chain-link fences and gates from one source with resources to provide chain-link fences and gates of consistent quality in appearance and physical properties.

1.5  PROJECT CONDITIONS

A. 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.

B. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1  CHAIN-LINK FENCE FABRIC

A. Steel Chain-Link Fence Fabric: Height indicated on Drawings. Provide fabric fabricated in one-piece widths for fencing in height of 12 feet and less. Comply with CLFMI's "Product Manual" and with requirements indicated below:
   1. Mesh and Wire Size: 2-inch mesh, 9 gage.
   2. Zinc-Coated Fabric: ASTM A 392, with zinc coating applied to steel wire mesh fabric after weaving with the following minimum coating weight:
      a. Class 1: Not less than 1.2 oz./sq. Ft. of uncoated wire surface.
      b. Class 2: Not less than 2 oz./sq. Ft. of uncoated wire surface.
   3. Coat selvage ends of fabric that is metallic coated during the weaving process with manufacturer's standard clear protective coating.
2.2 INDUSTRIAL FENCE FRAMING

A. Round Steel Pipe: Standard weight, Schedule 40, galvanized steel pipe complying with ASTM F 1083. Comply with ASTM F 1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8-oz./sq. Ft. zinc; and the following strength and stiffness requirements:
   1. Line, End, Corner, and Pull Posts and Top Rail: Per requirements for Light Industrial Fence.
   2. Line, End, Corner, and Pull Posts and Top Rail: Per requirements for Light Industrial Fence.

B. Post Brace Rails: Match top rail for coating and strength and stiffness requirements. Provide brace rail with truss rod assembly for each gate, end, and pull post. Provide two brace rails extending in opposing directions, each with truss rod assembly, for each corner post and for pull posts. Provide rail ends and clamps for attaching rails to posts.

C. Top Rails: Fabricate top rail from lengths 21 feet or longer, with swedged-end or fabricated for expansion-type coupling, forming a continuous rail along top of chain-link fabric.

D. Extended Members: Extend posts above top of chain-link fabric as required to attach barbed wire assemblies.

2.3 TENSION WIRE

A. General: Provide horizontal tension wire at the following locations:
   1. Location: Extended along bottom of fence fabric.

B. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire complying with ASTM A 824 and the following:
   1. Coating: Type II, zinc coated (galvanized) by the hot-dip process, with the following minimum coating weight:

2.4 INDUSTRIAL SWING GATES

A. General: Comply with ASTM F 900 for the following swing-gate types:
   1. Double gate.

B. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1083 and ASTM F 1043 for materials and protective coatings.

C. Frames and Bracing: Fabricate members from round galvanized steel tubing with outside dimension and weight according to ASTM F 900.

D. Frame Corner Construction: As follows:
   1. Welded or assembled with corner fittings and 5/16-inch- diameter, adjustable truss rods for panels 5 feet wide or wider.

E. Gate Posts: Fabricate members from round galvanized steel pipe with outside dimension and weight according to ASTM F 900 for the following gate fabric heights and leaf widths:

F. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame as required to attach barbed wire assemblies.
G. Hardware: Latches permitting operation from both sides of gate, hinges, center gate stops and, for each gate leaf more than 5 feet wide, keepers. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

1. Provide chains as needed.
2. Provide and maintain temporary locks until facilities are released to the Owner. Coordinate the switching of locks with the Owner to ensure that facilities remain secure.

2.5 INDUSTRIAL HORIZONTAL SLIDE GATES

A. General: Comply with ASTM F 1184 for the following slide-gate types:

1. Classification: Type II Cantilever Slide, Class 1 with external roller assemblies.
2. Classification: Type II Cantilever Slide, Class 2 with internal roller assemblies.

B. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1083 and ASTM F 1043 for materials and protective coatings.

C. Frames and Bracing: Fabricate from round galvanized steel tubing with outside dimension and weight according to ASTM F 1184.

D. Frame Corner Construction: As follows:

1. Type II Cantilever Slide Gates: Welded.

E. Gate Posts: Fabricate members from round galvanized steel pipe with outside dimension and minimum weight according to ASTM F 1184.

F. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame as required to attach barbed wire assemblies.

G. Guide Posts and Roller Guards: As required per ASTM F 1184 for Type II, Class 1 gates.

H. Hardware: Latches permitting operation from both sides of gate, locking devices, hangers, roller assemblies and stops fabricated from galvanized steel. Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.

1. Provide chains as needed.
2. Provide and maintain temporary locks until facilities are released to the Owner. Coordinate the switching of locks with the Owner to ensure that facilities remain secure.

2.6 FITTINGS

A. General: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F 626.

B. Pipe Sleeves: For posts set into concrete, provide preset hot-dip galvanized steel pipe sleeves complying with ASTM A 53, not less than 6 inches long with inside dimensions not less than 1/2 inch more than outside dimension of post, and flat steel plate forming bottom closure.
2.7 BARBED WIRE

A. Zinc-Coated Steel Barbed Wire: Comply with ASTM A 121, Chain-Link Fence grade for the following three-strand barbed wire:

   1. Standard Size and Construction: 12 gauge wire with, 3-point round barbs spaced not more than 5 inches on center.

2.8 CAST-IN-PLACE CONCRETE

A. General: Comply with ACI 301 for cast-in-place concrete.


   1. Concrete Mixes: Normal-weight concrete with not less than 3000-psi compressive strength (28 days), 3-inch slump, and 1-inch maximum size aggregate.

C. Materials: Dry-packaged concrete mix complying with ASTM C 387 for normal-weight concrete mixed with potable water according to manufacturer’s written instructions.

2.9 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.

B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer for exterior applications.

2.10 SIGNS

A. Signs shall meet or exceed the minimum standards given in the Missouri Standard Specifications for Highway Construction Section 1041 entitled Construction Signs, and all referenced standards therein.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.

   1. Do not begin installation before final grading is completed, unless otherwise permitted by Engineer.

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

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
3.3 INSTALLATION, GENERAL

A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
   1. Install fencing on established boundary lines inside property line.

B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

C. Post Setting: Hand-excavate holes for post foundations in firm, undisturbed or compacted soil. Set posts in concrete footing. Protect portion of posts aboveground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Using mechanical devices to set line posts per ASTM F 567 is not permitted. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.
   1. Dimensions and Profile: As indicated on Drawings.
   2. Concealed Concrete Footings: Top of footings shall be 2 inches below grade to allow covering with surface material.
   3. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer’s written instructions, and finished sloped to drain water away from post.
   4. Posts Set into Concrete in Voids: Form or core drill holes not less than 5 inches deep and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer’s written instructions, and finished sloped to drain water away from post.

3.4 CHAIN-LINK FENCE INSTALLATION

A. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.

B. Line Posts: Space line posts uniformly at 8 feet on center.

C. Post Bracing Assemblies: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail and at two-thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.

D. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch-diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.
   1. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same gage and type of wire.

E. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended by fencing manufacturer.
F. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.

G. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 15 inches on center.

H. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

I. Barbed Wire: Install barbed wire uniformly spaced as indicated on Drawings. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.

3.5 GATE INSTALLATION

A. General: Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.6 ADJUSTING

A. Gate: Adjust gate to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

B. Lubricate hardware and other moving parts.

END OF SECTION 323100
SECTION 331100 – WATER SUPPLY WELLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes materials and procedures for drilling and developing water supply wells in consolidated formations, including the following:

1. Test holes.
2. Drilling.
5. Draw down Testing.
6. Pump base pedestal.

B. Referenced Sections include the following:

1. Section 013200 – Schedule.

1.2 DRILLER’S EXPERIENCE

A. The Contractor shall submit evidence that he has adequate qualifications to complete all items of the Contract. This shall include the proper drill rigs, compressors, trucks, trailers, pump service rigs, testing equipment, and at least six references of previously completed state approved, pressure grouted, wells of similar size and depths covered by these plans and specifications. Preferably, the referenced wells shall have been drilled by the same Driller the Contractor intends to use on this project.

B. The work of drilling, casing and testing the well shall be performed by careful, efficient, and skilled mechanics in the normal full-time employment of the Contractor. All work is to be done by the same Contractor. No subcontracting will be allowed.

1.3 SUBMITTALS

A. Schedule: Submit a Preliminary Construction Schedule and Submittal Schedule according to Division 01 Section 013200 – Schedule.

B. The Contractor shall submit the following submittals:

1. Drilling fluid product data sheets.
2. Additive product data sheets.
3. Test Hole Report.
4. Operation and Maintenance materials.

PART 2 - PRODUCTS

2.1 CASING

A. The well shall be cased with new steel or wrought iron pipe meeting AWWA Standard A-100, ASTM or API specifications for water well construction, having full circumferential welds or threaded coupling joints, and installed in a water tight manner. If threaded joints are used, long recessed couplings shall be required and the completed joint shall have no more than two (2) exposed threads. The casing pipe shall have the minimum weight and thickness indicated below:
### Table: Nominal Size (inches)

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<th>10&quot;</th>
<th>12&quot;</th>
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<td>Inside Dia. (Inches)</td>
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<tr>
<td>Thickness (inches)</td>
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<tr>
<td>Weight (lbs per foot)</td>
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</tr>
<tr>
<td>Threads with Couplings</td>
<td>29.35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 2.2 LINERS

A. Well liners, if required, shall be of new steel or wrought iron pipe with a minimum wall thickness of 0.322 inches and shall be installed as directed by the State Geologist.

#### 2.3 GROUT

A. The cement grout shall be mixed at the site and shall be mixed to weigh at least fourteen pounds per gallon and shall conform to ASTM C150 with not more than six gallons of water per sack of cement.

### PART 3 - EXECUTION

#### 3.1 GENERAL INSTRUCTIONS

A. At least one week before starting to drill the well, the Contractor shall send a written request (copy to Engineer) to the State Geologist who will furnish a set of small sample sacks, a drill record book, and a letter of instructions regarding the collection and handling of drill cuttings. The Contractor shall request these items from:

1. Department of Natural Resources - Geological Survey and Resource Assessment Division (GSRAD)
   P. O. Box 250
   111 Fairgrounds Road
   Rolla, Missouri 65401
   (573-368-2100).

B. The well driller shall save a sample of cuttings from every five (5) feet of well depth and shall place the samples in properly labeled sacks. The cuttings shall be taken from the bailer or the well head, and not from the slush pit. The sacks containing the cuttings shall be sent, prepaid, to the State Geologist at Rolla, Missouri, for examination each day until the casing is set. After the casing is set, the samples shall be submitted weekly. A copy of the driller's log for the particular period shall accompany the samples.

C. The driller shall note in the drill record book, the identification of soil and rock formations encountered, and the location and depth of any openings, crevices, soft or broken ground, or discontinuities. The driller shall also note in the drill record book, the depth at which water is encountered, and the static water level as the drilling progresses and at the completion of the well. The drill record book shall also contain complete information as to the depth of casing, methods of sealing same, and seal test results.

D. When well drilling is completed, the driller shall forward all samples of cuttings not previously submitted and the drill record book to the State Geologist. Before final submittal to the State Geologist, the drill record book and the cuttings shall be accessible to the Engineer at all times.

#### 3.2 PLUMBNESS AND ALIGNMENT

A. The well shall be sufficiently straight and plumb to permit installation of the casing without binding and to permit satisfactory operation of the deep well pump. To demonstrate this fact, the Contractor shall furnish tools, labor, and equipment, at his expense, for testing plumbness and alignment. Tests shall be made after construction of the well is complete and before its acceptance. Additional tests, however, may and should be made by the
Contractor during performance of the work. The following method shall be used to verify the plumbness of the well:

1. A dummy casing forty (40) feet long and having an external diameter of not more than one-half (1/2) inch smaller in diameter than the inside diameter of the grouted casing shall be lowered throughout the depth of the well without binding.

2. Should the dummy casing fail to move freely throughout the length of the well, or should the well vary from the vertical in excess of two-thirds of the smallest inside diameter of that part of the well being tested per 100 feet of depth, the Contractor shall correct the plumbness and alignment of the well at his own expense. Should the Contractor fail to correct such faulty alignment or plumbness, the Engineer may refuse to accept the well. The Engineer may waive the requirements of this paragraph if, in his judgement:
   a. The Contractor has exercised all possible care in constructing the well and the defect is due to circumstances beyond his control.
   b. The utility of the completed well will not be materially affected.
   c. The cost of necessary remedial measures will be excessive.

B. In no event will the provisions of this paragraph with respect to alignment be waived.

3.3 GROUTING

A. After the casing has been installed to the proper depth, centered, and plumbed, it shall be raised approximately one foot and held securely in that position. Before the cement grout is introduced, water shall be circulated upward through the annular space and forced to the ground surface. A satisfactory casing seal shall be made by filling the entire annular space between the casing and the drill hole with neat cement grout, which shall be introduced through a conductor pipe within the casing and forced upward under pressure from the bottom of the casing in one continuous operation until the grout emerges at the ground surface on the outside of the casing. The conductor pipe shall be connected to a suitable plug at the bottom of the casing by means of a valved fitting. Methods utilizing the well casing for conducting grout shall not be used. After grout is applied, work on the well shall be discontinued for at least 72 hours or until the grout has properly set.

B. Where crevices or fractured formations make it impossible to circulate water through the annular space to the ground surface, bentonite or similar materials may be added to the circulating water to seal the formation before grouting is commenced. If, in the opinion of the Missouri Department of Natural Resources, it is impossible to seal such openings in this manner, the annular space shall be cemented as far as possible with grout introduced from the bottom of the casing and the remainder of the annular space shall be cemented by introducing grout from the top of the ground through a one (1) inch pipe inserted in the annular space. The pipe shall extend to within a few inches of the grout surface and, as the grout is introduced, the grout pipe shall be raised.

3.4 STATIC WATER LEVEL

A. The static water level in the drill hole shall be accurately determined before the casing is set and again after the casing seal is completed. Both determinations shall be recorded in the drill record book.

3.5 DEVELOPMENT

A. A temporary pump with a capacity in excess of the anticipated lift and final production capacity of the well, or other adequate equipment shall be installed for the purpose of developing the well and making a capacity test to determine the hydraulic conditions of the well. The well water shall be thoroughly developed, cleaned, and tested, and the well water shall be clear of sand before the permanent pump is installed. The Contractor shall meet the following development criteria:

1. Sand content shall be less than 5 mg/L for a minimum of a 2 hour time period
2. There shall be no significant increase in specific capacity, the ratio of discharge rate to the unit of drawdown it produces, during the duration as set forth in the Testing Section herein.

### 3.6 YIELD AND DRAWDOWN TEST

A. Yield and drawdown tests shall be performed prior to placement of the permanent pump. To perform the test, the Contractor shall furnish the equipment necessary to pump the well at a minimum capacity of 1.5 times the design capacity at the maximum anticipated drawdown. The Contractor shall also provide the equipment necessary to measure the flow and water level in the well. The equipment shall include, but not be limited to, a pump capable of 1.5 times the design flow with sufficient piping to place the pump at the design setting, throttling devices to reduce the discharge, flow meter, air line complete with gage, hand pump, and check valve. The Contractor shall provide for continuous, uninterrupted pumping throughout each stage of the testing.

B. The yield and drawdown test shall be conducted in two stages. During Stage 1, the well shall be pumped at 1.5 times the design pumping rate until stabilized drawdown in the well has continued for at least four hours. The total duration of this stage of the test shall be no less than 8 hours and no more than 24 hours, unless otherwise directed by the Engineer, in which case payment for additional testing shall be made at the unit rate provided in the bid.

C. After completion of Stage 1, Stage 2 shall include the well being pumped at the design rate and against a pressure approximately equal to the total dynamic head produced by the system until stabilized drawdown has continued for at least eight hours. The duration of this stage of the test shall not exceed 24 hours, unless otherwise directed by the Engineer, in which case payment for additional testing shall be made at the unit rate provided in the bid.

D. Stage 1 and Stage 2 may be conducted consecutively or as two separate events, at the discretion of the Contractor. If pumping is stopped for any duration of time between Stage 1 and Stage 2, the Contractor shall wait until the water level in the well has recovered to within one foot of the pre-pumping level before initiating pumping for Stage 2. After completion of the pumping test(s), Contractor shall monitor rebound of the water level in the well for four hours, or until the water level has rebounded to within 2 feet of the pre-pumping level.

E. After completion of Stage 1 and Stage 2, the Contractor shall supply all information necessary to size the permanent pumping equipment. Water level measurements shall be made according to the schedule found on the enclosed “Aquifer Test Data” form found at the end of this section, or similar form to record water level readings and pump test data. The Contractor shall complete the “Well and Pump Data” sheet also enclosed at the end of this section. Both forms shall be submitted to the Engineer.

F. The Contractor shall provide the following to the Engineer and the Missouri Department of Natural Resources upon completion of the yield and drawdown tests:
   1. Test pump capacity-head characteristics.
   2. Static water level.
   3. Depth of test pump setting.
   4. Time of starting and ending each test cycle.

G. The Contractor shall also provide recordings and graphic evaluation of the following at one-hour intervals to the Engineer and the Missouri Department of Natural Resources upon completion of the yield and drawdown tests:
   1. Pumping rate.
   2. Pumping water level.
   3. Drawdown.
   4. Water recovery rate and levels.
3.7 PUMP BASE
A. A concrete pump base shall be constructed as shown on the drawings. The top of the base shall be at the elevation shown, and the base shall extend deep enough to rest on ground that will give adequate support. The concrete shall be poured in place and shall have a 28-day compressive strength of at least 3,000 PSI. The top of the base shall be sloped downward toward the sides, and all corners shall be chamfered. All exposed surfaces shall be troweled or rubbed smooth and kept clean.

3.8 DISINFECTION
A. After the well has been completely constructed, it shall be thoroughly cleaned of all foreign substance, including tools, timber, rope, and debris of any kind, cement, oil, grease, joint dope, and scum. The casing pipe shall be thoroughly swabbed, using alkalis if necessary, to remove oils, grease, or joint dope.
B. In the case where the Well Driller Contractor is the same as the Well Pump Installer, disinfection is not required until after the permanent pump is installed.
C. Otherwise, the well shall be disinfected with a 25-ppm chlorine solution. With the temporary pump installed, the chlorine solution shall be poured into the well, and the well shall be agitated to accomplish mixing and then let stand for 24 hours. At the end of the 24-hour period, the well shall be pumped, and a chlorine residual test shall be run on the discharge. A chlorine residual of at least 0.5 ppm will be required to insure disinfection. After disinfection is accomplished to the satisfaction of the Engineer, the well shall be pumped to waste until all chlorine is removed.

3.9 BACTERIOLOGICAL, CHEMICAL, AND RADIOLOGICAL TESTING
A. The Contractor shall arrange for water testing from the completed well for bacteriological and chemical analysis. Test results must be submitted to the Engineer prior to release of final payment. The Contractor has the option to submit samples to a private lab, or to the Water Supply Program, Missouri Department of Natural Resources, for bacteriological and chemical analyses. The Contractor shall be fully responsible for any delays caused by sampling or testing of the water.
B. The well shall not be put in service until the analyses are completed and the water supply is approved by the state. Such approval shall not affect the acceptance of the well or payment to the Contractor.
C. The well shall be tested for radiological activity as required by the Missouri Department of Natural Resources.

3.10 WELL HEAD PROTECTION
A. Contractor shall provide protection to prevent tampering with the well or the introduction of foreign materials into the aquifer at all times during the construction. Caps shall be provided to seal the top of the well head. A threaded cap or a welded steel plate shall be used to seal the well during periods during the construction when the well will be left unattended for more than three calendar days. A properly fitted, firmly driven, wooden plug may be used as a temporary cap for periods less than three calendar days.
B. Contractor shall identify the location of all potential sources of pollution within a 1000 foot radius of the well and shall take all reasonable measures to prevent contamination from these sources. The Contractor shall provide a report of site reconnaissance, a sketch identifying the location of identified sources, and a record of actions taken to prevent contamination.
C. The permanent connection of the pump motor to the well casing shall include a bolted and gasketed connection between the motor base and the well casing to prevent contamination of the well.
D. The well casing shall terminate 4 feet above the 100-year flood elevation.
3.11 DISPOSAL OF WATER AND CUTTINGS

A. During the drilling and test pumping, the Contractor shall discharge all water and cuttings into an earth pit where the cuttings can be separated from the water so as to minimize discharge of the cuttings to the natural drainage course. A 90 degree v-notch weir shall be installed at the outlet of the earth pit to measure flow rates during the drilling operation for the air rotary drilling method.

B. The method and location of disposal shall be approved by the Owner. The contractor shall furnish all labor, materials, and equipment for constructing ditches or laying pipe and the cost of all such work shall be paid for by the Contractor. All ditches and pits dug by the Contractor shall be filled in to the satisfaction of the Owner upon completion of work.

3.12 PROTECTION OF THE SITE

A. Except as otherwise provided, the Contractor shall protect all structures, such as walks, pipelines, trees, shrubbery, and lawns during the progress of his work. Upon completion of the work, the Contractor shall remove all debris and unused materials and shall restore the site as nearly as possible to its original condition, including the replacement, at the Contractor's sole expense, of any facility or landscaping which has been damaged or destroyed.

3.13 CLEANUP

A. When the well has been completed, the Contractor shall remove all his equipment, material, etc. from the site and remove or dispose of all rubbish or other unsightly material caused by his operations. He shall restore the site to at least its original condition.

3.14 WELL ABANDONMENT

A. Well abandonment, if required, shall be completed in accordance with the rules set out in 10 CSR 23-3.110. The Contractor shall be responsible for registering the abandoned well with the Missouri Department of Natural Resources.

3.15 MEASUREMENT

A. The total depth of the drilled well shall be accurately measured from the surface of the ground at the well site to the bottom of the well and to points where the size of the hole is reduced. The lengths of casing (and liners, if any) set shall also be measured. All measurements shall be made to the nearest foot by the Contractor in the presence of the Engineer.

3.16 PAYMENT

A. Payment for drilling and completing the production well and testing will be made as follows: Total payment amount is based on assumed aquifer characteristics. Total payment amount shall be adjusted prior to payments being made based on the results of the test hole and unit prices provided in the bid. Upon successful completion of the Drawdown Testing and acceptance of the results by the Engineer and Owner, and completion of all disinfecting, water quality testing, and cleanup, payment shall be made at one hundred (100) percent of the total lump sum amount for each well. No partial payments will be made to the Contractor. Section 19.1 and 19.2 of the General Conditions do not apply to this Contract.

B. Payment will not be contingent upon completion of the chemical analysis results, but chemical samples must have been collected prior to payment.

END OF SECTION 331100
SECTION 331400 – WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Special Provisions apply to this Section.

1.2 SUMMARY

A. This Section includes water-distribution piping and specialties outside the building for the following:
   1. Water services
   2. Water mains
   3. Fire services
   4. Process Piping

B. Referenced Sections include the following:
   1. Section 312000 - Excavating and Backfilling Trenches.

C. Referenced Standards include the following:
   1. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 in. through 12 in. (100 mm through 300 mm), for Water Distribution; American Water Works Association; 1997.
   2. AWWA C110 - ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in. (76 mm through 1,219 mm), for Water; American Water Works Association; 1998.
1.3 DEFINITIONS
A. Fire-Service Main: Exterior fire-suppression-water piping.
B. Water Main: Exterior water distribution system piping.
C. Water Service: Exterior domestic-water piping.
D. Process Piping: Piping used within treatment facilities or used to connect treatment processes.
E. The following are industry abbreviations for piping materials:
   1. PVC: Polyvinyl chloride plastic.
   2. DIP: Ductile iron pipe.

1.4 SUBMITTALS
A. Product Data: For the following:
   1. Piping
   2. Fittings
   3. Meters
   4. Meter boxes
   5. Valves

1.5 QUALITY ASSURANCE
A. Product Options: Drawings indicate size, profiles, and dimensional requirements of piping and specialties and are based on the specific system indicated.
B. Regulatory Requirements:
   1. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
   2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.
C. Piping materials shall bear label, stamp, or other markings of specified testing agency.
D. NSF Compliance:
   1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF-pw" on piping.
   2. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.6 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 if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use hand wheels 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.

1.7 PROJECT CONDITIONS

A. 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 Owner not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's written permission.

1.8 PERMITS

1. Contractor shall refer to utility company to obtain all required permits and pay any associated permitting fees prior to commencement of work.

1.9 COORDINATION

A. Coordinate service connections to water main with utility company.

PART 2 - PART - PRODUCTS

2.1 PIPING MATERIALS

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

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Ductile-Iron Pipe: AWWA C151, Class 53 with mechanical-joint, push joint, or flanged joint as indicated. Inside of pipe and fittings shall be lined with cement mortar complying with ANSI A21.4 with a minimum thickness of 1/16th inches.

   1. Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern – Mechanical joint or flanged joint as indicated.

      a. Joint Restraint: All buried valves and fittings used on this project shall have restrained mechanical joints. For pipe 4” and larger use the Megalug Series 1100 produced by EBAA Iron Inc. or approved equal. For pipe smaller than 4” use a knuckle type joint and restraint such as that manufactured by HARCO (Harrington Corporation of Lynchburg, Virginia) or approved equal.

B. Ductile-Iron Flexible Expansion Joints: Compound, ductile-iron 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. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
C. Ductile-Iron Deflection Fittings: Compound, ductile-iron coupling fitting with sleeve and flexing sections for up to 20-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

D. Ductile-Iron Expansion Joints: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

E. Exposed Ductile Iron Pipe and Fittings: The coatings on all exposed piping inside buildings or structures shall be un-coated and suitable for painting.

2.3 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
   2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
   3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.4 PVC PIPE AND FITTINGS

A. PVC Pressure Pipe: Class 200, SDR 21, for rubber gasketed joints. PVC pressure pipe shall meet the following:
   2. PVC Pressure Rate Pipe: ASTM D 2241.
   4. Fittings shall be Ductile Iron

B. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket and spigot end.
   1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
      a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.5 GATE VALVES

A. AWWA, Cast-Iron Gate Valves: Nonrising-Stem, Resilient-Seated Gate Valves: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
   2. End Connections: Mechanical joint.

2.6 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," bottom section with base of size to fit over valve, and approximately 5 inch diameter barrel.
   1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.7 CHECK VALVES
A. Check valves shall have openings or waterways at least equivalent to the full area of the connecting pipes. They shall be of the single balanced disc, swing pattern type, with an outside spring lever, fully bronze mounted, with flanged, or mechanical joint ends as the nature of the connection shall require. In general ruggedness of design and construction, and in materials and workmanship, they shall correspond to the gate valves specified herein. The bottom of the cases shall have no pockets in which gravel, stones, or grit can collect. All internal working parts shall be readily accessible and removable through flanged covers. All check valves shall be checked for water-tightness and shall be tight against a back pressure of not less than 150 psi. Quality shall be equal to the Mueller A-2600 Series or the Clow F5380 Series check valves.

B. Silent check valves shall be installed where indicated on the plans. Silent check valves shall be the globe style, silent type with semi-steel bodies and bronze or stainless steel trim. They shall be of the wafer design with easily replaceable parts. The silent check valves shall perform equally well in all positions. The silent check valves shall be Val-Matic Silent Check Valves as manufactured by the Val-Matic Valve and Manufacturing Corporation or approved equal.

2.8 BUTTERFLY VALVES

A. Butterfly valves shall be cast or ductile iron body, rubber-seated; with bronze or stainless steel mountings. Butterfly valves shall be manufactured in full compliance with AWWA C504. Valves shall have standard flange, wafer, or mechanical joint ends, as the nature of the connections shall require. The operating stem shall be equipped with coupling nuts for extension stem. Quality shall be equal to the Dresser 450 Series or Clow F5300 Series butterfly valves. Extension stems and cast iron valve boxes shall be provided as shown on the plans. Floorstands shall be provided where shown on the plans.

2.9 ELECTRIC VALVE ACTUATORS

A. All electric actuators shall conform to AWWA C540-02 containing the following:
   1. motor
   2. gearing
   3. manual over-ride
   4. limit switches
   5. torque switches
   6. drive coupling
   7. integral motor controls
   8. position feedback transmitter
   9. mechanical dial position indicator

B. Motor: Induction type with class F insulation protected by means of thermal switches imbedded in the motor windings. The motor shall be specifically designed for actuator service.
   1. Electrical: 120 Volt, single phase, 60 hertz.

C. Motor Enclosure: NEMA 4 (watertight), totally enclosed, non-vented.

D. Gearing: grease lubricated designed to withstand full torque of motor.

E. Manual Over-ride: manual operation shall be via power gearing to minimize rim pull and facilitate easy change-over from motor to manual operation when actuator is under load. Return to electric operation mode shall be automatic upon motor operation. A seized or inoperable motor shall not prevent manual operation.
   1. Operator: Hand Wheel (or Chain drive if over 6'-6” above standing surface).

F. Limit Switches: shall be furnished at each end of travel. Limit switch adjustment shall not be altered by manual operation and shall be driven by counter-gear. Adjustment of limit switches shall require no more than five (5)
turns of the limit switch adjustment spindle. One set of normally open and one set of normally closed contacts shall be provided each end of travel. Contacts shall be silver and capable of reliably switching low voltage DC source from the control system.

G. Torque Switches: Each end of travel shall be equipped with a mechanically operated torque switch to trip when the valve load exceeds the torque switch setting. Torque switch adjustment device shall be calibrated directly in engineering units of torque.

H. All wiring shall be terminated at plug and socket connectors.

I. Quarter turn actuators shall be furnished with mechanical stops that restrict the valve/actuator travel.

J. Actuator shall be capable of valve closing times of: 60 seconds.

K. Operating temperature range: -20 to 160 degrees F with motor controls.

L. Open/Close Actuators: Integral motor controls shall consist of:
   1. reverse starters
   2. control transformer
   3. phase discriminator
   4. monitor relay (to signal fault conditions such as thermal switch trip, torque switch tripped in mid-travel, wrong phase sequence or phase failure)
   7. Indicator lights: red and green.
   8. Control system interface with optical isolators to separate incoming voltage signals from the internal motor controls.

M. Modulating Actuators: Dynamic valve torque shall be no more than 60% of the electric actuator’s maximum rated breakaway torque. Power gearing in modulating actuators shall have zero backlash between the motor and the actuator output. Integral motor controls shall consist of:
   1. Feedback potentiometer
   2. reverse starters
   3. control transformer
   4. phase discriminator
   5. monitor relay (to signal fault conditions such as thermal switch trip, torque switch tripped in mid-travel, wrong phase sequence or phase failure)
   8. Indicator lights: red and green.
   9. Positioner capable of accepting a 4-20 mA DC command signal and positioning valve by comparing the command signal with the present valve position as indicated by the feedback potentiometer mounted inside the actuator.
   10. The positioner shall be field adjustable to fail to the “Open”, “Closed” or “Last” position on loss of 4-20 mA DC command signal.

2.10 AIR RELEASE VALVES

A. Air release valves shall be of the simple lever type and shall be capable of automatically releasing accumulated air from a fluid system while that system is in operation and under pressure. To assure drop tight shut-off, a viton orifice button shall be used to seal the valve discharge orifice when the valve is in a closed position. The orifice diameter will be sized for use within a given operating pressure range to insure maximum discharge
capacity. The body and cover shall be of cast iron. With the exception of the viton orifice button, the leverage mechanism, float, and all other internal trim shall be of stainless steel. The stainless steel float shall be designed to and capable of withstanding a pressure in excess of 1,000 psi. Quality shall be equal to the Val-Matic Models #15, #22, or #25.

2.11 PRESSURE RELIEF VALVES
A. Pressure relief valves shall by-pass or relieve excess pressures that may occur in the system. It shall be the hydraulically operated, pilot controlled, diaphragm type and shall have a single removable seat and resilient disc. No external packing glands will be allowed and the diaphragm shall not be used as a seating surface. The pilot control shall be a direct acting, adjustable, spring loaded, diaphragm valve designed to permit flow when the controlling pressure exceeds the spring setting. The pilot control system shall operate such that as excess line pressure is dissipated, the main valve will gradually close to a positive, drip tight seating. The valve shall be the globe type and shall be rated for a pressure range of 20 to 200 psi. The valve shall be a Clayton 50 Pressure Relief Valve as manufactured by the Cla-Val Company or an approved equal.

2.12 FREE STANDING FIRE HYDRANTS
A. Dry-Barrel, High-Pressure Fire Hydrants: AWWA C502, one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure, and 250-psig minimum working-pressure design.
   1. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
   2. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
   3. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.

2.13 WATER METERS
A. Water meters shall be purchased through, and as required by the local utility company.
B. Description: AWWA C700, displacement-type, bronze main case. Register flow in gallons unless cubic feet are indicated.
C. Description: AWWA C701, turbine type. Register flow in gallons unless cubic feet are indicated.
D. Description: AWWA C702, compound-type, bronze case. Register flow in gallons unless cubic feet are indicated.

2.14 METER BOXES
A. Description: Cast-iron body and cover for disc-type water meter with lettering "WATER METER" in cover; and slotted, open-bottom base section of length to fit over service piping.
   1. Option: Base section may be cast-iron, PVC, or other pipe approved by the Engineer.
B. Description: Cast-iron body and double cover for disc-type water meter with lettering "WATER METER" in top cover; separate inner cover; air space between covers; and slotted, open-bottom base section of length to fit over service piping.
C. Description: Polymer-concrete body and cover for disc-type water meter with lettering "WATER" in cover; and slotted, open-bottom base section of length to fit over service piping. Include vertical and lateral design loadings of 15,000 lb minimum over 10 by 10 inches square.
2.15 EXTERIOR PIPE COATINGS

A. Buried Ductile-iron Pipe: Bituminous coated with either coal tar or asphalt base of approximately one mill thickness.

B. Exposed pipe: Three coat Alkyd Enamel system.

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to Section 312000 - Excavating and Backfilling Trenches for excavating, trenching, and backfilling.

B. Field check all dimensions shown on the plans and the "certified" equipment shop drawings and rectify any discrepancies before starting the work. All existing dimensions shall be verified in the field. Interferences shall be brought to the attention of the Engineer in writing.

C. Elevations of underground piping, uniform slope in direction of flow, and installation details shall be as shown on the plans and as specified in the Technical Specifications.

D. Any damage caused, directly or indirectly, to structures, buildings, equipment, utilities, roadways, and/or sidings shall be repaired or replaced to the satisfaction of the Engineer.

E. When obstructions that are not shown on the plans are encountered during the progress of work and interfere so that an alteration of the plans is required, the Owner, through the Engineer, will alter the plans or order a deviation in line and grade or arrange for removal, relocation, or reconstruction of the obstructions.

F. When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the approval of the Owner, to provide clearance as required by federal, state, or local regulations or as deemed necessary by the Owner to prevent future damage or contamination of either structure.

3.2 SEPERATION OF WATER MAINS AND SANITARY SEWERS

A. Horizontal Separation: Where potable water lines are to be laid parallel to existing or proposed sanitary sewers, it will be necessary to maintain at least ten (10') feet horizontal separation, edge of pipe to edge of pipe, between the gravity and pressure sewer lines and water lines. Pressure sewer line and water lines shall be laid in separate trenches.

1. In cases where the minimum horizontal separation cannot be obtained, water mains shall be laid in a separate trench or on an undisturbed earth shelf at such elevation where the bottom of the water main shall be at least eighteen inches (18") above the top of the sewer line. The Contractor shall notify the Engineer when minimum horizontal separations cannot be attained.

B. Vertical Separation: Water mains crossing sewers either above or below shall have a minimum of eighteen inches (18") vertical separation from edge of pipe to edge of pipe.

1. In cases where the minimum vertical separation cannot be obtained, water mains shall be constructed of mechanical joint PVC or ductile iron pipe with joints at least ten (10') feet each direction from the crossing point or cased in continuous casing that extends at least 10 feet (10') in each direction of the crossing point. The Contractor shall notify the Engineer when minimum vertical separations cannot be attained.

C. Separation from Sewer Manholes: Water lines shall be laid with a minimum horizontal clearance of ten feet (10') to any sewer manhole. The Contractor shall notify the Engineer if field conditions are such that the minimum separation cannot be obtained before continuing with construction.
3.3 PIPING APPLICATIONS

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

B. Use full lengths of pipe where length between fittings is less than the Mill-random lengths of pipes. Extra joints shall be avoided.

C. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.

D. Do not use flanges, unions, or keyed couplings for underground piping.

E. Underground Water Service Piping: Use the following:
   1. Use NPS 3/4 to NPS 2-1/2: Soft copper tube, Type K; wrought-copper fittings; and soldered joints.
   2. NPS 4: Ductile-iron or PVC push joint or mechanical joint pipe.

F. Underground Water Distribution Piping: Use pipe as designated on the plans, or one of the following:
   1. Ductile-iron, push joint or mechanical-joint pipe.
   2. PVC, SDR 21 Class 200 pipe listed for fire-protection service; Mechanical Joint, Ductile Iron fittings of same class as pipe; and gasketed joints.

G. Above Ground Piping: Use pipe as designated on the plans, or one of the following:
   1. Ductile-Iron, flanged joints and fittings.
   2. PVC, C900, flanged joints and ductile iron flanged fittings.

3.4 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

3.5 JOINT CONSTRUCTION

A. Make pipe joints according to the following:
   2. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to or ASTM D 3139 and pipe manufacturer's written instructions.
   3. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.6 PIPING INSTALLATION

A. Inspect each pipe for defects:
   1. Rung ductile iron pipe with a light hammer to detect cracks.
   2. Examine PVC pipe for visible cracks, holes, or foreign materials.
   3. All defective, damaged, or unsound pipe and fittings shall be rejected and removed from the site.

B. The trench shall be so excavated that the pipe, when laid, shall have a true and even bearing on its full length. Excavation of bell holes will be required such that even bearing is achieved. Pipe, fittings, and valves shall be placed in the trench with care and under no circumstances shall pipe or other materials be dropped or dumped into the trench.
C. Field cutting ductile iron pipe:
   1. Use Mechanical pipe cutters.
   2. Cuts shall be smooth, straight, and at right angles to the pipe axis.
   3. Cutting shall not damage the pipe or lining.

D. Field cutting PVC pipe:
   1. Bevel exterior edge of pipe cuts to prevent damage to gasket.

E. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
   1. Under Driveways: With at least 36 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.

F. Install copper tube and fittings according to CDA’s "Copper Tube Handbook."

G. Comply with NFPA 24 for fire-service-main piping materials and installation.

H. Extend water-service piping and connect to water-supply source, terminating 10 feet outside building line in locations and pipe sizes indicated.
   1. Terminate piping with caps, plugs, or flanges as required for piping material.
   2. Connect water-service piping to building distribution piping when systems are in place.

I. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joints as specified above.

J. Anchor service-entry piping to building wall.

3.7 UNFORESEEN OBSTRUCTIONS

   A. Notify the Owner through the Engineer of any obstructions encountered, which are not shown on the plans and interfere so that an alteration of the plans is required. The Owner through the Engineer will alter the plans or order a deviation in line and grade or arrange for the removal, relocation, or reconstruction of the obstruction.

3.8 FLANGED SYSTEMS

   A. All piping that is not to be buried shall be constructed with flanged joints and fittings unless otherwise specified on the plans.
   1. Bolts, gaskets and installation shall conform to AWWA C110, Appendix A.
   2. Use one gasket per joint.
   3. Tighten bolts using the crossover method to ensure even gasket load.
   4. Torque wrenches shall be used where required to uniformly torque bolts.
   5. Lubricate bolts with oil and graphite at the time of installation except when buried.

   B. Provide all necessary pipe supports required by the piping and valves as shown on the plans as well as any additional supports necessary to properly support piping and equipment during construction

   C. Where piping passes through walls, floors, or roofs, provide all grout, sleeves, plates, flashings, seals, caulking and any other penetration requirements as shown on the plans or as necessary to properly seal the penetration.

   D. Core drill wall, ceiling, or floor penetrations to install pipe as shown on the plans, or where necessary and prior written approval has been received from the Engineer.
3.9 **EXPOSED PIPE FINISHING**

A. Ductile-iron Pipe: all DIP to remain exposed shall be sandblasted to remove the bituminous coating and painted.
   1. Color shall be as indicated or as selected by the Owner.

B. Non-coated pipe need not be sandblasted provided that it is factory primed and free of rust or other deleterious substances.

3.10 **LAYING PIPE ON CURVES**

A. Long radius curves, either horizontal or vertical, may be laid with standard pipe by deflections at the joints for most "rigid" pipe and in the pipe for most "flexible" pipe. If the pipe is shown curved on the plans and no abrupt change in alignment is shown, it may be assumed that the curves can be made by deflection of the joints with standard lengths of pipe. It may be required to decrease laying lengths to construct deflection at a reduced radius of curvature.

B. Where field conditions require deflection of curves not anticipated by the plans, the Engineer will determine the methods to be used. No additional payment will be made for laying pipe on curves as shown on the plans, nor for field changes involving standard lengths of pipe deflected at the joints.

C. Maximum deflections at pipe joints and laying radius for the various pipe lengths are as found in the following standards (latest revisions):

D. When rubber gasket pipe is laid on a curve, the pipe shall be jointed in a straight alignment and then deflected to the curved alignment. Trenches shall be made wider on curves for this purpose.

3.11 **ANCHORAGE INSTALLATION**

A. Use restrained-joints as specified above.

B. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.12 **VALVE INSTALLATION**

A. Inspect all gate valves and fittings upon delivery in the field to insure proper working order before installation. They shall be set and jointed to the pipe in accordance with the latest revisions of AWWA Standards for the type of connection ends furnished.

B. Buried valves shall be installed in a vertical position and be provided with a standard cast iron valve box so arranged that no shock will be transmitted to the valve. The box shall be vertically centered over the operating nut and the cast iron box cover shall be set flush with the road bed or finished surface. A concrete base shall be poured around the valve box cover as detailed on the plans.

C. After installation, all valves shall be subjected to the field test specified herein. Should any defects in materials or workmanship appear during these tests, correct such defects with the least possible delay and to the satisfaction of the Engineer.

3.13 **WATER-METER INSTALLATION**

A. Arrange with utility company to install water-meters as shown on the plans. Contractor shall be responsible for cost of materials and permits required.
3.14 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.
C. AWWA-Type Fire Hydrants: Comply with AWWA M17.

3.15 CONNECTIONS
A. Water-Main Connection: Arrange with utility company to install water taps into existing mains. Contractor shall be responsible for cost of materials and permits required to make connections.
B. Connect all other piping to existing and proposed systems as shown on the plans.

3.16 FIELD QUALITY CONTROL
A. Piping Tests: The Contractor shall conduct piping tests on all piping systems before joints are covered and after thrust blocks have hardened sufficiently. Piping equipment and instruments which will not safely withstand the test pressures shall be isolated or removed before testing. Provide spool pieces for any piping, equipment, or instruments removed for testing. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
B. Perform all tests in the presence of the Engineer or the Engineer’s authorized representative.
C. Hydrostatic Tests: Test at 1-1/2 times working pressure (but not less than 150 psi) for 2 hours. Test pressure to be maintained within 5 psi of 1-1/2 times working pressure.
   1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 2 hour; decrease to 0 psig. Maximum allowable leakage is determined by utilizing the following formula:
      \[ L = \frac{(ND*\sqrt{P})}{7400} \]
      Where: \( L \) = allowable leakage, in gallons per hour
      \( N \) = number of joints in the length of pipeline tested
      \( D \) = nominal diameter of the Pipe, in inches
      \( P \) = average test pressure during leakage test, in pounds per square inch (psi)
   2. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.
D. It is the intent of this specification that all joints shall be watertight and free from visible leaks. Any leak discovered within one (1) year after the date of final acceptance of the work shall be repaired by, and at the expense of, the Contractor.
E. Prepare a test report based on the satisfactory completion of the hydrostatic test of each piping system or portion of the system. The report shall establish the exact limits of the test. This report shall contain the following:
   1. Test pressure at the beginning and end of the test.
   2. Time interval of the test.
   3. Marked-up set of flow diagrams:
      a. Sections of pipe shall be yellowed-out and initialed by the Contractor and Engineer, or his representative, as they are tested.
      b. The Contractor shall be responsible for maintaining this set of flow diagrams, which shall be given to the Engineer at the completion of the job.
3.17 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-service piping. Locate below finished grade, directly over piping. See 312000 - Excavating and Backfilling Trenches for underground warning tapes.

B. Install locator wire immediately above pipe to valves and risers at buildings.

3.18 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.

2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or as described below:

   a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.

   b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.

   c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.

   d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

C. Flushing

1. After installation and before use by the public, the Contractor shall disinfect the potable water lines. Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a tap should be provided large enough to develop a velocity of at least two and five-tenths (2.5) feet per second in the main. One two and one-half (2 1/2) inch hydrant opening will, under normal pressures, provide this velocity in pipe sizes up to and including twelve inches.

2. All taps required for chlorination or flushing purposes, or for temporary or permanent release of air shall be provided for by the Contractor as a part of the construction of water mains.

D. Chlorine Requirements

1. Before being placed into service, all new mains and repaired portions of, or extensions to, existing mains shall be chlorinated so that a chlorine residual of not less than twenty-five (25) mg/l remains in the water after standing twenty-four (24) hours in the pipe.

2. A chlorine gas-water mixture shall be applied by means of a solution-feed chlorinating device, or the dry gas may be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into water within the pipe being treated. Chlorinating devices for feeding solutions of the chlorine gas, or the gas itself, must provide means for preventing the backflow of water into the chlorine.

3. A mixture of water and high-test calcium hypochlorite (HTH, 60 - 70% Chlorine) may be substituted for the chlorine gas water mixture. The dry powder shall first be mixed as a paste and then thinned to a one (1) percent chlorine solution by adding water to give a total quantity of seven and five-tenths (7.5) gallons of...
water per pound of dry powder. This solution shall be injected in one end of the section of main to be disinected while filling the main with water in the amounts as shown in the following table:

<table>
<thead>
<tr>
<th>Pipe Size (inches)</th>
<th>Concentration in 100 feet of pipe (by diameter)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100% Chlorine, lbs.</td>
</tr>
<tr>
<td>4</td>
<td>0.027</td>
</tr>
<tr>
<td>6</td>
<td>0.061</td>
</tr>
<tr>
<td>8</td>
<td>0.108</td>
</tr>
<tr>
<td>10</td>
<td>0.170</td>
</tr>
<tr>
<td>12</td>
<td>0.240</td>
</tr>
</tbody>
</table>

4. Tablet disinfection is best suited to short extensions (up to 2500 ft.) and smaller diameter mains (up to 12 inch). Because preliminary flushing must be eliminated in using this method, it should be utilized only when scrupulous cleanliness has been used in construction. It shall not be used if trench water or foreign material has entered the main or if the water is below 41°F.

5. Tablets should be placed in each section of pipe, hydrants, hydrant branches, and other appurtenances. Tablets must be at the top of the main, and shall be attached by an adhesive such as Permatex Number 1, or any alternative approved by the Engineer. Tablets in joints between pipe sections, hydrants, hydrant branches, or appurtenances shall be crushed and placed inside the annular space or rubbed like chalk in butt ends of sections to coat them if the type of assembly does not permit crushing.

6. When using the tablet method, water velocity shall be less than one (1) foot per second during the filling of the section of piping with water.

<table>
<thead>
<tr>
<th>Number of 5-Grain Hypochlorite Tablets Required for a Dosage of 50 mg/l per Length of Pipe Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Size (inches)</td>
</tr>
<tr>
<td>--------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

7. Disinfectant Application

a. The preferred point of application of the disinfectant is at the beginning of the pipe line extension or any valved section of it, and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipe line extension. Alternate points of application may be used when approved or directed by the Engineer.

b. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used if desired.

c. Treated water shall be retained in the pipe for at least twenty-four (24) hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least twenty-five (25) mg/l.

d. In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressure.
8. Final Flushing and Testing
   a. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shows upon test, a chlorine residual of less than 1 mg/l. In the event chlorine is normally used in the source of supply, then the tests shall show a residual of not in excess of that carried in the system.
   b. After flushing, water samples collected on two (2) successive days from the treated piping system, as directed by the Engineer, shall show satisfactory bacteriological results. Bacteriological analysis must be performed by a laboratory approved by the Missouri Department of Natural Resources. The Contractor shall be responsible for securing, delivering, and testing of all samples.
   c. Should the initial treatment result in an unsatisfactory bacteriological test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained.

END OF SECTION 331400
SECTION 333000 – SANITARY SEWERAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and Special Provisions apply to this Section.

1.2 SUMMARY

A. This Section includes sanitary sewerage outside of buildings.

B. Referenced Sections include the following:

1. Section 312000 - Excavating and Backfilling Trenches.

C. Referenced Standards Include the Following:

1. ACI 318 / 318R - Building Code Requirements for Structural Concrete & Commentary; American Concrete Institute; 1999.
2. ACI 350R - Environmental Engineering Concrete Structures; American Concrete Institute; 1989.
7. ASTM A 746 - Specifications for Ductile Iron Gravity Sewer Pipe.
9. ASTM C 76 - Specifications for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
11. ASTM C 361 - Specifications for Reinforced Concrete Low-Head Pressure Pipe.
15. ASTM C 497 - Methods of Testing Concrete Pipe, Manholes Sections, or Tile.


24. ASTM F 794 - Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.

25. AWWA C 301 - Prestressed Concrete Pressure Pipe, Steel Cylinder Type.


27. AWWA C 900 - Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 inch - 12 inch., for Water Distribution.

28. AWWA C 907 - Polyvinyl Chloride (PVC) Pressure Fittings for Water - 4 inch through 8 inch.


1.3 DEFINITIONS

A. NPS: Nominal Pipe Size, given in inches.

B. PE: Polyethylene plastic.

C. PVC: Polyvinyl chloride plastic.

1.4 PERFORMANCE REQUIREMENTS

A. Gravity Flow, Non-pressure Piping: Pass a 5.0% mandrel test and a low pressure air test.

B. Force-Main Pressure Ratings: At least equal to system operating pressure, but not less than 150 psig.

1.5 SEPARATION OF WATER AND SEWER LINES

A. Where sanitary sewers are to be laid parallel to existing potable water lines, it will be necessary to maintain at least ten (10') feet horizontal separation between the sewer and water lines. At points where sewers cross under water mains with less than two (2') feet of vertical separation, sewers shall be constructed of ductile iron pipe with mechanical joints for ten (10') feet each direction from the crossing point.

1.6 SUBMITTALS

A. Product Data: For the following:
   1. Each type of piping material
   3. Manhole frame and cover.

B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
   1. Precast concrete manholes, including frames and covers.
   2. Cast-in-place concrete manholes and other structures, including frames and covers.

C. Design Mix Reports and Calculations: For each class of cast-in-place concrete.

D. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.
C. Handle precast concrete manholes and other structures according to manufacturer’s written rigging instructions.

1.8 PROJECT CONDITIONS

A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.

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.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

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

B. Each pipe or fitting shall have plainly and permanently marked thereon:

1. Pipe class (and profile if applicable).
2. Manufacturer’s name or trademark.
3. Nominal pipe size.
4. Date of manufacture.

2.2 PIPES AND FITTINGS

A. Ductile-Iron 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. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.

B. PVC SDR Pressure Pipe: Class 200, SDR 21 according to ASTM D 2241 and ASTM D 1784.

2. All fittings shall be ductile iron.

C. PVC AWWA Pressure Pipe: AWWA C900, Class 150, for gasketed joints.

1. PVC Pressure Fittings: AWWA C907, for gasketed joints.

D. PVC Sewer Pipe and Fittings: According to the following:

1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for gasketed joints.
2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.

E. PVC Profile Gravity Sewer Pipe and Fittings: ASTM F 794, open and closed profile, bell and spigot for gasketed joints.

F. Prestressed Concrete Cylinder Pipe: ANSI/AWWA C 301, bell and spigot or tongue and groove for welded and gasketed joints.

2. Joints: bell and spigot or tongue and groove ends formed by steel joint rings welded to the steel cylinder, and sealed by rubber gasket.
3. Cement: ASTM C 150, modified Portland Cement, Type II.
4. Length: sections shall be a minimum of sixteen (16) feet except for closure lengths, and less than four (4) feet at connections to manholes.
5. Protective coating: One- or two-coat, coal-tar epoxy; 10-mil minimum thickness, unless otherwise indicated; factory or field applied to the interior surface of all pipe including surfaces at joints not covered by resilient rubber end rings.

2.3 MANHOLES

A. Normal-Traffic Precast Concrete Manholes: ASTM C 478, precast, reinforced concrete, of depth indicated, with preformed butyl mastic sealant 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 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
5. Top Section: Eccentric-cone type, unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Gaskets: Use two each, 1-inch by 1-inch, preformed butyl mastic joint sealant meeting ASTM C990. Sealant shall be Bidco C-56 or approved equal.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.

8. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101, or Cast iron Neenah R-1980-J or approved equal. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 42 inches deep.
9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section. A-Lock or approved equal.

B. Cast-in-Place Concrete Manholes: Construct of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.

1. Ballast: Increase thickness of concrete, as required to prevent flotation.
2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
3. Steps: Manufactured from deformed, 1/2-inch steel reinforcement rod complying with ASTM A 615/A 615M and encased in polypropylene complying with ASTM D 4101, or Cast iron Neenah R-1980-J or approved equal. Include pattern designed to prevent lateral slippage off step. Cast or anchor into sidewalls with steps at 12- to 16-inch intervals. Omit steps for manholes less than 42 inches deep.
C. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering "SANITARY SEWER" cast into cover.

2.4 CONCRETE

A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
   1. Cement: ASTM C 150, Type II.

B. Portland Cement Design Mix: 3000-psi minimum, with 0.45 maximum water-cementitious materials ratio.
   2. Reinforcement Bars: ASTM A 615/A 615M, 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.
      a. Invert Slope: 2.5 percent through manhole.
   2. Benches: Concrete, sloped to drain into channel.
      a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000-psi minimum, with 0.58 maximum water-cementitious materials ratio.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.5 PROTECTIVE COATINGS

A. Description: One- or two-coat, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:

2.6 CLEANOUTS AND LAMPHOLES

A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. The cover should consist of “Neenah #R-1976 or equal” 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. Sewer Pipe Fitting and Riser to Cleanout: PVC or ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.7 AIR/VACUUM VALVES

A. Air/Vacuum Valves shall be of the type that automatically exhausts large quantities of air during the filling of a pipeline and allows air to re-enter during the draining or when a negative pressure occurs.
B. Valves shall have connections and valving for backwash operations. Valves shall be equipped with quick connect couplings and a six foot hose for connecting to backwash water.

C. All Air/Vacuum valves shall be equal to Val-Matic Models #301BW or approved equal.

2.8 SPRINKLERS

A. Sprinklers shall be constructed of a heavy duty brass or stainless steel.

B. The nozzles shall be interchangeable and easily replaced.

C. The sprinklers shall have a 1 1/4" full circle sprinkler head with a 3/8" nozzle. The sprinkler shall be capable of producing differing gpm at a nozzle pressure of minimum 25 psi. The sprinklers shall be a Rainbird model 80E or an approved equal capable of producing differing radii.

D. Sprinkler Head Supports: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.
   3. The sprinkler and supply line shall be securely attached to a 5 foot tall, 12 inch by 12 inch or 12 inch diameter concrete pedestal. The post shall be securely set into the ground and the top 12 inches shall be painted bright orange for easy visibility. Concrete pedestals shall be numbered by etching or engraving the numbers into the pedestals.

E. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 - Excavating and Backfilling Trenches.

3.2 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 - Excavating and Backfilling Trenches. Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
   1. Use warning tape or detectable warning tape over ferrous piping.
   2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 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: Use the following:
   1. NPS 4 to NPS 6: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.
   2. NPS 8 to NPS 15: PVC sewer pipe and fittings, solvent-cemented joints, or gaskets and gasketed joints.

D. Pressure-Flow Piping: Use the following:
   1. NPS 4 to NPS 8: PVC Pressure Pipe for gasketed joints.
3.4 INSTALLATION, GENERAL

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer’s written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.

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. Install gravity-flow service piping of sizes and in locations indicated. Terminate service piping 10 feet inside front property line at low side of property as indicated below.
   1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
   2. Install piping with 36-inch minimum cover.

F. Install force-main piping between and connect to sewage pump station outlet and termination point indicated.
   1. Install piping with restrained joints at horizontal and vertical changes in direction. Use cast-in-place concrete supports and anchors or corrosion-resistant rods and clamps.
   2. Install piping with 36-inch minimum cover.

G. Extend sanitary sewerage piping and connect to building’s sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

H. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.5 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings according to installations indicated.


C. PE Pipe and Fittings: As follows:
   1. Join pipe, tubing, and gasketed fittings with gaskets for watertight joints according to ASTM D 2321 and manufacturer’s written instructions.
   2. Install according to ASTM D 2321 and manufacturer’s written instructions.
   3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association’s "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."

D. PVC Pressure Pipe and Fittings: Join and install according to AWWA M23.

E. PVC 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.
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.

3.6 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Form continuous concrete channels and benches between inlets and outlet.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere, unless otherwise indicated.

D. Install precast concrete manhole sections with gaskets according to ASTM C 891.

E. Construct cast-in-place manholes as indicated.

3.7 LAMPHOLE INSTALLATION

A. Lampholes shall be installed in accordance with the details shown on the Plans. The wye branch and riser pipe shall be of the same material as that used for the line that runs out of the lamphole. The top of the riser pipe shall be covered by a cast iron frame and cover set in concrete. The top of the cover shall be set so that groundwater cannot enter the sewer line.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318/318R and ACI 350R.

3.9 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 commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and fasten wye fitting to pipe with stainless steel band and stainless steel screws, or encase the entire fitting, plus a 6-inch overlap, with not less than 6 inches of concrete with a 28-day compressive strength of 3000 psi.

C. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 SPRINKLER INSTALLATION

A. General: Install sprinklers as per manufacturers written recommendations.

B. The sprinklers shall be connected to the force main by a Ford, or an approved equal, stainless steel service saddle and a ford, or an approved equal, corporation stop, also to include bushing for connection between corporation stop and sprinkler.

3.11 CLEANOUT INSTALLATION

A. Install cleanouts, and riser extension from sewer lateral/service line to grade. Use PVC pipe fittings in sewer laterals at branches for cleanouts and PVC pipe for riser extensions to grade. Install piping so cleanouts are parallel with finished grade.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in gravel, asphalt, or concrete pavement with tops flush with pavement surface.
3.12 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 8-inch-thick, brick masonry bulkheads.
   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 use one procedure below:
   1. Remove structure and close open ends of remaining piping.
   2. Remove top of structure down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.
   3. Backfill to grade according to Section 312000 - Excavating and Backfilling Trenches.

3.13 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 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 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. Reinspect and repeat procedure until results are satisfactory.

C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. All testing shall be done in the presence of a representative of the Engineer and/or the authorities having jurisdiction.
   5. Submit separate reports for each test.
   6. If authorities having jurisdiction do not have published procedures, perform tests as follows:
      a. All testing shall be done only after all piping has been installed and backfilled for a minimum period of thirty (30) days.
      b. All Gravity Sanitary Sewerage Piping: Perform low pressure air test according to the following:
1) Contractor shall supply all equipment necessary to conduct the test.

2) Install plugs at each end of the line to be tested in a manner to withstand the internal pressure during testing. External blocking or bracing will not be allowed.

3) Introduce low pressure air to the sealed line until the internal pressure reaches 4.0 psig plus an additional 1.0 psig for every 2.3 feet of groundwater above the pipe as determined by the Engineer.

4) Allow 2 minutes for the air pressure to stabilize.

5) Disconnect the air hose from the control panel to the air supply.

6) The line shall be termed “Acceptable” if the time required in minutes for the pressure to decrease 1.0 psig is not less than the time shown for the given diameters as follows:

<table>
<thead>
<tr>
<th>Pipe Dia. (In.)</th>
<th>Minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>4.0</td>
</tr>
<tr>
<td>10</td>
<td>5.0</td>
</tr>
<tr>
<td>12</td>
<td>5.5</td>
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<tr>
<td>15</td>
<td>7.5</td>
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<tr>
<td>18</td>
<td>8.5</td>
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<tr>
<td>21</td>
<td>10.0</td>
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<tr>
<td>24</td>
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<tr>
<td>27</td>
<td>13.0</td>
</tr>
<tr>
<td>36</td>
<td>17.0</td>
</tr>
<tr>
<td>48</td>
<td>22.5</td>
</tr>
</tbody>
</table>

7) Leaks and loss in test pressure constitute defects that must be repaired.

8) Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

c. Flexible Gravity Sanitary Sewerage Piping: Perform mandrel test to demonstrate that not more than 5% deflection exists as follows:

1) Flush line with water to assure that no mud or trash is in the line.
2) A rope shall be passed through the pipe (from one manhole to the other).
3) A mandrel with diameter equal to 95% of the inside diameter of the pipe shall be attached to the line and placed at the entrance to the pipe.
4) A second rope of sufficient length shall be attached to the other end of the mandrel.
5) Draw the mandrel through the sewer line.
6) Any resistance to the movement of the mandrel through the pipe shall be considered evidence of excessive deflection.
7) The deflected portion of the line shall be exposed and repaired.
8) The entire line shall be retested until no resistance to the movement of the mandrel through the entire line is encountered.

D. Acceptance Testing of Manholes:

1. Each manhole shall meet the requirements of the following acceptance test. A vacuum test shall be performed on each manhole in accordance with the following procedures in order to assure that each manhole is watertight. The Contractor shall furnish all necessary labor, equipment, and appurtenances to perform the acceptance tests. All defects shall be repaired to the satisfaction of the Engineer until acceptable test results are achieved.

2. Each manhole shall pass two (2) tests. The first test shall be conducted after assembly of the manhole but prior to backfilling; and the second test shall be conducted after backfilling.
3. The vacuum test shall include testing of the seal between the cast iron frame and the concrete cone, slab, or grade rings.

4. Plug all pipes entering the manhole at least eight (8) inches into the sewer pipe. The plug must be inflated at a location past the manhole/pipe gasket.

5. Brace all plugs to prevent the plug or pipe from being dislodged and drawn into the manhole.

6. A vacuum of at least 10.5 inches of mercury shall be drawn on the manhole. Shut the valve on the vacuum line to the manhole and then disconnect the vacuum line from the vacuum pump. Open the vacuum line valve and adjust the vacuum in the manhole to 10.0 inches of mercury.

7. The vacuum pressure shall be determined by a liquid-filled pressure gage having a 3.5-inch diameter face with a reading from 0 to 30 inches of mercury. The vacuum test equipment shall be capable of having two (2) gages connected. The gage supplied with the test equipment shall match the reading of a gage furnished by the Engineer. The gage reading shall be verified on each project with a frequency as determined necessary by the Engineer.

   a. The time lapse for the vacuum reading to drop from 10.0 inches of mercury to 9.0 inches of mercury shall not be less than the following times for a manhole to be considered as passing the vacuum test:
      
      b. Manhole depth less than 10 feet; 2.0 minutes.
      
      c. Manhole depth 10 to 15 feet; 2.5 minutes.
      
      d. Manhole depth 15.1 to 25 feet; 3.0 minutes.

8. If a manhole fails the vacuum test, the manhole shall be uncovered and patched on the exterior of the manhole; retested prior to backfilling; and then retested again after backfill is completed.

END OF SECTION 333000
SECTION 333200 – SANATORY SEWAGE PUMPING STATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sanitary sewerage pumping stations including:
   1. Wet wells.
   2. Valve Vaults.
   3. Pumping Equipment.
   4. Controls.

B. Referenced Sections include the following:
   1. Section 333000 – Sanitary Sewerage.
   2. Section 323100 – Chain-Link Fences and Gates.

C. Referenced Standards Include the Following:
   1. ACI 318 - Building Code Requirements for Structural Concrete.
   2. ASTM A 48 - Specifications for Grey Iron Castings.
   3. ASTM A 185 - Specifications for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.
   4. ASTM A 615 - Specification for Deformed and Plain Billet-SteelBars for Concrete Reinforcement.

1.2 GENERAL

A. The Contractor shall furnish and install the pumping system complete, to include two submersible non-clog wastewater pumps with discharge connection elbows, motors, pump rail guides, pump mounting plates with discharge elbow and rail supports, access frames with covers and guide rail supports, pump lifting chains with hooks, portable manual hoist for lifting pumps, wiring channel, weatherproof control enclosure, exhaust blower, de-humidifier, electrical pump panel, float switch type level sensors, valve box, wet well and valve box top slap, access hatches, and all piping, valves, and related items as shown on the Plans and as described herein. The submersible pump system shall be complete to provide for automatic operation as specified. All system components shall be as manufactured by Flygt Corporation, or approved equal.

1.3 DEFINITIONS

A. ACC: Automatic Control Center.

B. H-O-A: hand-off-automatic switch.

1.4 DESIGN OPERATING CONDITIONS

A. Pump requirements:
1. Total Dynamic Head: 132 feet.
2. Pump capacity: 437.7 gpm (each).
3. Pump speed: 1755 rpm.
4. Minimum solid diameter: 3 inches.
5. Pump discharge diameter: 4 inches.
6. Discharge piping diameter: 4 inches.

B. Electrical service and motor requirements:
1. Voltage: 460 volts.
2. Phases: 3.
3. Frequency: 60 hertz.

1.5 SUBMITTALS
A. Shop Drawings and Product Data shall be submitted for the following items:
1. Valves.
2. Pipe and fittings.
3. Electrical controls.
4. Pumping Equipment.
5. Precast Concrete structures.
6. Hatches and other hardware.

B. The following information shall be included at a minimum.
1. Pumps:
   a. Name of Manufacturer.
   b. Type of model, including all dimensions.
   c. Design rotative speed.
   d. Minimum required submergence.
   e. Discharge connections.
   f. Weight of complete pump assembly, including motor.
   g. Mounting materials and details.
   h. Certified performance curves showing capacity, head, NPSH requirements, efficiency, and bhp requirements.
2. Pump motors:
   a. Name of manufacturer.
   b. Type and model.
   c. Rated size of motor (hp).
   d. Starting current.
   e. No-load current.
   f. No-load power factor.
   g. Locked rotor current.
   h. Locked rotor power factor.
   i. Current, power factor, and efficiency at full, 3/4, and ½ load.
3. Electrical Controls:
   a. Name of manufacturer.
   b. Detailed views of enclosures, inside and outside.
C. Operation and Maintenance Information:

1. The Contractor shall submit, to the Engineer, operation and maintenance information prepared by the equipment manufacturer or supplier of the following equipment:
   a. All valves
   b. Electrical Controls
   c. Pumping Equipment

2. The O&M information shall cover:
   a. Equipment function, normal operating characteristics, and limiting conditions.
   b. Assembly, installation, alignment, adjustment, and checking instructions.
   c. Operating instructions for start-up, routine and normal operation, regulation and control.
   d. Maintenance instructions.
   e. Guide to "troubleshooting."
   f. Parts lists and predicted life of parts subject to wear.
   g. Outline, cross sections, assembly drawings, and other Engineering data.
   h. Test data and performance curves, where applicable.

3. The Contractor shall submit to the Engineer, six (6) copies of operation and maintenance information in addition to any instructions or parts lists packed with or attached to equipment when delivered. The O&M information shall be submitted unbound, unperforated so that the Engineer can bind the material in specially prepared Operation and Maintenance Manual. Payment for the equipment will not be made to the Contractor until the O&M information is received and approved by the Engineer.

PART 2 - PRODUCTS

2.1 CONCRETE

   A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
      1. Cement: ASTM C 150, Type II.

   B. Portland Cement Design Mix: 3000-psi minimum, with 0.45 maximum water-cementitious materials ratio.
      2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.2 PROTECTIVE COATINGS

   A. Concrete Exteriors: One- or two-coat, coal-tar epoxy; 15-mil minimum thickness, unless otherwise indicated; factory or field applied to the following surfaces:
      1. Concrete wet wells, storage basins, and vaults: On exterior surface.

   B. Exposed Piping: Three coat Alkyd Enamel Paint System
C. Interior Valve Vault: Two coat Epoxy Masonry Paint System.
   1. First Coat: Epoxy Masonry Filler.
   2. Color: off white.

2.3 ACCESS FRAMES AND COVERS

A. Aluminum door access frame assembly (ies) shall be provided over the pumps and valve vault as shown on the Plans. The frame(s) shall support the guide rails, electrical wiring channel, and the hoist socket. The hinged cover(s) shall be provided with lifting handles, locking hasps, and safety latches to hold the covers in an open position. The frame(s) shall be waterproof. The required galvanized carbon steel lifting chains and Flygt Grip Eye Stem apparatus (or equal) shall also be provided.

B. Door leaves shall be 1/4-inch thick aluminum diamond plate reinforced respectively for a 300 p.s.f. live load. The frame shall be extruded aluminum with an integral anchor flange and door seat on all four sides. The access door shall be equipped with a flush lifting handle that does not protrude above the cover, and 316 stainless steel hinges with 316 stainless steel tamper resistant bolts/locknuts. A staples for a padlock shall be supplied for security. An adhesive backed vinyl material that protects the product during shipping and installation shall cover the entire top of the frame covers. Installation shall be in accordance with manufacturer’s attached instructions. The door shall be manufactured and assembled in the United States. Manufacturer shall guarantee the door against defects in materials and workmanship for a period of ten years. The access hatch shall supplied for the following additional features: Stainless steel horizontal springs for easy opening, 316 stainless steel watertight slamlock, and bituminous coating on frame surface in contact with concrete.

2.4 PIPING, VALVES, AND FITTINGS

A. Refer Section 333000 – Sanitary Sewerage for pipe, valve, and fitting material for gravity and pressure sewer piping.

B. The discharge connection elbow shall be permanently installed in the wet well along with the discharge piping. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal watertight contact.

2.5 PUMP INSTALLATION SYSTEMS

A. All pump and motor units shall be easily installed and removed without having to enter the wet well. Pump installation shall be by a simple linear downward motion guided by not less than two guide bars. The pump discharge flange shall automatically and firmly connected with the discharge line without the need of adjustment, fasteners, clamps or similar devices, and without having to tilt or rotate the motor. Unit removal shall be by simple linear upward motion.

B. A manually operated, portable winch shall be provided to facilitate installation and removal of the pump units. The winch shall be mountable into an access frame or surface mounted socket. If a surface mounted socket is installed, a removable cover plate shall be provided to keep the socket free of dirt, rocks, and silt. The hoist bases shall be located to allow the winch to extend over and remove either pump in the wetwell.

C. Mounting Bases: A separate discharge elbow and base shall be furnished for each pump. These plates shall include adjustable guide rail supports and discharge elbow with flange to align with the pump sealing flange. Plates and fittings shall be coated with a tar base epoxy paint. The base shall be anchored to the concrete slab (wet well bottom) with stainless steel threaded anchor bolts and removable hex nuts. The
discharge elbows shall have 125-pound standard flanges. The discharge piping shall be as shown on the plans. No portion of the pump shall bear directly on the sump floor.

D. Rail Supports: The Contractor shall furnish and install two pump guide rails (304 stainless steel Schedule 40 pipe) for each pump. The rails shall be of sufficient length to extend from the lower guide connections on the pump discharge base to the upper guide connections on the access frames. The guide rail diameter shall be set by the pump manufacturer. In addition to the mounting base rail supports and the access frame rail supports, intermediate rail supports shall also be provided to stiffen the guide rails if the wet well is over 20 feet deep.

2.6 PUMPS

A. General: Pumps shall be submersible non-clog wastewater pumps.

B. Materials: Major pump components shall be grey cast iron with smooth surfaces free of irregularities. Materials shall conform to the following:

1. Pump bowl and casing: ASTM A 48, grey cast iron.
2. Impellers: ASTM A 532 (Alloy IIIA) 25% chrome cast iron.
4. Impeller wear ring: ASTM A 532 (Alloy III A) 25% chrome cast iron
6. Shaft seals: double mechanical type; tungsten carbide/carbon
   b. Lower: tungsten carbide.
7. Exposed bolts, nuts, clamps, and other mounting hardware: ANSI 304 stainless steel.

C. Pump impellers: non-clog design, dynamically balanced type capable of passing a three inch minimum spherical solid, fibrous material, heavy sludge, and other matter normally found in sewage.

D. Pump shaft seals: Each pump shall be provided with a double, mechanical, mounted in tandem, rotating shaft seal system. The upper seal shall run in an oil reservoir located between the pump and motor chambers. The lower seal shall operate in the pumped media. Each seal shall function independently of the other. The seals shall require neither maintenance nor adjustment and shall be easily inspected and replaceable. The seals shall include stationary and positively driven tungsten carbide rings. Each seal interface shall be held in contact by its own spring. The seals shall operate with negligible leakage following slight initial leakage at start-up. The stator chamber shall be provided with a seal failure sensor to automatically detect and signal excess water in the bottom of the motor chamber. This sensor shall activate a warning light in the individual pump control circuit if excess moisture is detected. Mechanical seals requiring constant differential pressure for effective sealing are not acceptable.

E. Other seals: All mating surfaces where watertight sealing is required shall be machined and fitted with nitrile rubber O-rings. The fitting shall accomplish sealing by metal-to-metal contact between machined surfaces, resulting in controlled compression of the O-rings in two planes without requiring specific torque limits to cause positive sealing.

F. Cable entry seal: shall be watertight without relying on specific torque requirements. Epoxies, silicones, and other secondary sealing systems shall not be acceptable. The cable entry junction chamber and motor
shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top.

G. Pump shaft: The pump shafts shall rotate on two permanently lubricated bearings. The upper bearing shall be a single row deep groove ball bearing; the lower bearing, a two-row angular contact ball bearing. The shaft shall have a threaded fastener for the impeller and a sliding fit with one key.

2.7 PUMP MOTOR

A. General: The pump motors shall be sized by the manufacturer to operate the equipment at the appropriate speed and over the full range of the impeller without exceeding the nameplate horsepower rating. The motors shall be the squirrel-cage, induction, shell type housed in an air filled, watertight chamber. The motors shall be capable of continuous duty, sustaining a minimum of fifteen starts per hour, and operating in a totally, partially, or non-submerged condition. The motor shall meet the electrical requirements of Paragraph 1.3B of this Section.

B. Stator: winding and leads shall be insulated with moisture resistant Class H insulation, which will resist a temperature of 180 degrees Centigrade (311 degrees Fahrenheit).

C. Temperature control: Thermal sensors shall be used to monitor stator temperatures. The thermal sensors/switches shall be used in conjunction with, and supplemental to, external motor over-protection to automatically shut off the motor when excessive temperatures are sensed.

D. Cables: Each pump motor shall have the necessary power and control cables. The cable shall be Hypalon jacketed Type SPC to exceed ASTM D4247. The manufacturer’s code shall be permanently embossed on the cable exterior. Cable sizing shall conform to NEC specifications for pump motors. Each cable shall be as long as necessary to properly connect the pump to its power and control circuits.

2.8 PUMP CONTROLS

A. Automatic Control Center (ACC) Enclosure: shall be rated NEMA 4X Stainless Steel mounted as shown on the plans. The enclosure shall meet the following:

1. Shall be as manufactured by:
   b. Boss.
   c. Wigman.
   d. Flygt Corporation.
   e. Healy-Ruff/Pumpak.
   f. Mini-Cas
   g. Multitrode
   h. Or approved equal.

2. Shall meet the following at a minimum:
   a. All exposed surfaces: 14 gauge stainless steel.
   b. Interior shall have a full deadfront covering entire control panel.
   c. Dead front and backplate: 14 gauge cold rolled steel.
   d. All materials shall be predrilled and finished after cutouts have been made.
   e. All surfaces shall be degreased, phosphatized, and primed with white primer paint prior to being finished.
   f. Final coat: interior surfaces shall be white baked enamel.
g. The enclosure shall also provide for and include the following mechanical and electrical facilities:

1) Inner Swing Panel - Provision of a “dead front” feature shall be provided using a full size hinged inner door to mount all operator devices. Material shall be .125” aluminum with turned down flanges on all four sides for added rigidity. The inner door and components shall have a “dead back” feature in order to avoid accidental shock hazard. The inner door shall be large enough to fill the entire opening of the enclosure. The inner swing door shall be mounted on an adjustable slide rail that allows adjustment of the location throughout the depth of the enclosure. Mounting hardware which penetrates the enclosure and violates the environmental rating of the enclosure shall not be allowed. All hardware shall be corrosion resistant. Quarter-turn latches shall be provided for securing the inner door in the closed position; captive screws are not acceptable. In addition, an inner door handle shall be provided for operator convenience.

2) Exterior Mounting Plate - The enclosure shall incorporate a minimum 3/16” thick marine aluminum plate mounted on a vertical stainless steel strut covering the entire back of the panel enclosure for the purposes of mounting the Utility Meter and Service Entrance Main Disconnect. There shall be a minimum ½” clearance between the rear of the control panel enclosure and the mounting plate.

3) Condensation Heater - A 100 watt (minimum), 120 VAC heater shall be provided to protect the enclosure from the harmful effects of condensation, corrosion and low temperatures. The heater shall be complete with an adjustable thermostat. Branch protection shall be provided.

B. High Voltage

1. Main Disconnect Switch - As previously specified, a main disconnect switch shall be provided to allow the operator to disconnect the main pump control panel power before opening the inner door. The switch handle shall interlock the inner swing door. The handle shall have a defeatable feature allowing the inner door to be opened without disconnecting the power for troubleshooting and maintenance. A separate Fused Service Entrance Disconnect Switch shall be provided and installed by others.

2. Individual Branch Disconnect and Short Circuit Protection - Each pump shall have a thermal magnetic type circuit breaker and starter sized for the pump motor to be supplied. The starter shall be NEMA and UL Listed, full voltage non-reversing type complete with an electronic, adjustable Class 10 overload relay. The overload shall be sized based on the actual pump full load amps and service factor, NOT, the NEC Table 430-150.

3. Power Distribution System - Associated with this installation will require the individual branch disconnect and short circuit protection to have a U.L. interrupting rating of 14 kA at 460 VAC.

4. Control Power - The 120 VAC, single-phase power shall be derived from a 3kVA transformer. The transformer shall have circuit breakers for both primary and secondary overcurrent protection. Branch circuit breakers shall be provided for control, alarms, and the 15A GFI outlet.

5. Lightning Arrester - The system shall be protected by a lightning arrester for the electrical service and shall be capable of handling up to 600vac. It shall be parallel MOV design and provide protection for Category C Transient Surges as defined in ANS/IEEE C62.41 without degradation of components. The arrester shall provide protection between each phase line and the ground line. The arrester shall be UL listed as a Secondary Surge Arrester, UL category OWHX. The enclosure shall be molded UV resistant polycarbonate or equal material. All electrical connectors shall be sealed in a UL component.
recognized epoxy to exclude moisture, dirt and corrosion. A one-half inch conduit nipple and lock nut shall be provided. Leads shall be color coded and a minimum of 18 inches long. It shall be provided loose for mounting on the exterior of the Utility Service Entrance Disconnect by the installing contractor.

6. Ground Lugs - Ground lugs shall be provided for both incoming service and for each motor.

C. ACC Controls: shall be Flygt model F-3000 or Healy-Ruff/Pumpak Duplex control panel or approved equal, and shall contain the following at a minimum:

1. Main breaker.
2. Individual pump motor breakers.
3. Control circuit breakers.
4. Short circuit protection.
5. Thermal overload protection.
8. Auxiliary contacts.
9. Control transformer.
11. Automatic transfer to non-operating pump (in the event of overload or operating pump failure).
12. Overload reset.
14. Loss of phase and high/low voltage protection (each pump).
15. Surge and transient protection equal to the Zone Defender by Atlantic Scientific Corporation.
16. Hand/off/automatic operators (each pump).
17. Lights:
   a. Run lights; Red.
   b. Power on; Green.
   c. Warning; Amber.
      1) High motor temperature.
      2) Pump seal failure.
   d. High or low water level; Flashing Red.
18. Exterior top mounted flashing red light and alarm horn for all alarm conditions.
19. Running time meters.
21. 120 Volt duplex receptacles.
22. Panel heater (sized for panel).
23. Battery and battery charger for alarm system.

D. All electrical and control components shall be properly sized for operating conditions, and shall be Square-D or approved equal.

E. Running time meters for each pump shall be mounted on the face of the control panel, record to seven places, automatically totalize pump running time in hours and tenths of hours, and NOT be capable of being manually reset.
F. Labels: engraved on black-on-white laminated phenolic in letters 3/8 inches high all units by function including all switches, starters, panels, sub-panels, breakers, timers, relays, lights, and meters (e.g., “PUMP NO. 1 – MAGNETIC STARTER”).

G. Components: Operator control devices shall be 22mm, NEMA and U.L. listed for Types 1, 12, 3R, 4 and 4X. Contact blocks shall be self-wiping and color coded bridge type rated at 10 A. Must have a rated insulation of 600 V. Terminal connections shall be suitable for two 14 AWG control wires. All control relays shall be DPDT rated 10A @ 120VAC, 8-pin socket mount type. Sockets shall have pressure plate terminals that accept two 14 AWG wires and shall be rated a minimum of 300V. All terminal blocks supplied shall be box lug type rated at the proper voltage/amperage and shall accept two 14 AWG wires. All control wiring shall be MTW and shall be color coded in accordance with all applicable codes and laws. Spiral wrap, tie wrap, fasteners and wire duct shall be provided as required for aesthetics and safety. All components mounted on the door and/or inner swing panel shall be wired with insulated connectors (where "finger proof" terminals are not provided) to prevent accidental shock hazards. All components on the back panel shall be mounted on DIN rail or fastened via drilled and tapped screws to facilitate easy component replacement. Pop rivets shall not be allowed. Ammeter loops shall be provided between the disconnect switch and combination starter for better heat dissipation and an easy means of meter readings. Self-adhesive Brady B-498 System vinyl cloth printed adhesive wire markers shall be supplied at both ends of every wire. All components on the back panel shall be identified by a Brady B-498 System polyester printed adhesive label. Dymo labels are not acceptable. These labels shall include all pertinent data applicable to ratings and sizes. Components on the door of the enclosure shall be identified with custom engraved plastic legend plates. Voltage identification labels and comprehensive warning labels shall also be provided.

H. Alternating Relay: The pump control system shall provide for automatic lead pump alternation after each run cycle. The duplex alternating relay shall be an X (cross) wired relay, double pole as manufactured by Time Mark 261-DXT-120 and be complete with LED indicating lights showing the status of the internal relay and a lead selector toggle switch which will allow the alternation to be canceled and omit a disabled pump. Contacts shall be rated 10 A at 120VAC.

I. Mode Select: Method of operation shall be by a three position green illuminated maintained “Hand-Off-Auto” selector switch which shall provide for mode selection and run indication.

J. Pump Monitoring and Control: One Mini-Cas 120 unit shall be supplied for each pump to monitor the pump for overtemp and leakage. The unit shall be an 11-pin mounting style and shall be mounted in the inner door by utilizing an 11-pin reverse socket. The unit shall be powered by 120VAC and shall contain LED indication for power on, overtemp and leakage conditions. The unit shall contain and overtemp reset pushbutton to reset the unit after the fault has cleared, as well as a selector switch that allows the selection of manual or auto reset. The Mini-Cas 120 unit shall be model 14-407129 as manufactured by Flygt Corporation (or approved equal).

Level Control Equipment: Water level sensing shall consist of conductivity sensors mounted integral in a single probe. The probe length shall be 2.0 meters, with a minimum of 10 sensors. Provide 33 feet of cable integral to the probe. Relays shall be provided for 120VAC operation.

The probe shall be constructed from Unplasticized-PVC (U-PVC) 32mm tubing with molded sensor units at regular intervals along the probe and shall be Multitrode Model 1.5/10-10 (or equal). Each sensor unit will be U-PVC injected to prohibit ingress of moisture, and the sensor material will be Avesta (or equal) SMO254 stainless steel. The probe will be mounted in a turbulent area of the wet well, suspended on its own cable and connected to a 6mm stainless steel hook which would hang from a 30mm stainless steel angle
containing a polyurethane squeegee pad positioned min the opening into the wet well, so that the probe can be removed without entering the wet well. The squeegee will have a 30mm hole and slot, enabling the probe to be pulled through and cleaned. Probe cable shall be run in a separate conduit away from any high voltage cables. Ten (10) sensors will be spaced along the length of the probe assembly, and each will be individually connected to a correspondingly numbered U-PVC/PVD .75mm flexible cable. The molded sensor unit will contain two Avesta sensors (or equal) mounted on opposite sides of sensor unit. Each Avesta sensor (or equal) will be 24mm high and no wider than 2mm, and will protrude from the surface of the PVC. The probe shall be pressure injected with an epoxy resin to encapsulate all internal components and connections to form a rigid, homogenous unit. Each sensor unit containing the two Avesta sensors (or equal) will be rotated 90 degrees to the previous sensor unit to eliminate tracking between sensors. The cable will be encoded with number and text along the entirety of the cable and at intervals not greater than 200mm, for identification. This cable will be dark blue in color, with the cores light blue. The flexible cables shall be capable of supporting the weight of the probe and able, without the need for additional support. The cable shall be secured to the top of the probe by a synthetic rubber compression fitting. The probe shall be covered by a ten-year manufacturer warranty.

The level/alarm control relays shall be solid-state electronic modules in a high impact plastic case with a DIN rail attachment on the back. The relays are to be matched with the level sensing probe which works in conjunction with the relay and uses the conductivity of the liquid to complete and electrical circuit. The level/alarm control relays shall be Multitrode models MTR/MTRA (or equal).

K. Elapsed Time Meter(s): A six digit non-resettable type elapsed time meter to record hours of operation shall be provided for each pump. They shall be wired with insulated connectors to prevent accidental shock hazards.

L. Intrinsically Safe Barrier: An intrinsically safe barrier shall provide a barrier between a 10 channel conductance probe located in a hazardous location and the conductance relay in a non-hazardous location. The barrier shall be designed to pass the level sensing signal of the conductance relay through unchanged. The barrier shall clamp voltage and current levels at a safe level. The barrier shall be an UL913 listed intrinsically safe device and shall be installed per NFPA and UL698A standards. The unit shall be Multitrode model MTISB-10 (or approved equal).

M. Convenience Outlet: A Duplex GFI outlet rated 15A and mounted on the inner swing door of the control panel enclosure. A 15A branch circuit breaker shall be provided for this outlet.

N. Lighting: Contractor to provide outdoor weatherproof LED dust to dawn light fixture powered by a circuit breaker in the pump control panel. This light shall be mounted to the unistrut equipment rack.

O. Alarms: Alarm power shall be derived from a 120VAC Power. A weatherproof red flashing incandescent alarm light and a horn rated 90dB at ten feet shall be provided to indicate a high level, power failure and/or pump failure alarm condition. They shall be mounted on the exterior of the Pump Control Panel and shall be UL recognized for NEMA 4 to maintain the environmental rating of the enclosure.

2.9 BASIC OPERATION

A. The pumps shall be operated automatically or manually as a pump down, lead/lag, common off system. Each pump shall be controlled primarily through "Hand-Off-Auto" three position maintained selector switches as well as other divisions within this specification.

1. Position Commands
   a. OFF- In this position the applicable pump will not run under any circumstance.
b. **HAND** - In this position the applicable pump shall run without regard for the level sensing commands and will rely on operator discipline to run and stop. The controls shall be designed so that only one pump may run in either the “hand” or “auto” mode.

c. **AUTO** - In this position both pumps shall be controlled by the level probe equipment. The controls shall be designed so that only one pump may run in either the “hand” or “auto” mode.

2. **Pump Sequence:**
   a. LEVEL Probe Set Point 3 - High Level Alarm.
   b. LEVEL Probe Set Point 2 - Start Lead Pump; shall alternate on each call.
   c. LEVEL Probe Set Point 1: - Off/Low; all pumps stop.

3. The Level Probe Shall be supplied with a total of 10 set points to allow for future operator adjustment.

B. **Float Test:** a pump test panel shall be mounted in the ACC near the H-O-A switches and shall have an “Open-Auto-Closed” switch and LED for each float. A 1-2/Auto/2-1 sequence selector switch with lead pump position indicating LED’s shall be included. LED colors shall be as follows:

1. Alarm LED’s; Red.
2. Start LED’s; Green.
3. Stop LED’s; Amber.

C. All LED, selector switch, and timer functions shall be silkscreened on the chassis.

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**PART 3 - EXECUTION**

### 3.1 INSTALLATION GENERAL

A. The pumping system shall be equipped with all piping, valves, and fittings as shown on the plans and specified herein. All piping shall be cement-lined ductile iron except where noted otherwise on the plans.

B. Refer to Section 333000 – Sanitary Sewerage for product and installation requirements for gravity and pressure sewer piping, fittings, and valves.

C. All piping shall be installed true to line and grade in a neat and skillful manner and be made watertight throughout. The openings where piping passes through the wetwell or valve box walls shall be neatly grouted, full depth, and waterproofed on the outside with the same material as is used to waterproof the wetwell and valve box structures. All exposed piping shall be painted and left clean. Pipe supports shall be provided as needed to support the piping within the valve vault.

D. If the Contractor encounters utility lines in his trench line, he will see that an appropriate utility representative is on hand to direct him in his excavation. If the Contractor cuts or damages these lines, it shall be his responsibility to repair or have the utility employee repairs the lines at the Contractor’s expense, including materials and labor of such repair, to its original condition.

E. All exposed piping shall be painted with three coats of an Alkyd Enamel Paint System. Piping color shall be grey. All interior concrete surfaces shall be painted with two coats of an Epoxy Masonry Paint System. The first coat shall be an Epoxy Masonary Filler. Interior concrete color shall be off-white.

### 3.2 REMOVAL OF WATER

A. The Contractor shall provide and maintain equipment to remove and dispose of all water, surface water and groundwater, entering the excavations, and shall keep the excavations dry until the structures to be built therein are completed. No reinforcing steel shall be placed in water, and no water shall be allowed to
rise over any reinforcing steel before the concrete has been placed. No water shall be allowed to come into contact with any concrete within twenty-four hours after placing unless authorized by the Engineer. The cost of removing any surface water or groundwater shall be considered an incidental part of construction and no additional payment will be allowed.

3.3 ADAPTATION OF PIPING AND EQUIPMENT

A. The Contractor shall furnish equipment readily adaptable for installation and operation in the structure shown on the plans and specified herein. He shall assume full responsibility for alteration of any planned structure to accommodate other types of equipment. Any equipment which requires alteration of the structure will be considered only if the Contractor assumes all responsibility for making and coordinating all necessary alterations. The Contractor shall provide all such alterations at no extra cost to the Owner.

3.4 START-UP AND CORRECTION PERIOD

A. All workmanship and materials throughout shall be of the highest quality and shall be subject to the approval of the Engineer. The manufacturer of the pump station shall furnish factory-trained personnel to supervise installation, make any necessary adjustments, place in operation, and instruct the Owner’s operator in the proper care and maintenance of the equipment.

B. The manufacturer shall correct any defects in design, materials, and workmanship for one year following the date of start-up.

3.5 SPARE PARTS

A. The Contractor shall a complete set of pilot lights, and one spare starter for the station.

3.6 LANDSCAPING

A. After the pump station has been completed, all debris, construction wastes, etc. shall be removed from the site, and all disturbed areas shall be graded to final grade, smoothed, and dressed. Fencing shall then be installed as shown on the plans and according to Section 323100 – Chain-Link Fences and Gates, and compacted chat shall be placed 6” thick around the pump station site. A black 10-mil polyethylene sheet shall be placed below the chat. The chat shall be smooth and uniform throughout the fenced area. All disturbed areas outside the fence shall be smoothed to match the existing ground, cleaned of all debris, tilled, fertilized, limed, and seeded according to the Division 03 Section 312500 – Permanent Erosion Control and Landscaping.

3.7 SIGNS

A. Install a minimum of one sign per side on the outside of the fencing facing away from the sewage pump station.

B. The sign wording and geometry shall be as shown on the plans or as specified by the engineer, materials shall be as specified in Section 323100 – Chain-Link Fences and Gates.

C. An embedded metal ruler shall be installed within the wet well. Elevation shall be in half-foot intervals and shall correspond with the lowest elevation of the lagoon cell and increase in value.

END OF SECTION 333200
SECTION 333400 - LAGOON EARTHWORK AND STRUCTURES

PART 1 – GENERAL

1.1 SUMMARY

A. This section covers earthwork construction for, lagoon levees and side slopes, lagoon seal, and fill at the wastewater treatment facilities site. Construction and installation of lagoon structures and miscellaneous lagoon equipment are also covered in this section. Excavation and backfilling for structures and underground piping shall be performed in accordance with Sections 312000 - Excavating and Backfilling Trenches and 333000 - Sanitary Sewerage of these Technical Specifications.

B. Referenced Sections include the following:

1. Section 033000 – Cast-In-Place Concrete
2. Sections 312000 – Excavating and Backfilling Trenches.
3. Section 323100 – Chain-Link Fences and Gates.
4. Section 333000 – Sanitary Sewerage.

1.2 GENERAL

A. All work shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards. Excavations and embankments shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete structures.

B. Backfilling and construction of fills and embankments during freezing weather shall not be done except by permission of the Engineer. No backfill, fill or embankment materials shall be installed on frozen surfaces, nor shall frozen materials, snow or ice be placed in any backfill, fill, or embankment.

C. The Contractor shall confine all operations inside the property lines and shall be responsible and liable for all damage outside of the property lines. The Contractor shall be responsible for organizing his operations to perform within the property lines shown on the Plans.

1.3 EXCAVATION AND EMBANKMENT CONSTRUCTION

A. Preparation of Subgrade for Compacted Fill

1. In compacted fill areas where organic matter is present, the top six (6”) inches of topsoil shall be stockpiled for finish grading operations.
2. No fill shall be placed on frozen soil. Immediately before depositing fill, the areas where lagoon berms or road embankment are to be constructed, the surface shall be plowed to a depth of six (6”) inches and dragged with a disk harrow until well pulverized. The first layer of new material shall not be over six (6”) inches in depth in an uncompacted state and shall be compacted in such a manner as not to leave a dividing plane. Following layers shall not exceed nine (9”) inches in an uncompacted state.

1.4 COMPACTED FILL

A. Material for compacted fill will be obtained from the area of the proposed lagoon excavation, as shown on the plans. All lagoon excavation used for an embankment or structure backfill shall be compacted.

B. Compaction shall begin at the bottom and shall be carried to the top in uniform lifts that are of full width and shape of the proposed levees. The material shall be free from lumps over six (6”) inches in size. The layer shall be disked or otherwise treated, if necessary, to break up large lumps and no unusual segregation of
different types of material shall be allowed. Maximum rock size shall not exceed one-half the thickness of the compacted lift.

C. Care shall be taken to prevent dividing places between layers of the compacted fill. Scarification shall be used to remove any smooth surfaces which would cause such conditions.

D. When embankment is to be placed on hillsides or against existing embankments, the existing slopes which are steeper than 6 to 1 shall be continuously benched in not less than twelve (12") inch rises over these areas where required, as the work is brought up in layers. Benching shall be of sufficient width to permit placing and compacting operations. Each horizontal cut shall begin at the intersection of the ground line and the vertical side of the previous bench. Fill shall be placed in horizontal layers not less than 100 feet in length and not exceeding nine (9") inches in depth of loose measure and shall have a moisture content such that the required degree of compaction may be obtained.

E. To ensure that the fill is being compacted properly, the Contractor shall secure the services of an independent testing laboratory to provide certified tests on in-place density. Testing methods, frequency, and minimum standards are listed below in Part 2 - Quality Control of this Section.

1.5 UNAUTHORISED EXCAVATION

A. Except where authorized, shown, or specified, all material excavated below the bottom of the required subgrade shall be replaced by and at the expense of the Contractor with specified fill material.

1.6 LAGOON SEALING

A. The lagoon seal shall be twelve inches thick. It shall be constructed in two - six inch lifts. Bentonite shall be applied at 4.0 lbs/sq. ft. per 6" lift.

B. Soil Sealant Materials shall have the following properties:

1. Unified Classification shall be CL, CH, GC, or SC.
2. Liquid Limit shall exceed 30.
3. Plasticity Index shall exceed 20.
4. Percent Passing the 200 Sieve shall exceed 50%.
5. Permeability shall not exceed \(1.0 \times 10^{-7}\) cm/sec.

C. The Engineer shall use the above criteria to determine the suitability of any sample for use as a sealant.

1.7 SEAL CONSTRUCTION

A. The sealer shall be free flowing, high swelling bentonite clay. Six inches of the existing liner shall be removed. Once the lagoon bottom and sides are constructed the exposed surface shall be scarified to a depth of six inches and the bentonite shall be applied at a rate of 4.0 lb/sqft/6 inch lift. Half of the bentonite shall be applied in the north/south direction and the other half in the east/west direction. Then an additional six inches of liner material shall then be replaced with the bentonite in the same manner as the first lift and recompacted.

B. Only approved materials shall be used in seal construction. All materials used for the seal and the soils beneath the seal shall be compacted to the standards listed in Part 2 - Quality Control of this Section. Once constructed, the seal shall be kept continuously moist by wetting the surface. The seal shall not be allowed to crack.
1.8 TESTING SEAL FOR COMPACTION

A. To demonstrate proper compactive effort on the seal, the Contractor shall provide tests as required below in Part 2 - Quality Control of this Section. Holes drilled or driven into the seal to perform the tests shall be filled with bentonite clay.

1.9 TESTING SEAL FOR WATER TIGHTNESS

A. Upon completion of the lagoon seal construction, the Contractor shall perform a Water Balance Study to measure percolation losses (seepage rates) through the lagoon bottom and sides. The Contractor shall employ an independent testing laboratory to conduct the Water Balance Study. The "Closed Bottom Barrel Method" shall be used to perform the Water Balance Study (as defined by the Missouri Department of Natural Resources) and reproduced herein.

B. The measured percolation losses shall not exceed 1,700 gallons per acre per day (1/16 inch per day). All raw data and calculations used to formulate final results shall be made available to the Engineer.

C. The cell to be tested must be prefilled to at least the two (2') foot level with clear water, and the test conducted before the introduction of sewage to the cell. The water level shall remain above the two-foot level during the test to ensure accurate level measurements. It is advised to begin the test with a water level several inches above the two-foot minimum level.

D. Water Balance Study Procedure:

1. Accurately determine the square footage of the lagoon cell to be tested. The horizontal distance from the toe of the side slopes to the dike at the water level used for the study must be included in the square footage determination.

2. No sewage inflow to the lagoon cell should be allowed until the test has been completed and approved. If an unavoidable discharge or transfer of water to a cell must occur during the study period, that inflow must be accurately measured by either a flow recorder or by time clocks on pumps that have been calibrated at least twice during the study period. If an accurate measurement of flow cannot be made, the test must be redone. If control structure slide gates or valves leak, they must be plugged for the duration of the test.

3. Rainfall measurement must be taken from a reliable rain gauge installed at the lagoon site. Rainfall measurements must be used to account for runoff from the top of the berm and side slopes. Rainfall shall be measured daily during the normal work week.

4. Water losses through evaporation must be incorporated into the seepage calculations. The barrel method does not directly calculate the value of evaporation but gives a joint value for rainfall and evaporation.

5. No discharges should be allowed from the lagoon cell during the test period. If discharge from the cell is unavoidable during the test period, accurate flow measurements must be made by either flow recorder or time clocks on pumps (that have been calibrated at least twice during the discharge period) or some other form of accurate measurement.

6. The water level of the test cell shall be recorded to the nearest one sixteenth (1/16") of an inch. The measurements should be made within the cell control structure from a fixed measuring device. Water level measurements shall be taken daily during a normal five (5) day work week.

7. A large (approximately 55 gallons), clean (no oil or grease film), light-colored (inside and outside) barrel can be used to measure the rainfall and evaporation in the lagoon test cell. At least three (3) barrels must be used with a surrounding baffle on each to avoid possible splash over. The barrels must be placed where they are accessible for reading the water depths. The barrel must be on firm footing with the bottom of the barrel on the bottom of the lagoon cell. The top of the barrel shall extend at least one (1) foot but not more than two (2) feet above the water level in the cell. The barrel top shall be cut to within these dimensions if necessary. The top of the barrel shall always remain level. A measuring device shall
be fixed to the inside of the barrel to facilitate accurate water depth measurement to the nearest one-sixteenth (1/16) of an inch.

8. The water level in the test barrels should initially be set as close as possible to the water level outside the barrel. At the daily readings the water level in the barrels may need to be adjusted up or down to again be as close as possible to the outside water level. The adjustments shall be closely measured and recorded to ensure they are not used in the overall increase or drop in the barrel water levels. Do not adjust the water level in the barrel during the test unless it varies from the water level outside the barrel by more than five (5) inches.

9. Data shall be obtained on a daily basis for a period of thirty (30) days during a period of time when no freezing can occur or when air temperatures do not go above ninety to ninety-five degrees Fahrenheit (90-95°F). If realistic estimates of surface runoff into the cell cannot be made, the data taken on days with rainfall should not be used in the calculations. In any case, there must be thirty (30) days of data.

10. The net seepage rate should be given in gallons per acre per day calculated for each test cell over the cell bottom and dike areas by using the following equation:
   a. \[ S = F + R - E - O - WL \]
      1) Where:
         WL = Change in height of water level in a pond cell given in inches after taking rainfall and evaporation into account. WL will be a positive number for an increase in pond depth and a negative number for a decrease in pond depth. WL will be calculated in the following manner:
            \[ WL = H_p - H_b \]
         2) Where:
            WL = Water elevation change;
            \( H_p \) = The change in the water level within the test cell;
            \( H_b \) = The change of water level measured in the barrel;
            S = Net seepage rate from the test cell calculated to inches of water elevation and converted to gallons per acre per day;
            F = Wastewater flow into the test cell during the study period (should be zero). If inflow occurs, it would be given in gallons and converted to inches of water elevation over the test cell;
            R = Rainfall directly on lagoon system calculated in inches during the study period. In the barrel method, this factor is not used in the seepage calculations as it is automatically accounted for in the barrel measurement. However, runoff from the berms must be accounted for and calculated as inches of water in the test cell;
            E = Evaporation from the test cell surface measured in inches over the duration of the study period. In the barrel method, this factor is not used in the seepage calculations as it is automatically accounted for in the barrel measurement;
            O = Outflow from the test cell during the study period (should be zero). If outflow occurs, it would be given in gallons and converted to inches of water elevation over the test cell;

Note: When data taken on rainfall days is eliminated, the days between rainfall events essentially become short separate water balance studies. In this case, the seepage rate will become the average of the studies.

PART 2 – QUALITY CONTROL

2.1 GENERAL

A. The Contractor shall secure the services of an independent Testing Laboratory directed by a Professional Engineer to oversee the testing program. The Testing Laboratory shall perform the required tests and shall provide test reports to the Project Engineer within 24 hours of the completion of the tests. The Professional Engineer in charge of the Testing Laboratory shall certify the test reports. He shall provide a weekly report to the Project Engineer which includes the following:
   1. Assurance that materials met or exceeded the design specifications.
   2. Assurance that density/moisture test results met or exceeded design specifications.
   3. Assurance that seal thickness and elevation requirements were met.
4. Assurance that all testing was performed by or under the direction of the Testing Laboratory's Professional Engineer.

5. A listing of deviations from design standards.

B. Any deviations from minimum design standards shall be reported to the Project Engineer immediately. Upon completion of the levees and seal, the Professional Engineer in charge of the Testing Laboratory shall provide a report to the Project Engineer assuring that the seal has been constructed as specified or listing deviations from design standards. The Project Engineer will then forward this report to the Missouri Department of Natural Resources Poplar Bluff Regional Office.

C. Following is a listing of required tests, test frequencies, and minimum standards:

1. Standard Proctor (ASTM D-698) - 1 test at beginning of levee construction, 1 test at beginning of seal construction, additional tests when material changes are noted.

2. Unified Classification (ASTM D-2487) - One (1) test for every 5000 cubic yards of seal material. Minimum Design Standard - Materials shall classify as CH, CL, SC, or GC.

3. Liquid Limit/Plasticity Index (ASTM D-4318) - One (1) test for every 5000 cubic yards of seal material. Minimum Design Standard - Liquid Limit equal to or greater than 30, Plasticity Index equal to or greater than 20.

4. Percent Passing No. 200 Sieve (ASTM D-1140) - One (1) test for every 5000 cubic yards of seal material. Minimum Design Standard - Percent Passing No. 200 Sieve shall be equal to or greater than 50%.

5. Compacted Permeability (U.S. Army Publication EM-1110-2-1906 - "Falling Head Permeability Test") - One (1) test for every 5000 cubic yards of seal material. Minimum Design Standard - permeability shall be less than \(1.0 \times 10^{-7}\) centimeters per second.

6. Field Density for Embankment and Structural Fill (ASTM D-2292) - 4 tests per acre per lift including base below fill areas. Minimum Design Standards - Percent Compaction equal to or greater than 95%

7. Moisture Content for Embankment and Structural Fill (ASTM D-3017) - 4 tests per acre per lift including base below fill areas. Minimum Design Standards - Moisture content between -2% and +4% of optimum.

8. Field Density for Lagoon Seal (ASTM D-2292) - 4 tests per acre per lift including base below fill areas. Minimum Design Standards - Percent Compaction equal to or greater than 95%

9. Moisture Content for Lagoon seal (ASTM D-3017) - 4 tests per acre per lift including base below fill areas. Minimum Design Standards - Moisture content between +2% and +6% of optimum.

10. Barrel Test (as described above) - 1 test per cell. See test description for acceptable values.

### 2.2 EXCESS EXCAVATED MATERIAL

A. Lagoon excavated fill material not used for levee or rock filter closure shall be the responsibility of the Contractor to remove and dispose of the excess material from the project site.

### 2.3 DEWATERING

A. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all water entering excavations, trenches, or other parts of the work. Each excavation shall be kept as dry as possible during subgrade preparation and continually thereafter until the structure to be built, pipe to be installed, or excavation is completed to the extent that no damage from hydrostatic pressure, flotation or other cause will result.

B. All excavation for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level beneath such excavations twelve (12") inches or more below the bottom of the excavation.

C. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practical without causing damage to adjacent property.
D. If it is determined by the Contractor that the excavation cannot be kept dry, he shall request from the Engineer permission to construct under wet conditions. Permission to construct under wet conditions shall not in any way be considered to relieve the Contractor from full responsibility for the proper construction of the structure to be built or the pipe to be installed. Construction under wet conditions shall not result in damages from hydrostatic pressure or flotation. Construction under wet conditions shall result in a final product equal to that constructed under dry conditions.

E. The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes and all such pipes or conduits shall be left clean and free of sediment.

F. Dewatering at the lagoon site will not be paid for separately; but, shall be considered incidental to the cost of the lagoon excavation and embankment.

2.4 RIP-RAP

A. Submittal of Rip-rap Samples

1. The Contractor shall furnish to the Owner at the site of the work, without cost to the Owner, such samples of rock materials for testing as may be required by the Owner from proposed quarry sites and from rock materials delivered to the site of the work.
2. Rock for rip-rap may be obtained from any source approved by the Engineer.
3. If rip-rap is to be obtained from a source not previously tested by the Owner, the Contractor shall submit representative samples for testing at least 30 days before the rip-rap is required for use. The samples shall consist of three or four rock fragments totaling 200 pounds.
4. The Engineer reserves the right to make inspections of quarry sites and quarries. The approval by the Owner of some rock fragments from a particular quarry site shall not be construed as constituting the approval of all rock fragments taken from the quarry, and the Contractor will be held responsible for the specified quality gradation of rock fragments delivered to the work site. All rock fragments not meeting the requirements of these specifications, as determined by tests and/or inspection at the quarry and work site, will be rejected.

B. Rip-rap Characteristics

1. Individual rock fragments shall be dense, sound, and resistant to abrasion and shall be free from cracks, seams, and other defects that would cause significant deterioration by water and frost action.
2. The rip-rap shall be such that at least 90% of the rock is well graded between 3" and 8" least dimension.

C. Placement of Rip-rap

1. The areas to receive rip-rap or slope protection of any kind shall be dressed smooth to the slopes or shapes called for on the Plans and shall be free from stumps, organic matter, or waste material. Generally, a toe trench should be provided in which to key the bottom course of rip-rap.

D. The rip-rap does not need to be compacted; however, it shall be placed to grade in a manner to ensure that the larger rock fragments are uniformly distributed and the smaller rock fragments serve to fill the spaces between the larger rock fragments which will result in well-keyed, densely placed, uniform layers of rip-rap. Hand placing will be required only to the extent necessary to secure the results specified above. Rip-rap shall be placed over a 10 mil black plastic vegetation barrier. Care shall be taken not to damage the barrier during placement of the rock.
2.5 PRE-FILLING OF LAGOON CELLS

A. The Contractor shall maintain the moisture content of the seal. As soon as the sealing, sterilizing, seeding, and erosion protection operations are complete, the Contractor shall prefill the lagoon cells to a depth of two feet with water. If the lagoon seal is allowed to dry and crack, the seal must be recompacted in accordance with these specifications. Contractor shall be responsible for providing water for filling the cells.

2.6 INFLUENT AND EFFLUENT STRUCTURES

A. General

1. The influent and effluent structures shall be constructed as shown in the Plans. All poured-in-place concrete shall conform to Section 03300 Cast-In-Place Concrete of these Technical Specifications. All concrete shall have a minimum 28-day compressive strength of 4000 psi. All reinforcement steel shall conform to ASTM A-615 and only deformed type, made of intermediate grade billet steel shall be used.
2. All joints and openings around pipes shall be sealed watertight with expanding concrete and bituminous joint compound.

B. Transfer Structure

1. Contractor shall provide piping, valves, valve stems, valve boxes, concrete splash pads, and grating over the end of the pipes and any other items necessary to provide the transfer of waste from cell 1 to cell 2 and from cell 2 to cell 3 in order to provide a complete and functional project according to Division 2 Section 02530 "Sanitary Sewerage.", as shown on the plans, or approved by the Engineer.

C. Effluent Structure

1. Place pre-cast four foot diameter wet well at the location and grade as shown on the plans. Piping, concrete splash pads, and grating shall be placed to the elevation and grade as shown on the plans or approved by the Engineer.

D. Pipe, Fittings, & Valves

1. The type of pipe to be used is shown on the Plans. All fittings shall be compatible with and equal in quality to the pipe they are used with. All pipe, fittings, valves, and flap gates shall comply with Section 02530 Sanitary Sewerage of these Technical Specifications.

2.7 LAGOON SITE AND APPLICATION AREA PERIMETER FENCING

A. All lagoon and application area perimeter fencing shall comply with Section 02821 Chain-Link Fences and Gates.

2.8 LAGOON FENCING AND APPLICATION AREA SIGNS

A. The Contractor shall furnish and install signs attached to the lagoon and application area site fencing in the locations shown on the Plans. The signs shall be securely attached to fence posts. The lettering for the signs is shown on the Plans.

2.9 LOCKS AND KEYS

A. The Contractor shall provide all locks to be used on the gates, disconnect enclosures, miscellaneous enclosures, etc. The locks shall be heavy duty, high quality locks, all keyed alike. A minimum of ten (10) keys shall be provided with the locks.
2.10 MISCELLANIOUS PAINTING

A. All exposed metal surfaces throughout the treatment facilities shall be primed as recommended by the manufacture and followed by two finish coats of epoxy paint.

1. The color to be selected by the Owner from a full list of colors provided by the manufacturer.

END OF SECTION 333400
APPENDIX NO. 1
MODNR Land Disturbance Operating Permit No. MO-R100038
JUL 11 2017

OA-Facilities Mgmt, Design, and Construction
301 West High Street, Hst Rm 370
Jefferson City, MO 65101

Dear OA-Facilities Mgmt,

Enclosed please find your Missouri State Operating Permit which authorizes land disturbance activities for Office of Administration. This permit has been issued at your request and is based upon information submitted in your application to the Missouri Department of Natural Resources.

Please note that prior to the beginning of land disturbance activities other permits may also be required. Especially note the requirements for a Missouri Department of Natural Resources 401 Water Quality Certification and the U.S. Army Corps of Engineers 404 permit. A 401 Certification is needed when placing material, or fill, into the jurisdictional waters of the United States. Examples are culverts under road crossings, riprap along stream banks and storm water outfall pipes. The term ‘jurisdictional waters’ refers to large lakes, rivers, streams and wetlands, including those that don't always contain water.

The permitting and certification process is shared between the department and the U.S. Army Corps of Engineers. More details can be found at the US Army Corps of Engineer’s Website at http://www.usace.army.mil/. Some of these activities are also described on page 2, item 3 of the enclosed permit.

This permit contains several requirements and should be thoroughly read and understood by you. If your permit requires environmental monitoring, copies of the necessary forms have been enclosed. In all future correspondence regarding your permit please reference your permit number as shown on page 1 of the permit.

Please contact the Water Pollution Enforcement and Compliance Unit if you would like to schedule an Environmental Assistance Visit (EAV) at 573-751-1300. During the visit, staff will review the requirements of the permit and answer any questions that you may have. Staff will also be available to walk the site to advise on Best Management Practices required by the permit. The department’s regional office staff may also contact you to schedule an EAV.
If you were adversely affected by this decision, you may be entitled to an appeal before the administrative hearing commission 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 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 Administrative Hearing Commission. Contact information for the AHC is as follows: Administrative Hearing Commission, Third Floor, 131 West High Street, Jefferson City, MO 65101 (Mailing address: PO Box 1557, Jefferson City, MO 65102-1557), Phone: 573-751-2422, Fax: 573-751-5018, Website: www.oa.mo.gov/ahc.

Please be aware that this facility may also be subject to any applicable county or other local ordinances or restrictions.

Sincerely,

WATER PROTECTION PROGRAM

[Signature]

David J. Lamb
Acting Director

DJL/sm

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 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 681, Cole County
UTM Coordinates: 571840.000/4270368.000
Receiving Stream: Various State Wide (U)
First Classified Stream - ID#: Missouri R. (P) 701.00
USGS# and Sub Watershed#: 10300102 - 1305

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)

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.

July 01, 2017
Issue Date
Edward B. Galbraith, Director
Division of Environmental Quality

June 22, 2022
Expiration Date
David J. Lamb, Acting Director
Water Protection Program
APPLICABILITY

1. This general 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. This general permit also authorizes the discharge of stormwater and certain non-stormwater discharges from smaller projects where the Missouri Department of Natural Resources (department) has exercised its discretion to require a permit [10 CSR 20-6.200(1)(B)].

2. This general permit is issued to a city, county, state or federal agency or other governmental jurisdiction for land disturbance projects performed by or under contract to the permittee.

3. A general stormwater control plan or stormwater pollution prevention plan (SWPPP) must be developed prior to issuance of this permit. These plans must include a narrative of the types and appropriate uses of Best Management Practices (BMPs) for erosion and sediment control and stormwater management. All water pollution controls on land disturbance sites shall conform to the storm water control program and/or SWPPP of the city, county or other governmental jurisdiction in which the land disturbance activity is occurring. The requirements of the stormwater control plan and/or SWPPP must be at least as stringent as those described in this permit and 10 CSR 20-6.200.

4. 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 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 legal owner of the property, right-of-way or the holder of an easement on the property, and operator on which the site is located are responsible for compliance with this permit.

5. This permit authorizes discharges from construction support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided that appropriate stormwater controls are designed, installed, maintained and provided:
   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; and
   c. The support activity does not continue to operate beyond the completion of the construction activity at the project it supports.

   The permittee is responsible for compliance with this permit for any construction support activities.

6. This permit authorizes non-stormwater discharges from the following activities provided that these discharges are addressed in the permittee’s specific SWPPP required by this general permit:
   a. Dewatering activities if there are no contaminants other than sediment present in the discharge, and the discharge is treated as specified in Requirements, Section 10.o. of this permit;
   b. Flushing water hydrants and potable water lines;
   c. Water only (i.e., without detergents or additives) rinsing of streets and buildings; and
   d. Site watering to establish vegetation.

7. This general permit does not authorize the:
   a. placement of fill materials in waters or floodplains
   b. obstruction of stream flow,
   c. redirection of stormwater across private property not owned or operated by the permittee, or
d. Changing the channel of a defined drainage course.
These actions may be regulated by other federal, state, or local entities, such as the U.S. Army Corps of Engineers or Federal Emergency Management Agency. This general permit addresses only the quality of the stormwater runoff and the minimization of off-site migration of sediments and other water contaminants.

8. This permit does not authorize land disturbance activity in jurisdictional waters of the United States, unless the permittee has obtained the required Clean Water Act Section 404 Department of the Army permit from the U.S. Army Corps of Engineers and its associated Section 401 Water Quality Certification from the department. Land disturbance activities may not begin in the affected waters of the United States until the required §404 permit and §401 water quality certification have been obtained.

9. This general permit prohibits any discharge of wastewater generated from air pollution control equipment or the containment of scrubber water in lined ponds to waters of the state.

10. This general permit prohibits any discharge of sewage or pollutants to waters of the state including but not limited to:
   a. Any hazardous material, oil, lubricant, solid waste or other non-naturally occurring substance from the site, including fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;
   b. Soaps or solvents used in vehicle and equipment washing;
   c. Hazardous substances or petroleum products from an on-site spill or handling and disposal practices;
   d. Wash and/or rinse waters from concrete mixing equipment including ready mix concrete trucks, unless managed by an appropriate control. Any such pollutants must be adequately treated and addressed in the SWPPP, and cannot be discharged to waters of the state;
   e. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
   f. Domestic wastewaters, including gray waters; or
   g. Industrial stormwater runoff.

11. The department reserves the right to revoke or deny coverage under this general permit to applicants for stormwater discharges from land disturbance activities at sites that have contaminated soils that will be disturbed by the land disturbance activity or where such materials are brought to the site to use as fill or borrow. A site-specific permit may be required to cover such activities.

12. If at any time the department determines that the quality of waters of the state may be better protected by requiring the owner/operator of the permitted site to apply for a site-specific or different general permit, the department may do so [10 CSR 20-6.010(13)(C)]. Examples of when this may occur:
   a. The permittee is not in compliance with the conditions of this general permit;
   b. The discharge no longer qualifies for this general permit due to changed site conditions and/or regulations; or
   c. Information becomes available that indicates water quality standards have been or may be violated.

   The permittee will be notified in writing of the requirement to apply for a site-specific permit or a different general permit. When issued to the authorized permittee, the applicability of this general permit to the permittee is automatically terminated upon the effective date of the site-specific or different general permit.

13. Any owner/operator authorized by a general permit may request to be excluded from the coverage of the general permit and apply for a site-specific permit [10 CSR 20-6.010(13)(D)].
14. 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; or the Resource Conservation and Recovery Act. Determination of applicability for the above mentioned acts is the responsibility of the permittee.

15. This permit does not supersede any requirement for obtaining project approval under an established local authority.

16. This permit is not transferable to other owners or operators.

EXEMPTIONS FROM PERMIT REQUIREMENTS

1. Facilities that discharge all stormwater runoff directly to a combined sewer system are exempt from stormwater permit requirements.

2. Land disturbance activity as described in 10 CSR 20-6.010(1)(B) and 10 CSR 20-6.200(1)(B).

3. Oil and gas related activities as listed in 40 CFR 122.26(a)(2)(ii).

REQUIREMENTS

   Per 40 CFR Part 127 National Pollutant Discharge Elimination System (NPDES) Electronic Reporting Rule, reporting shall be submitted by the permittee via an electronic system to ensure timely, complete, accurate, and nationally-consistent set of data about the NPDES program. All general permit covered facilities under this master general permit shall comply with the department’s requirements for electronic reporting.
   a. Reporting Requirements.
      (1) Application to participate in the department’s eDMR system is required as part of the application for general permit coverage in order to constitute a complete permit application and may be accessed at dnr.mo.gov/env/wpp/edmr.htm.
      (2) The permittee must electronically submit quarterly reports via the eDMR system.
   b. Other actions. The following shall be submitted electronically after such a system has been made available by the department:
      (1) General Permit Applications/Notices of Intent to discharge (NOIs);
      (2) Notices of Termination (NOTs);
      (3) No Exposure Certifications (NOEs); and
      (4) Low Erosivity Waivers and Other Waivers from Stormwater Controls (LEWs).
   c. Electronic Submissions. To access the eDMR system, use the following web link: https://edmr.dnr.mo.gov/edmr/E2/Shared/Pages/Main/Login.aspx.
   d. Waivers from Electronic Reporting.
      (1) The permittee must electronically submit reports unless a waiver is granted by the department in compliance with 40 CFR Part 127.
      (2) The permittee may obtain a temporary or permanent electronic reporting waiver by first submitting an eDMR Waiver Request Form (Form 780-2692: http://dnr.mo.gov/forms/780-2692-f.pdf, by contacting the appropriate permitting office or emailing edmrm@dnr.mo.gov). The department will either approve or deny this electronic reporting waiver request within 120 calendar days of receipt.
      (3) Only permittees with an approved waiver request may submit reports on paper to the Department for the period that the approved electronic reporting waiver is effective.

2. Quarterly Reports: 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;
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 to the department quarterly via the department’s eDMR system. When a permittee terminates permit coverage, the permittee shall submit with the request for termination, the final quarterly report for the current calendar quarter. The permittee shall submit quarterly reports according to Table A.

<table>
<thead>
<tr>
<th>Activity for the months of:</th>
<th>Report is due:</th>
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<tbody>
<tr>
<td>January, February, March (1st Quarter)</td>
<td>April 28</td>
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<tr>
<td>April, May, June (2nd Quarter)</td>
<td>July 28</td>
</tr>
<tr>
<td>July, August, September (3rd Quarter)</td>
<td>October 28</td>
</tr>
<tr>
<td>October, November, December (4th Quarter)</td>
<td>January 28</td>
</tr>
</tbody>
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3. This permit is to ensure the design, installation and maintenance of effective erosion and sediment controls minimize the discharge of pollutants by:

a. Controlling stormwater volume and velocity within the site to minimize soil erosion;
b. Controlling 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 in the immediate vicinity of discharge points;
c. Minimizing the amount of soil exposed during construction activity;
d. Minimizing the disturbance of steep slopes;
e. Addressing factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle size expected to be present on the site to minimize sediment discharges from the site;
f. Providing and maintaining natural buffers around surface waters as detailed in 10.f;
g. Directing stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration and filtering, unless infeasible; and
h. Minimizing soil compaction and, unless infeasible, preserve topsoil. Minimizing soil compaction or preserving topsoil is not required where the intended function of a specific area of the site dictates that it be compacted or the topsoil be disturbed or removed.

4. Installation of Best Management Practices (BMPs) necessary to prevent soil erosion at the project boundary must be complete prior to the start of all phases of construction.

5. Install sediment controls along any perimeter areas of the site:

a. Remove any sediment per the manufacturer’s instructions or before it has accumulated to one-half of the above-ground height of any perimeter control.
b. For sites where perimeter controls are infeasible, other practices shall be implemented to minimize discharges to perimeter areas of the site.

6. BMPs shall be maintained and remain in effective operating condition during the entire duration of the project, with repairs made within the timeframe specified in the Requirements Section 9 of this permit, until final stabilization has been achieved.

7. Minimize sediment track-out from the site:

a. Restrict vehicle traffic to properly designed exit points such as an aggregate stone with an underlying geotextile or non-woven filter fabric.
b. Use appropriate stabilization techniques at all points that exit onto paved roads.
c. Remove any sediment that has been tracked out within the same business day or by the end of
the next business day if track-out occurs on a non-business day.

8. SWPPP Development and Implementation: 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. The permittee
shall fully implement the provisions of the SWPPP required under this part as a condition of
this general permit throughout the term of the land disturbance project. **The SWPPP must be
developed prior to issuance of the permit and must be updated with details specific to
the land disturbance site prior to conducting any land disturbance activities at the site.**
Either an electronic copy or a paper copy of the SWPPP must be accessible to anyone on-site
at all times when land disturbance operations are in progress, or other operational activities
that may affect the maintenance or integrity of the BMP structures and made available as
specified under the Records Section of this permit.

9. The SWPPP must:
   a. List and describe all points of discharge to receiving water(s);
   b. Incorporate required practices identified below;
   c. Incorporate erosion control practices specific to site conditions;
   d. Provide for maintenance and adherence to the plan;
   e. Discuss whether or not additional authorizations, such as a Section 404 permit and
      associated Section 401 Water Quality Certification are required for the project; and
   f. Name the person responsible for inspection, operation and maintenance of BMPs.

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; compliance with the Missouri
Water Quality Standards; and compliance with the terms and conditions of this general
permit.

The following manuals are acceptable resources for the selection of appropriate BMPs.
(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/npdes/developing-stormwater-pollution-prevention-plan-swppp; and
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 is

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 should be described and justified in
the SWPPP.

10. SWPPP Requirements: The following information and practices shall be provided for in the
SWPPP:
   a. Nature of the Construction Activity: The SWPPP briefly must describe the nature of the
      construction activity, including:
      (1) The function of the project (e.g., low density residential, shopping mall, highway, etc.);
      (2) The intended sequence and timing of activities that disturb the soils at the site;
      (3) Estimates of the total area expected to be disturbed by excavation, grading, or other
           construction activities including off-site borrow and fill areas; and
      (4) 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.
b. **Site Map:** The SWPPP must contain a legible site map showing the site boundaries and points of discharge to receiving water(s) and identifying:
   (1) Direction(s) of stormwater flow and approximate slopes for all phases of construction activities;
   (2) 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);
   (3) Location of permanent and temporary structural and non-structural BMPs identified in the SWPPP;
   (4) Locations where stabilization practices are expected to occur;
   (5) Locations of off-site material, waste, borrow or equipment storage areas;
   (6) Locations of all waters of the state (including wetlands);
   (7) Locations where stormwater discharges to a surface water; and
   (8) Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

c. **Site Description:** In order to identify the site, the SWPPP shall include facility and points of discharge to receiving water(s) information. 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.

d. **Selection of Temporary and Permanent BMPs:** The permittee shall select, install, use, operate and maintain appropriate BMPs for the permitted site and list them in the SWPPP.

e. **Preservation of trees and vegetation:** The SWPPP shall require existing vegetation and trees to be preserved where practical.

f. **Surface Water Buffers:** For surface waters of the state, defined 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, located on or adjacent to the site,” the permittee must comply with (1)-(3), except as noted in (4):
   (1) Provide and maintain a 50-foot undisturbed natural buffer;
   (2) 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
   (3) 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.
   (4) The permittee is not required to comply with (1), (2) or (3) above if one of the following exceptions apply and documentation is provided in the SWPPP:
      (a) As authorized per Clean Water Act Section 404 Department of the Army permit and its associated Section 401 Water Quality Certification from the department.
         1. The angle of any crossing shall be as perpendicular as feasible to the water course or natural stream buffer to minimize adverse impacts.
      (b) 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 your site. This includes situations where you have implemented permanent control measures that will prevent such discharges, such as a berm or other barrier.
      (c) 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.
         1. 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, you are required to comply with (1), (2), or (3) above.
      (d) For linear projects where site constraints make it infeasible to implement a buffer or equivalent provided you limit disturbances within 50 feet of any waters of the state and/or you provide supplemental erosion and sediment controls to treat stormwater
discharges from earth disturbances within 50 feet of the water of state.
(e) For small residential lot construction as defined as ‘a lot being developed for
residential purposes that will disturb less than 1 acre of land, but is part a larger
common plan of development or sale,’ one has the option of complying with (1), (2)
or (3) above or one of the following alternatives:
1. Tiered-technology approach where:
   a. A 50-foot or larger buffer is retained, no additional requirements are needed,
   b. The buffer is greater than 30 feet but less than 50 feet wide, implement
double perimeter controls spaced a minimum of at least 5 feet apart between
land disturbance and water of the state, or
   c. A less than or equal to 30-foot buffer is maintained, implement double
perimeter controls between land disturbance and water of the state and
stabilization activities completed with 7 calendar days of temporary or
permanent cessation of land disturbance; or
2. Sediment discharge risk based on the site’s slope, location and soil type when
combined with buffer width.

g. Measuring Buffer Width: 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.

h. Description of BMPs: The SWPPP shall include a description of both structural and non-
structural BMPs used one or more times at the site, providing the following general
information for each:
   (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 for the BMP.

i. Specific Instance of BMPs: 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) Where, in relation to other site features, the BMP is to be located;
   (3) When the BMP will be installed in relation to each phase of the land disturbance
   procedures to complete the project; and
   (4) Site conditions that must be met before removal of the BMP if the BMP is not a
   permanent BMP.

j. Disturbed Areas: Slopes for disturbed areas must be defined in the SWPPP. A site map or
maps defining the sloped areas for all phases of the project must be included in the SWPPP.
(1) For soil disturbing activities that have 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.
(2) 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.
(3) Allowances to the 14 day completion period for temporary and final stabilization may be
made due to weather and equipment malfunctions. In drought-stricken areas where
initiating vegetative stabilization measures immediately are infeasible, alternative
stabilization measures must be employed. The use of allowances shall be documented in
the SWPPP.
(4) 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 seven days of ceasing operations on that part of the site.

(5) In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed.

k. Installation: The permittee shall ensure the BMPs are properly installed at the locations and relative times specified in the SWPPP.

(1) Peripheral or border BMPs to control runoff from disturbed areas shall be installed or marked for preservation before general site clearing is started. Note that this requirement does not apply to earth disturbances related to initial site clearing and establishing entry, exit and access of the site, which may require that stormwater controls be installed immediately after the earth disturbance.

(2) For phased projects, BMPs shall be properly installed as necessary prior to construction activities.

(3) Stormwater discharges from disturbed areas which leave the site shall pass through an appropriate impediment to sediment movement such as a sedimentation basin, sediment traps and/or silt fences prior to leaving the land disturbance site.

(4) A drainage course change shall be clearly marked on a site map and described in the SWPPP.

(5) If vegetative stabilization measures are being implemented, stabilization is considered “installed” when all activities necessary to seed or plant the area are completed.

l. Sedimentation Basins: The SWPPP shall include a sedimentation basin for each drainage area with ten or more acres disturbed at one time.

(1) The sedimentation basin shall be sized to a local 2-year, 24-hour storm. A 2-year, 24-hour storm event shall be determined for the project location using the National Oceanic and Atmospheric Administration’s National Weather Service Atlas 14 which can be located at http://hdsc.nws.noaa.gov/hdsc/pfds/.

(2) Basins designed and initiated under the 2012 Area-Wide Land Disturbance General Permit MO-R100038 or prior authorizations shall comply with the requirements held in those authorizations. Any construction activities designed and initiated under this authorization shall comply with the local 2-year, 24-hour storm event by January 1, 2018.

(3) Accumulated sediment shall be removed from the basin when basin is 50% full.

(4) Utilize outlet structures that withdraw water from the surface when discharging from basins and impoundments unless infeasible.

(5) Discharges from the basin shall not cause scouring of the banks or bottom of the receiving stream.

(6) The SWPPP shall require the basin be maintained until final stabilization of the disturbed area served by the basin.

(7) 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.

(8) 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 delivery. 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.
m. **Pollution Prevention Measures:** The SWPPP shall include BMPs for pollution prevention measures. At minimum such measures must be designed, installed, implemented and maintained to:

1. Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
2. 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. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk or stormwater contamination (such as final products and material intended for outdoor use);
3. Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures. Included but not limited to the installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers; and

n. **Roadways:** Where applicable, upon installation of or connection to roadways, all efforts should be made to prevent the deposition of earth and sediment onto roadways through the use of proper BMPs.

1. Stormwater inlets susceptible to receiving sediment from the permitted land disturbance site shall have curb inlet protection.
2. Where stormwater will flow off the end of where a roadway terminates, a sediment catching BMP such as gravel berm or silt fence shall be provided.
3. Curb inlets shall be cleaned weekly or following a precipitation event that generates a run-off.

o. **Dewatering:** Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls. The SWPPP shall include a description of any anticipated dewatering methods.

1. The SWPPP shall call for 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 specified BMPs.

11. **Good housekeeping** practices shall be maintained at all times to keep waste from entering waters of the state. Solid and hazardous waste management include providing trash containers and regular site cleanup for proper disposal of solid waste such as scrap building material, product/material shipping waste, and food containers and cups, and providing containers and proper disposal of waste paints, solvents and cleaning compounds. The provision of portable toilets for proper disposal of sanitary sewage and the storage of construction materials should be kept away from drainage courses and low areas.

12. All **fueling facilities** present shall at all times adhere to applicable federal and state regulations concerning underground storage, above ground storage and dispensers.

13. **Hazardous substances** 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.

14. **Containers:** All paint, solvents, petroleum products, petroleum waste products and storage containers such as drums, cans, or cartons shall be stored according to BMPs. 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.
15. **Amending/Updating the SWPPP:** The permittee shall amend and update the SWPPP as appropriate during the term of the land disturbance activity. The permittee shall amend the SWPPP at a minimum whenever the:
   a. 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;
   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 excessive sediment deposits in streams or lakes); and/or
   f. Department determines violations of water quality standards may occur or have occurred.

16. An individual shall be designated by the permittee as the lead for environmental matters. The lead individual for environmental matters shall have a thorough and demonstrable knowledge of the site’s SWPPP and sediment and erosion control practices in general. The lead individual for environmental matters or a designated inspector knowledgeable in erosion, sediment and stormwater control principles shall inspect all structures that function to prevent pollution of waters of the state.

17. **Site Inspections:** The permittee (or a representative of the permittee) shall conduct regularly scheduled inspections.
   a. 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.
   b. Inspections are only required during the project’s normal working hours.
   c. For disturbed areas that have not been finally stabilized, all installed BMPs and other pollution control measures shall be inspected for proper installation, operation and maintenance.
   d. Areas on-site that have been stabilized must be inspected at least once per month.
      (1) For areas where disturbed portions have undergone temporary stabilization at the same time active construction continues on other areas, inspections shall occur at least once a month while stabilized and when re-disturbed shall follow either frequency outlined in subsection h. below.
      (2) For areas where disturbed portions have undergone final stabilization at the same time active construction continues on other areas, inspection frequency may be cease on the finally stabilized areas according to the following:
         (a) After the first monthly inspection, inspect once more within 24 hours of a storm event of 0.25 inches or greater.
         (b) If there are no issues or evidence of stabilization problems, further inspections may cease.
         (c) If unstable site conditions or sediment movement are observed, the site must be re-stabilized and monthly inspections shall occur until final stabilization is confirmed following a storm event of 0.25 inches or greater.
   e. All stormwater outfalls shall be inspected for evidence of erosion or sediment deposition.
   f. When practicable the receiving stream shall also be inspected for 50 feet downstream of the outfall.
   g. Any structural or maintenance problems shall be noted in an inspection report and corrected as soon as possible but no more than seven calendar days after the inspection.
      (1) If weather conditions 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.
      (2) The documentation must be filed with the regular inspection reports.
      (3) The permittee shall correct the problem as soon as weather conditions allow.
   h. All BMPs must be inspected in accordance to one of the two schedules listed below, and any
changes to the frequency of inspections, including switching between the options listed below, must be documented in the SWPPP:

(1) At least once every seven 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 and within 72 hours if the event ceases during a non-work day such as a weekend or holiday; or

(2) Once every 14 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches or greater or the occurrence of runoff from snowmelt. To determine if a storm event of 0.25 inches or greater has occurred on-site, the permittee must either keep a properly maintained precipitation gauge on site, or obtain the storm event information from a weather station near the site.

(a) Inspections shall be conducted within 24 hours once a storm event has produced 0.25 inches within a 24 hour period, even if the storm event is still continuing.

(b) If the permittee has 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 is 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.

18. The SWPPP must explain how the person responsible for erosion control will be notified when stormwater runoff occurs

19. Site Inspections Reports: A log of each inspection and copy of the inspection report shall be kept readily accessible and must be available upon request by the department. Electronic logs are acceptable as long as reports can be provided in a timely manner. If inspection reports are kept off-site, the SWPPP must indicate where they are stored. The inspection report shall be signed by the permittee or by the person performing the inspection if duly authorized to do so. The inspection report is to include the following minimum information:
   a. Inspector’s name;
   b. Date of inspection;
   c. Observations relative to the effectiveness of the BMPs;
   d. Actions taken or necessary to correct the observed problem; and
   e. Listing of areas where land disturbance operations have permanently or temporarily stopped.

20. Notification to All Contractors: The permittee shall be responsible for notifying 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 action or precautions shall be taken while on-site to minimize the potential for erosion and the potential for damaging any BMP. The SWPPP shall contain a record of notification; for example, a list of contractors or entities given a copy of the SWPPP or education session sign-in sheet. The permittee is responsible for any damage a subcontractor may do to established BMPs and any subsequent water quality violation resulting from the damage.

21. Public Notification: The permittee shall post a copy of the public notification sign on page 15 of this permit at the main entrance to the site. 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 permit has been terminated.

OTHER DISCHARGES

A record of each reportable release of hazardous substance shall be retained with the SWPPP and made available to the department upon request. The department may also require the submittal of a written or electronic report detailing measures taken to clean up the spill within five (5) days of the spill. Such a report must include the type of material spilled, volume, date of spill, date clean-up was completed, clean-up method, and final disposal method.
SAMPLING REQUIREMENTS AND EFFLUENT LIMITATIONS

The department may require sampling and reporting as a result of illegal discharges, compliance issues, complaint investigations, or other such evidence of contamination from activities at the site. If such an action is needed, the department will specify in writing any sampling requirements, including such information as location, extent and parameters.

RECORDS

1. The permittee shall retain copies of this general permit, the SWPPP and all amendments for the site, results of any monitoring and analysis, and all site inspection records. The records shall be accessible during normal business hours. The records shall be retained for a period of at least three years from the date of the Letter of Termination.

2. The permittee shall provide a copy 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.

3. 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.

LAND PURCHASE AND CHANGE OF OWNERSHIP

1. If the permittee sells any portion of the 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.

2. Property of any size which is part of a larger common plan of development where the property has been stabilized and the original permit terminated will require application of a new land disturbance permit for any future land disturbance activity unless exempted per 10 CSR 20-6.010(1)(B), 10 CSR 20-6.200(1)(B), and 40 CFR 122.26(a)(2)(ii).

3. If the entire tract is sold to a single entity, then this permit shall be terminated when the new owner obtains a new land disturbance permit for the site.

4. 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 while no permit is required for less than one acre of land sold.

TERMINATION

This permit may be terminated when all projects are stabilized. The project is considered to be finally stabilized when perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetation cover shall be at least 70% over 100% of the site. In order to terminate the permit, the permittee shall notify the department by submitting Form H- Request for Termination of a General Permit (http://dnr.mo.gov/forms/780-1409-f.pdf).

DUTY TO REAPPLY

Unless terminated, the permittee shall submit an application for the renewal of this permit by submitting Form E-Application for General Permit (http://dnr.mo.gov/forms/780-0795-f.pdf) and
**Form G – Application for Stormwater Permit Under the General Permit: Land Disturbance**

(http://dnr.mo.gov/forms/780-1408-F.pdf) no later than thirty (30) days prior to the permit’s expiration date. If a facility submits a timely and complete application in accordance with 10 CSR 20-6.010(5)(B), (5)(C), and (10)(E)1, as well as § 644.051.10, RSMo 2015, if the department is unable, through no fault of the permittee, to issue a renewal prior to expiration of the previous permit, the terms and conditions of the expired permit are administratively continued and will remain fully effective and enforceable until such time when a permit action is taken. Failure to submit a renewal application for a facility that is still in operation is a violation of the Missouri Clean Water Law. As part of the complete application and as required by the federal NPDES eReporting rule, participation in the department’s Electronic Discharge Monitoring Report Submission System (eDMR) will be required. Facilities already participating in eDMR need not re-apply upon renewal. More information can be found at: http://dnr.mo.gov/env/wpp/edmr.htm. Failure to apply for renewal of a permit may result in termination of this permit and enforcement action to compel compliance with this condition and the Missouri Clean Water Law. This permit may be applied for and issued electronically once made available by the director in accordance with Section 644.051.10, RSMo.

**MODIFICATION, REVOCATION, AND REOPENING**

1. The full implementation of this operating permit shall constitute compliance with all applicable federal and state statutes and regulations in accordance with §644.051.16, RSMo, and the CWA section 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 Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a) (2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:
   a. contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
   b. controls any pollutant not limited in the permit.
2. 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.

**STANDARD CONDITIONS**

These Standard Conditions incorporate permit conditions as required by 40 CFR 122.41 or other applicable state statutes or regulations. These minimum conditions apply unless superseded by requirements specified in the permit.

1. **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.

2. **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.

3. **Duty to Provide Information:** The permittee shall furnish to the department, within a reasonable time, 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.
4. **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.

5. **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.
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
MO-R100038

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 (permit) 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 a permit.

This Fact Sheet is for a:
☐ Major
☐ Minor
☐ Industrial Facility
☐ Variance
☒ Master General Permit
☐ Permit with widespread public interest

Definitions

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.

Immediately: For the purposes of this permit, immediately should be defined as within 24 hours.

Infeasible: Infeasible means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale: A contiguous area where multiple separate and distinct construction activities are occurring under one plan.

Non-structural Best Management Practice: Institutional, educational or pollution prevention practices designed to limit the amount of stormwater runoff or pollutants that are generated in the landscape. An example includes ordinance development.

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 should be defined as any activity that has been
ceased without any intentions of future disturbance.

Structural Best Management Practice: Physical controls working individually or as a group, appropriate to the source, location, and area climate for the pollutant to be controlled. Examples include moving earth for sedimentation basin and planting vegetation.

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 – Facility Information**

Facility Type: Industrial Stormwater  
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 SWPPP requirement to minimize pollutants of concern from this type of facility or for all facilities covered under this permit. 10 CSR 20-6.200(6)(A)7. specifies that “general permits shall contain BMP requirements and/or monitoring and reporting requirements to keep the stormwater from becoming contaminated.” 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 local conditions.

While drafting this permit for renewal, the department hosted four public meetings on January 27, February 24, April 18, and May 19, 2016, which allowed stakeholders to voice concerns about conditions within the permit and submit comments during the period of initial involvement. These concerns were taken into consideration when drafting the permit.

**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 beneficial water uses shall be maintained in accordance with 10 CSR 20-7.031(4). The BMP requirement established by this permit are intended to be protective of all streams that fall within the categories of receiving water bodies indicated above. A general permit does not take into consideration site-specific conditions.
Part III – Applicability

Condition number 5 includes support activities. Those support activities are to become part of the land disturbance permitted area and included in the acreage calculations, whether the support activities are located adjacent to, on-site or off-site from the main land disturbance construction area. For example, if the main land disturbance site is 0.6 acres and the project needs fills that is gathered from a borrow site specific to this project which equals 0.5 acres, then the total acreage for this project is an acre or more and the conditions of this permit apply to both the main construction area and the borrow area.

Condition number 14 was expanded to include a more comprehensive list of state and federal requirements that must be taken into consideration.

If the proposed project encounters and will potentially affect a species of concern, please report it to the Missouri Department of Conservation and the United States Fish and Wildlife Service. For more information about requirements of the Endangered Species Act, please visit the following links:

1. To determine the potential for species of concern within or near a project, please visit the United States Fish and Wildlife Services’ “Information, Planning and Conservation” website at http://ecos.fws.gov/ipac/.
2. If there are listed species in the county or township, check to see if critical habitat has been designated and if that area overlaps or is near the project area. Critical habitat designations and associated requirements may also be found at 50 CFR Parts 17 and 226. For additional information, use the map view tool at http://criticalhabitat.fws.gov/crithab/ to find data specific to the state and county.

The Missouri Department of Conservation’s internet site for the Natural Heritage Review may be very helpful and can be found at the following link, https://naturalheritagereview.mdc.mo.gov/.

Part IV – Exemptions

Condition Number 2 was added to cite all state exemptions from permitting requirements, combining several previous cited exemptions into one condition and reference. This includes an exemption for linear construction where the entire disturbance, including clearing of land to access the linear disturbance, is less than two feet in width.

Condition Number 3 was added to cite federal regulations that exclude land disturbance projects related to the installation or maintenance work for oil and gas related activities.

Part V – Rationale of Technology Based Limitations & Permit Conditions

303(d) List & Total Maximum Daily Load (TMDL):
Section 303(d) of the Federal CWA requires that each state identify waters that are 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 that are impaired but not addressed by normal water pollution control programs.

Anti-Backsliding:
A provision in the Federal Regulations [CWA Section 303(d) (4); CWA Section 402(c); 40 CFR Part 122.44(I)] that requires a reissued permit to be as stringent as the previous permit with some exceptions.

- Applicable: Backsliding proposed in this permit conforms to the anti-backsliding provisions of Section 402(o) of the CWA and 40 CFR 122.44. The department has determined that technical mistakes were made in the previous permit [CWA 402(o)(2)(B)(ii)]. The Department has determined that technical mistakes or mistaken interpretations of law were made in issuing the
permit under section 402(a)(1)(b).

**Settleable Solids:** The Settleable Solids limitation was removed since has been determined to not be a statewide technology or water quality based limitation given a variability of soil type in the state. Increased technology based best management practices have been included and are a more appropriate technology based requirement.

**Water Quality Standard Narrative Prohibitions.** The previous permit contained language which referenced compliance with the water quality standards found in 10 CSR 20-7.031. In order to comply with 40 CFR 122.44(d)(1), the permit writer has conducted reasonable potential determinations for each general and applicable specific criterion and established numeric effluent limitations where reasonable potential exists. While the removal of the previous permit language creates the appearance of backsliding, the permit writer has evaluated discharges associated with this general permit as to whether reasonable potential to cause excursions of specific or general criteria on a statewide level and found that no reasonable potential exists given the proper implementation of a Stormwater Pollution Prevention Plan and associated best management practices and that the requirements of this permit are equally protective as compared to the previous permit. Therefore, given this new information, and the fact that the previous permit special condition was not consistent with 40 CFR 122.44(d)(1), an error occurred in the establishment of the general criteria as a special condition of the previous permit.

**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 that the best avenue forward for implementing the Antidegradation requirements into general permits is by requiring the appropriate development and maintenance of a SWPPP. The SWPPP must identify all Best Management Practices (BMPs) that are reasonable and effective, 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 new BMPs that are reasonable and cost effective. New facilities seeking coverage under this permit are required to develop a SWPPP that includes this analysis and documentation of appropriate BMPs. Renewal of coverage for a facility requires a review of the SWPPP to assure that the selected BMPs continue to be appropriate.

- Applicable: The main pollutant of concern in this permit is sediment. Compliance with the technology-based limitations established in this permit for the protection of General Criteria, along with the evaluation and implementation of BMPs as documented in the SWPPP, meets the requirements of Missouri’s Antidegradation Review [10 CSR 20-7.031(3), 10 CSR 20-7.031 Table A, and 10 CSR 20-7.015(9)(A)].5.

**STORMWATER POLLUTION PREVENTION PLAN (SWPPP):**
In accordance with 40 CFR 122.44(3)(k) Best Management Practices (BMPs), BMPs are implemented 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 Developing Your Stormwater Pollution Prevention Plan, a Guide for Construction Sites (EPA 833-R-06-004; https://www3.epa.gov/npdes/pubs/sw_swppp_guide.pdf) published by the United States Environmental Protection Agency (EPA) in May 2007, BMPs are measures or practices used to reduce the amount of pollution entering waters of the state. BMPs may take the form of a process, activity, or physical structure. EPA developed resources and tools related to construction stormwater along with the BMPs to control and minimize stormwater (https://www.epa.gov/npdes/stormwater-discharges-construction-activities). Along with EPA’s resources and tools, the International Stormwater BMP database (www.bmpdatabase.org/index.htm) may provide guidance on BMPs appropriate for specific industries.

Additionally in accordance with 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 stormwater discharges.

☐ Applicable: A SWPPP shall be developed and implemented for each site and shall incorporate required practices identified by the department with jurisdiction, incorporate erosion control practices specific to site conditions, and provide for maintenance and adherence to the plan.

The new permit has been revised to allow permittees to store SWPPP documents electronically as long as they can be provided in an expedient manner.

Release of a hazardous substance must be reported to the department in accordance with 10 CSR 24-3.010. If the spill occurs outside of normal business hours, or if the permit holder cannot reach regional office staff for any reason, the permit holder is instructed to report the spill to the department’s 24 hour Environmental Emergency Response hotline at (573) 634-2436 at the earliest practicable moment after discovery. Leaving a message on a department staff member voice-mail does not satisfy this reporting requirement.

WATER QUALITY STANDARDS:
Per 10 CSR 20-7.03(1)(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.

SPECIFIC CRITERIA CONSIDERATIONS:
An evaluation of discharges associated with land disturbance activities has been conducted to determine if any pollutants discharged under this general permit would have reasonable potential to cause or contribute toward an excursion of specific water quality criterion. Pollutants discharged from land disturbance activities are not commonly associated with pollutants listed as specific criteria in the Missouri Water Quality Standards; therefore, reasonable potential to cause an excursion of a specific criterion does not exist.

GENERAL CRITERIA CONSIDERATIONS:
In accordance with 40 CFR 122.44(d)(1), effluent limitations shall be placed into the permit for those pollutants which have been determined to cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality. The rule further states that pollutants which have been determined to cause, have the reasonable potential to cause, or contribute to an excursion above a narrative criterion within an applicable State water quality standard, the permit shall contain a numeric effluent limitation to protect that narrative criterion. In order to comply with this regulation, the permit writer will complete reasonable potential determinations on whether the discharge will violate any of the general criteria listed in 10 CSR 20-7.03(1)(4). These specific requirements are listed below followed by derivation and discussion [the lettering matches that of the rule itself, under 10 CSR 20-7.03(1)(4)]. It should also be noted that Section 644.076.1, RSMo states that it shall be unlawful for any person to cause or permit any discharge of water contaminants from any water contaminant or point source located in Missouri that is 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.

(a) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses. The SWPPP requires implementation of best management practices to store, prevent, or minimize stormwater and/or any related land disturbance activity discharges (namely sediment). If one follows their SWPPP and other permit conditions including timely inspections, no reasonable potential to cause an excursion of this narrative exists. Additionally, there had been no indication to the Department that a stream has had issues maintaining beneficial uses as a result of the controlled and managed stormwater discharges per the SWPPP. Therefore, based on the information reviewed during the drafting of this permit, no reasonable potential to cause or contribute to an excursion of this criterion exists.

(b) Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses. Please see (a) above as justification is the same.

(c) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses. Please see (a) above as justification is the same.

(d) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life. This permit addresses discharges from land disturbance activities and it is expected to include an toxic pollutants. Best management practices are to be addressed in the SWPPP should any toxic pollutant of concern be on-site.

(e) There shall be no significant human health hazard from incidental contact with the water. Please see (a) above as justification is the same.

(f) There shall be no acute toxicity to livestock or wildlife watering. Please see (d) above as justification is the same.

(g) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community. Please see (a) above as justification is the same.

(h) Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid Waste Law, section 260.200. RSMo. except as the use of such materials is specifically permitted pursuant to section 260.200-260.247. Please see (a) above. Additionally, any solid wastes received or produced at this facility are wholly contained in appropriate storage facilities, are not discharged, and are disposed of offsite. Therefore, this discharge does not have reasonable potential to cause or contribute to an excursion of this criterion.

The settleable solids requirement was removed from this permit and was replaced with additional, more specific BMP requirements. The settleable solids limit was determined not to be protective of all waters across the state, therefore, it was removed. Examples of these BMPs include requirements to:

- Install and maintain perimeter controls along areas of the site that will receive pollutant discharges;
- Minimize sediment track-out from the site;
- Provide storage for runoff up to and including a 2-year, 24-hour storm event when designing sedimentation basins; and
- Direct stormwater to vegetated areas.

The minimum buffer width was increased from 25 feet to 50 feet. Studies have shown that a 50 foot vegetative buffer more adequately treats sediment from stormwater discharges. This appears to be standard in EPA’s permit as well as in many other states. A literature review was conducted to assess the effectiveness of buffer widths in relation to sediment removal. In an early literature review on grass buffers in agricultural settings, Dosskey (2001) concluded that 40 -100% of sediment entering from cultivated fields was removed using buffer strips 0.5 to 20 meters. Liu et al. (2008) conducted an analysis of 85 estimates of sediment removal by vegetated buffers. They found that sediment removal efficiency ($E_s$, the percentage of inflowing sediment trapped within a buffer) increased with buffer width according to the relationship: $E_s = 13.4 \log_e (w) + 56.9$ in
which \( w \) (m) is buffer width. This equation predicts that \( E_s \) increases from 78% for a 5 meter wide buffer to 88% and 97% at widths of 10 meters and 20 meters, respectively. Yaun et al. (2009; 93 estimates) and Zhang et al. (2010; 81 estimates) garnered similar results to Liu et al.

In order to design controls that match the sediment removal efficiency of a 50-foot buffer, first the permittee must know what this efficiency is for the 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 sediment controls used to reduce the discharge of sediment prior to the buffer.

Sediment removal efficiencies are based on the U.S. Department of Agriculture’s RUSLE2 (Revised Universal Soil Loss Equation 2) model for slope profiles using a 100-foot long exposed slopes.

Sediment removal is defined as the annual sediment delivered at the downstream end of the 50-foot natural buffer (tons/yr/acre) divided by the annual yield from cleared area (tons/yr/acre).

Sediment removal is in part a function of (1) a perimeter control (i.e., silt fence) located between the disturbed portion of the site and the upland edge of the natural buffer and (2) stormwater flows traveling through a 50-foot buffer of undisturbed natural vegetation.

Additional guidance may be found at https://www.epa.gov/sites/production/files/2017-02/documents/2017_cgp_final_appendix_g_-_buffer_reqs_508.pdf.

Inspection frequencies: Site inspection frequencies have been changed from the previous permit based upon guidance from the USEPA and from stakeholder discussions. These frequencies will allow flexibility but will still allow for frequent enough inspections to ensure that all BMPs are adequately functioning.

**Part VI – Effluent Limitations Determination**

In this general permit, Technology-Based Effluent Limitations are established through the SWPPP and BMP requirements. Effective BMPs may have to be designed on a site-specific basis. The implementation of monitoring provides a tool for each facility to evaluate the effectiveness of BMPs to ensure protection of water quality.

**Part VII – Land Purchase and Change of Ownership**

A “larger common plan of development or sale” is a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan. This term is used in conjunction with common promotional plan, as defined in §644, RSMo.

Any portion of a project that is sold to a developer is still considered part of a larger common plan of development or sale and will require a permit.

If a portion of a site is sold to an individual for the purpose of building his or her private residence:

- A permit is required if the portion of land sold is equal to or greater than one acre.
- A permit is not required if the portion of land sold is less than one acre.

**Part VIII – Termination**

The word ‘plant density’ was removed from the first paragraph since the department determined that percent of vegetative cover more accurately describes the vegetative requirements of this permit. This decision was made after discussion within the department and with stakeholders.

It is preferable that temporary BMPs such as sediment fence be removed prior to permit termination to
eliminate potential solid waste issues that may occur as a result of unnecessary and unmaintained BMPs.

Additional options for winter site stabilization as part of the vegetation requirement may exist, such as using a seeded erosion control blanket.

**Part IX – Duty to Reapply**

This section has been revised to reflect the current applicable statutes which require applicants to submit an application for coverage 30 days prior to expiration of this permit. Currently, a paper application if required; however, applicants are to submit an application for coverage electronically as soon as they are made available by the director. The department will announce the availability status of the new permit and the process to reapply at least 60 days prior to the expiration of the existing permit.

**Part X – Standard Conditions**

This section was revised to only include the standard conditions that specifically apply to this permit. All other conditions have been removed.

**Part XI – 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 NOTICE:**
The department shall give public notice that 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 seeking comments on this permit occurred from March 31 to May 1, 2017.

**DATE OF FACT SHEET:** 06/16/2017

**COMPLETED BY:**
CHRISTOPHER MILLER  
ENVIRONMENTAL SPECIALIST  
573-526-3337  
christopher.miller@dnr.mo.gov

**EDITED BY:**
STACIA BAX  
ENVIRONMENTAL SUPERVISOR  
573-526-4586  
stacia.bax@dnr.mo.gov
APPENDIX NO. 2
MODNR Construction Permit No. CP0002007
RE: Land Application – W.E. Sears Youth Center Wastewater Treatment Facility, MO-0031496, Construction Permit No. CP0002007, Butler County

Dear Mr. Kelly Hammack:

The Missouri Department of Natural Resources’ Water Protection Program has reviewed the plans and specifications submitted by Smith & Co., Engineers for the State of Missouri, Office of Administration. Please find enclosed Construction Permit No. CP0002007.

This permit will terminate 24 months from the date of issuance. In accordance with 10 CSR 20-6.010(5)(J), the Department may grant an extension. If you believe that an extension is necessary, you must submit a request and a justification in writing for the extension at least 30 days prior to the permit expiration date.

This construction permit does not supersede any requirements of the operating permit or enforcement actions. Nothing in this permit removes any obligations to comply with county or other local ordinances or restrictions.

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 Section 621.250, RSMo. 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. Contact information for the AHC is: 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: ahc.mo.gov.
Mr. Kelly Hammack
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If you have any questions concerning this matter, please contact Mr. Andrew Appelbaum, of the Water Protection Program by phone at 314-416-2062 or by mail at Department of Natural Resources, P.O. Box 176, Jefferson City, MO 65102.

Thank you for your efforts to help ensure clean water in Missouri.

Sincerely,

WATER PROTECTION PROGRAM

Refaat Mofrakis

Refaat Mofrakis, P.E., Design/Development/ Survey Manager
Engineering Section

RM:aat

Enclosures

c: Dominic Thompson, P.E., Smith & Co. Engineers
STATE OF MISSOURI

DEPARTMENT OF NATURAL RESOURCES

MISSOURI CLEAN WATER COMMISSION

CONSTRUCTION PERMIT

The Missouri Department of Natural Resources hereby issues a permit to:

Kelly Hammack
Facility Operations Manager
W.E. Sears Youth Center
301 W. High Street
Jefferson City, MO 65102

for the construction of (described facilities):

See attached.

Permit Conditions:

See attached.

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.

A representative of the Department may inspect the work covered by this permit during construction. Issuance of a permit to operate by the Department will be contingent on the work substantially adhering to the approved plans and specifications.

This permit applies only to the construction of water pollution control components; it does not apply to other environmentally regulated areas.

February 27, 2019
Effective Date

Edward B. Galbraith, Director, Division of Environmental Quality

February 26, 2021
Expiration Date

Chris Wieberg, Director, Water Protection Program
CONSTRUCTION PERMIT

I. CONSTRUCTION DESCRIPTION

Conversion of an existing three cell discharging lagoon to a no-discharge land application system. Existing lagoon will be replaced with a single cell earthen lagoon basin with a working storage capacity of approximately 2,665,000 gallons. All sludge from existing lagoon will be hauled off-site and disposed in accordance with a sludge disposal plan approved by the Southeast Regional Office. Addition of a lift station with two 35 HP Flyght (or equivalent) effluent pumps each with a minimum capacity of 437.3 gpm at a TDH of 132 feet, approximately 4078 lineal feet of 6-inch pvc force main; a land application site with 26 fixed sprinkler heads over approximately 11.15 acres. Together with all the necessary appurtenances to make a complete and usable wastewater system to serve a school and youth center and effectively treat, hold and land apply a wastewater flow of 17,800 gallons per day with no-discharge to waters of the state. The site is located in the SW 1/4, of the SW 1/2, of Section 34, T26N, R05E, Butler County.

Approximate locations:
Lagoon basin emergency discharge point   UTM, X=721774, Y=4082035
Application field                     UTM, X=721600, Y=4081950

Vegetation: forest

Dry weather average annual flow: 17,800 GPD
Wettest 1 in 10 year effluent flow from precipitation: 1760 GPD

Design spray irrigation: up to 1 inch/day, up to 3 inches/week, up to 24 inches/year (wettest 1 in 10)
Application area required for 24 inches/year: 10.95 acres.
Application area available to fixed sprinklers: 11.15 acres.
Sludge will be stored in the treatment lagoon and removed when necessary.

Storage basin and application site will be fenced and fitted with warning signs.

A closure/sludge disposal plan will need to be submitted to the Southeast Regional Office for review and approval prior to closure activities.

This project will also include general site work appropriate to the scope and purpose of the project and all necessary appurtenances to make a complete and usable wastewater treatment facility.

II. COST ANALYSIS FOR COMPLIANCE

Pursuant to Section 644.145, RSMo, when issuing permits under this chapter that incorporate a new requirement for discharges from publicly owned combined or separate sanitary or storm sewer systems or publicly owned treatment works, or when enforcing provisions of this chapter or the Federal Water Pollution Control Act, 33 U.S.C. 1251 et seq., pertaining to any portion of a publicly owned combined or separate sanitary or storm sewer system or [publicly owned] treatment works, the Department of Natural Resources shall make a “finding of affordability” on the costs to be incurred and the impact of any rate changes on ratepayers upon which to base such permits and decisions, to the extent allowable under this
chapter and the Federal Water Pollution Control Act. This process is completed through a cost analysis for compliance. Permits that do not include new requirements may be deemed affordable.

The Department is not required to make a “finding of affordability”. Per Section 644.145.3, a “finding of affordability” is a statement as to whether or not an individual or household would be required to make unreasonable sacrifices in order to make the projected monthly payments for sewer services. While this facility is a publically-owned treatment works, the permittee accomplishes capital improvements through an established budget for operation and maintenance and not through the issuance of utility bills to customers for sewer services. Because of this, the Department cannot determine the “affordability” of the new permit requirements.

III. CONSTRUCTION PERMIT CONDITIONS

The permittee is authorized to construct subject to the following conditions:

1. This construction permit does not authorize discharge.

2. All construction shall be in accordance with the plans and specifications submitted by Smith & Co., Engineers on January 4, 2019.

3. The Department must be contacted in writing prior to making any changes to the approved plans and specifications that would directly or indirectly have an impact on the capacity, flow, system layout, or reliability of the proposed wastewater treatment facilities or any design parameter that is addressed by 10 CSR 20-8, in accordance with 10 CSR 20-8.110(11).

4. 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 Southeast Regional Office per 10 CSR 20-7.015(9)(G).

5. The wastewater treatment facility shall be located above the twenty-five (25)-year flood level.

6. The wastewater facility structures, electrical equipment, and mechanical equipment shall be protected from physical damage by not less than the one hundred- (100-) year flood elevation per 10 CSR 20-8.140(2)(B). The minimum distance between wastewater treatment facilities and all potable water sources shall be at least three hundred feet (300') per 10 CSR 20-8.140(2)(C).
7. In addition to the requirements for a construction permit, 10 CSR 20-6.200 requires land disturbance activities of 1 acre or more 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 dnr.mo.gov/env/wpp/epermit/help.htm. See dnr.mo.gov/env/wpp/stormwater/sw-land-disturb-permits.htm for more information.

8. 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 dnr.mo.gov/env/wpp/401/ for more information.

9. In accordance with 10 CSR 20-6.010(12), a full closure plan shall be submitted to the Department’s Southeast Regional Office for review and approval of the permitted wastewater treatment system being replaced. The closure plan must address the removal and disposal of all sludge. The closure plan must meet the requirements outlined in Standard Conditions Part III of the Missouri State Operating Permit No. MO-0031496. Closure shall not commence until the submitted closure plan is approved by the Department.

10. Upon completion of construction:

A. Submit an electronic copy of the as built if the project was not constructed in accordance with previously submitted plans and specifications; and

B. Submit the enclosed form Statement of Work Completed to the Department in accordance with 10 CSR 20-6.010(5)(N) and request the operating permit modification be issued.

IV. REVIEW SUMMARY

1. CONSTRUCTION PURPOSE

Existing lagoon does not consistently meet ammonia limitations. Owner elected to convert system to a no-discharge spray irrigation system.
2. **FACILITY DESCRIPTION**

The W.E. Sears Youth Center treatment facility is located at 9400 Sears Lane, Poplar Bluff, in Butler County, Missouri. The current facility is a 3 cell lagoon with chlorination and dechlorination, has a dry weather design average flow of 17,800 gpd, with a hydraulic population equivalent of 178.

The proposed treatment facility will have a reconstructed single lagoon cell with a surface area of approximately 51,500 square feet with an effective storage volume of approximately 2,665,000 gallons. Land application to occur over approximately 11.15 acres at a maximum rate of 24 inches/year. Facility will have no discharge.

3. **COMPLIANCE PARAMETERS**

The proposed wastewater treatment plant will be a complete no-discharge treatment facility. All liquid waste will be treated and disposed on-site. A Missouri State Operating Permit is required to be maintained. Monitoring of the facility will be required along with keeping records of land application and maintenance activities. There are currently no sampling requirements of the land applied water.

4. **REVIEW of MAJOR TREATMENT DESIGN CRITERIA**

The area that will take on precipitation to the new storage basin is considered to be 51,516 sq. ft. The wettest 1-in-10 year rainfall is estimated to be 60 inches and average evaporation is estimated as 40 inches for a net precipitation of 20 inches. This additional water (642,318 gallons per year or 1760 gpd) needs to be accounted for land application purposes. The dry weather design flow is 17,800 gpd; the wet-weather design flow is considered to be 19,560 gpd.

The existing three cell lagoon will have all the sludge removed and disposed off-site. Details of the sludge disposal have not been provided and need to be approved by the Southeast Regional Office. The new earthen lagoon basin will be sealed with bentonite at a rate of 8 pounds per sq. ft. (4 lbs./sq. ft. per 6-inch lift). The basin will have a bottom rectangular dimension of approx. 106 ft. X 272 ft. and will have 2:1 sloping walls; the depth from the top of the berms to the lagoon floor will be 13 feet. There will be an emergency spillway one foot below the berm top. The storage volume is between the two foot depth and the 11 foot depth. The one foot between the maximum storage level and the spillway is reserved for the 25 year, 24 hour storm event. The storage volume is estimated to be approx. 2,665,000 gallons. The storage volume must hold a minimum of 75 days of flow and the estimated precipitation during the same period during the wettest 1 in 10 year. Precipitation for the wettest 90 days is estimated at 18 inches. Allowing 2 feet for precipitation and using only the lower 7 feet results in a storage volume of approximately 1,982,000 gallons which is sufficient for over 111 days of storage of the design flow.

The water from the holding basin will be land applied to forest area with an approximate available area of 15 acres. 26 spray irrigation sprinkler heads with varying spray patterns will be installed to cover approximately 11.15 acres. At the wet weather design flow the minimum
area required for a maximum of 24 inches of applied wastewater per year is 10.95 acres. Water will be irrigated by a lift station with two 35 HP Flyght (or equivalent) effluent pumps, 3 phase, 460 volt, each with a minimum capacity of 437.3 gpm at a TDH of 132 feet; pumped through approximately 4078 feet of 6 inch pvc force main, 26 fixed sprinkler heads with varying spray patterns, Rainbird Model 80E, with 3/8-inch nozzle.

The pump and application rate is intended to be approximately 437 gpm. Maximum application rates are 1 inch per day; and 3 inches per week. At full design flow, yearly application would take approximately 272 hours (34 – 8 hr. days).

5. OPERATING PERMIT

Operating permit MO-0031496 will require a modification to reflect the construction activities. The modified W.E. Sears Youth Center WWTF, MO-0031496, was successfully public noticed from January 25, 2019 to February 25, 2019 with no comments received. At completion of construction, submit the Statement of Work Completed to the Department in accordance with 10 CSR 20-6.010(5)(N) and request the operating permit modification be issued.

Andrew Appelbaum, P.E.
Engineering Section
andy.appelbaum@dnr.mo.gov
H1610-01 Prebid Meeting Directions: The W. E. Sears Youth Center (WESYC) is 6 mi north on Hwy 67 of the Poplar Bluff Hwy 60 / Hwy 67 intersection. From the Hwy 67 / Sears Ln intersection, go west on Sears Lane to the WESYC Admin Bldg parking area. (See map’s Sears Lane blue-line to Admin Bldg red-dot parking-area.)

Enter the WESYC Admin Bldg visitors entrance/lobby, sign-in at the front desk, and await directions to the H1610-01 Prebid Meeting Room.