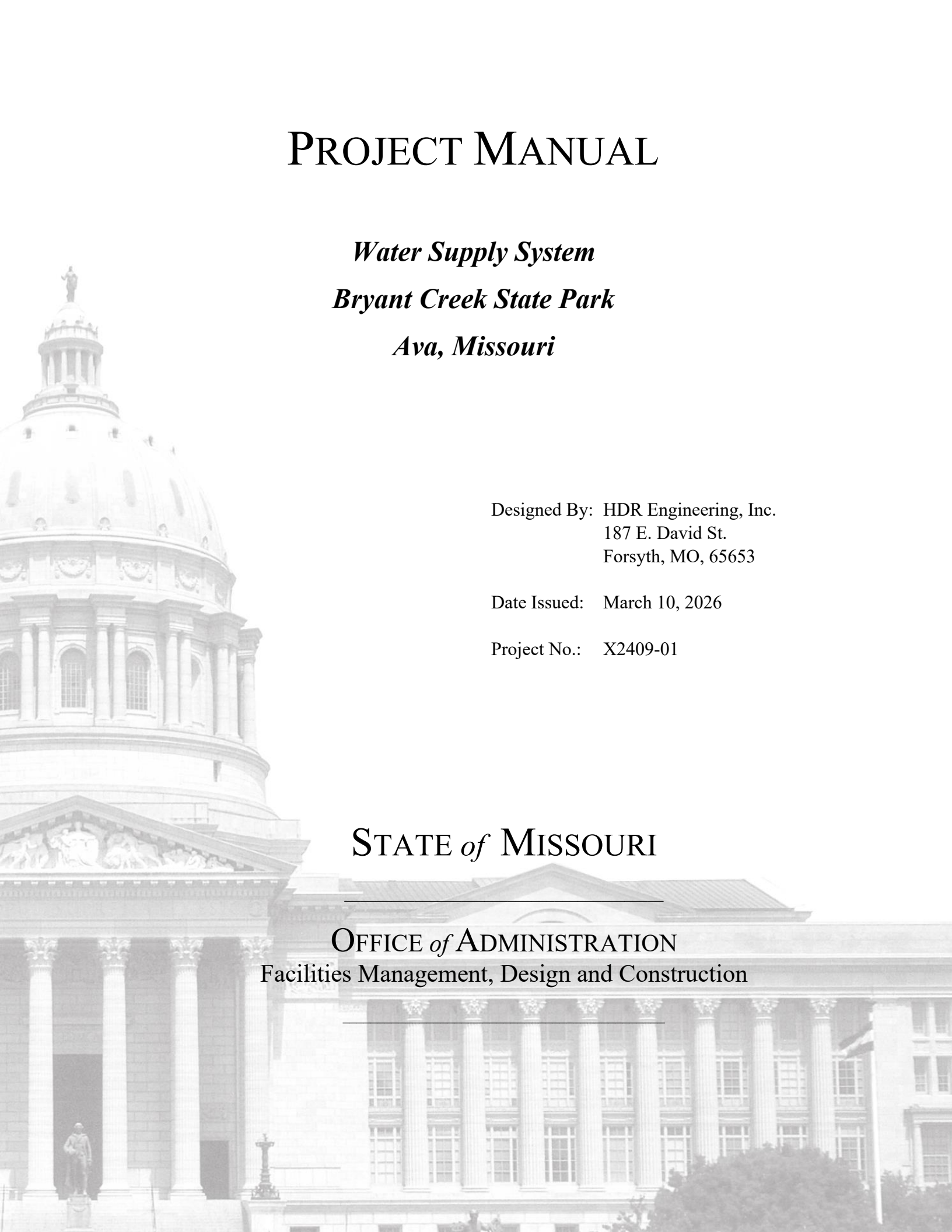




PROJECT MANUAL

Water Supply System Bryant Creek State Park Ava, Missouri

Designed By: HDR Engineering, Inc.
187 E. David St.
Forsyth, MO, 65653

Date Issued: March 10, 2026

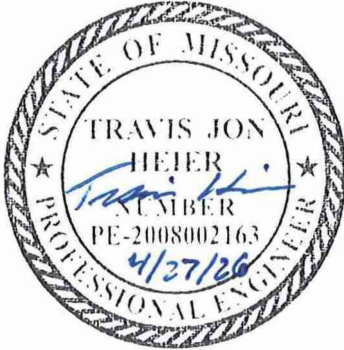
Project No.: X2409-01

STATE *of* MISSOURI

OFFICE *of* ADMINISTRATION
Facilities Management, Design and Construction

00 01 07
SEALS AND SIGNATURES

Owner Name: Missouri Office of Administration
Facility or Site Name: Bryant Creek State Park
Project Name: Water Supply System
Project or Contract Designation: 10440837
Engineer: HDR Engineering, Inc. MO Certificate of Authority #000856

Travis Heier, PE License No. 2008002163 	

Engineer's seal and signature does not apply to the documents that comprise Division 00, Bidding and Contracting Requirements.

It is a violation of applicable laws and regulations governing professional licensing and registration for any person, unless acting under the direction of the licensed and registered design professional(s) indicated above, to alter in any way the Specifications in this project manual.

END OF SEALS AND SIGNATURES

TABLE OF CONTENTS

SECTION	TITLE	NUMBER OF PAGES
----------------	--------------	------------------------

DIVISION 00 – PROCUREMENT AND CONTRACTING INFORMATION

000000 INTRODUCTORY INFORMATION

000101	Project Manual Cover	1
000107	Professional Seals and Certifications	1
000110	Table of Contents	2
000115	List of Drawings	1

001116	INVITATION FOR BID (IFB)	1
--------	--------------------------	---

002113	INSTRUCTIONS TO BIDDERS	7
--------	-------------------------	---

NOTICE TO BIDDERS

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

004000 PROCUREMENT FORMS & SUPPLEMENTS

004113	Bid Form	*
004322	Unit Prices Form	*
004337	MBE/WBE/SDVE/HDVE Compliance Evaluation Form	*
004338	MBE/WBE/SDVE/HDVE Eligibility Determination Form for Joint Ventures	*
004339	MBE/WBE/SDVE/HDVE Good Faith Effort (GFE) Determination Forms	*
004340	SDVE Business Form	*
004340.1	HDVE Business Form	*
004541	Affidavit of Work Authorization	*
004545	Anti-Discrimination Against Israel Act Certification form	*

005000 CONTRACTING FORMS AND SUPPLEMENTS

005213	Construction Contract	3
--------	-----------------------	---

006000 PROJECT FORMS

006113	Performance and Payment Bond	2
006325	Product Substitution Request	2
006519.16	Final Receipt of Payment and Release Form	1
006519.18	MBE/WBE/SDVE/HDVE Progress Report	2
006519.21	Affidavit of Compliance with Prevailing Wage Law	1

007000 CONDITIONS OF THE CONTRACT

007213	General Conditions	20
007300	Supplementary Conditions	1
007346	Wage Rate	4

DIVISION 01 - GENERAL REQUIREMENTS

011000	Summary of Work	2
012100	Allowances	3
012200	Unit Prices	2
012300	Alternates	2
012600	Contract Modification Procedures	2
013100	Coordination	4
013115	Project Management Communications	4

013200	Schedule – Bar Chart	4
013300	Submittals	5
013513.28	Site Security and Health Requirements (DNR)	5
015000	Construction Facilities and Temporary Controls	8
017400	Cleaning	3
017900	Demonstration and Training	6

TECHNICAL SPECIFICATIONS INDEX:

DIVISION 3 – CONCRETE

03 05 05	Concrete Testing and Inspection	7
03 11 13	Formwork	5
03 15 19	Anchorage to Concrete	8
03 21 00	Reinforcement	5
03 31 30	Concrete Materials and Proportioning	12
03 31 31	Concrete Mixing, Placing, Jointing, and Curing	15
03 35 00	Concrete Finishing and Repair of Surface Defects	10

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES

06 10 00	Rough Carpentry	5
----------	-----------------	---

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

07 21 00	Building Insulation	6
07 26 00	Under Slab Vapor Retarder	2

DIVISION 8 – OPENINGS

08 11 00	Hollow Metal Doors and Frames	4
----------	-------------------------------	---

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 92 00	Seeding, Sodding, and Landscaping	5
----------	-----------------------------------	---

DIVISION 33 – UTILITIES

33 05 31.16	PVC Pressure Pipe for Water Transmission and Distribution	6
33 11 13	Potable Water Supply Wells	7
33 14 11	Water Utility Transmission and Distribution Piping	18
33 16 23	Hydropneumatic Water Storage Tanks	6

DIVISION 40 – PROCESS INTERCONNECTIONS

40 05 31	Pipe – Plastic	3
40 05 52	Miscellaneous Valves	4
40 05 61	Gate Valves	3
40 05 66	Check Valves	5

DIVISION 46 – WATER AND WASTEWATER EQUIPMENT

46 33 11	Chemical Feed – Liquid Systems	4
----------	--------------------------------	---

APPENDIX

1. DNR Permits	34
----------------	----

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:

	<u>TITLE</u>	<u>SHEET #</u>	<u>DATE</u>
1.	Cover Sheet	Sheet G-001	03/10/26
2.	Sheet Index and Overall Site Plan	Sheet C-100	03/10/26
3.	Site 01 Water Supply Plan View Base Bid	Sheet C-101	03/10/26
4.	Site 02 Water Supply Plan View Bid Alternates	Sheet C-102	03/10/26
5.	Details	Sheet C-501	03/10/26
6.	Details	Sheet C-502	03/10/26
7.	Well Details	Sheet C-503	03/10/26
8.	Well House Plan View	Sheet A-101	03/10/26

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 Supply System
Bryant Creek State Park
Ava, Missouri
Project No.: X2409-01

3.0 BIDS WILL BE RECEIVED:

- A. Until: 1:30 PM, October 22, 2026
- B. **Only electronic bids sent to FMDCBids@oa.mo.gov shall be accepted:** (See Instructions to Bidders for further detail)

4.0 DESCRIPTION:

- A. Scope: The project includes new water systems for the North and South Day Use Areas including potable wells, well houses, pressure tanks, chlorination systems, piping, yard hydrants, and appurtenances.
- B. MBE/WBE/SDVE Goals: MBE 0%, WBE 0%, SDVE 3%, or HDVE 3%. **NOTE: Only MBE/WBE firms certified by the State of Missouri Office of Equal Opportunity as of the date of bid opening, or SDVE(s)/HDVE(s) meeting the requirements of Section 34.069, RSMo, Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE/HDVE participation goals for this project.**

5.0 PRE-BID MEETING:

- A. Place/Time: 10 AM, October, 8, 2026, at 4297 Co Rd 142, Rockbridge, MO 65741. The meeting location is approximately 4 miles from the Park.
- B. Access to State of Missouri property requires presentation of a photo ID by all persons.

6.0 HOW TO GET PLANS & SPECIFICATIONS:

- A. View Only Electronic bid sets are available at no cost or paper bid sets for a deposit of **\$100.00** from American Document Solutions (ADS). MAKE CHECKS PAYABLE TO: American Document Solutions. Mail to: American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433, <https://www.adsplanroom.net>. NOTE: Prime contractors will be allowed a maximum of two bid sets at the deposit rate shown above. Other requesters will be allowed only one bid set at this rate. Additional bid sets or parts thereof may be obtained by any bidder at the cost of printing and shipping by request to American Document Solutions at the address shown above. Bidder must secure at least one bid set to become a planholder.
- B. **Refunds: Return plans and specifications in unmarked condition within 15 working days of bid opening to American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433. Deposits for plans not returned within 15 working days shall be forfeited.**
- C. Information for upcoming bids, including downloadable plans, specifications, Invitation for Bid, bid tabulation, award, addenda, and access to the ADS planholders list, is available on the Division of Facilities Management, Design and Construction's web site: <https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans>.

7.0 POINT OF CONTACT:

- A. Project Manager: Nathan Graessle, email: nathaniel.graessle@oa.mo.gov

8.0 GENERAL INFORMATION:

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

SECTION 002113 – INSTRUCTIONS TO BIDDERS

1.0 - SPECIAL NOTICE TO BIDDERS

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

2.0 - BID DOCUMENTS

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

3.0 - BIDDERS' OBLIGATIONS

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

4.0 - INTERPRETATIONS

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

5.0 - BIDS AND BIDDING PROCEDURE

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

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

004113	Bid Form (all pages are always required)
004322	Unit Prices Form
004336	Proposed Subcontractors Form
004337	MBE/WBE/SDVE/HDVE Compliance Evaluation Form
004338	MBE/WBE/SDVE/HDVE Eligibility Determination for Joint Ventures
004339	MBE/WBE/SDVE/HDVE GFE Determination
004340	SDVE Business Form
004340.1	HDVE Business Form
004541	Affidavit of Work Authorization
004545	Anti-Discrimination Against Israel Act Certification form

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

6.0 - SIGNING OF BIDS

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

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

7.0 - RECEIVING BID SUBMITTALS

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

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

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

9.0 - AWARD OF CONTRACT

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

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

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

10.0 - CONTRACT SECURITY

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

11.0 - WORKING DAYS

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

12.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

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

13.0 - ANTI-DISCRIMINATION AGAINST ISRAEL ACT CERTIFICATION:

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

14.0 - MBE/WBE/SDVE/HDVE INSTRUCTIONS

- A. Definitions:
 - 1. "MBE" means a Minority Business Enterprise.

2. **“MINORITY”** has the same meaning as set forth in 1 CSR. 10-17.010.
3. **“MINORITY BUSINESS ENTERPRISE”** has the same meaning as set forth in section 37.020, RSMo.
4. **“WBE”** means a Women’s Business Enterprise.
5. **“WOMEN’S BUSINESS ENTERPRISE”** has the same meaning as set forth in section 37.020, RSMo.
6. **“SDVE”** means a Service-Disabled Veterans Enterprise.
7. **“SERVICE-DISABLED VETERAN”** has the same meaning as set forth in section 34.074, RSMo.
8. **“SERVICE-DISABLED VETERAN ENTERPRISE”** has the same meaning as “Service-Disabled Veteran Business” set forth in section 34.074, RSMo.
9. **“HDVE” means an Honorably Discharged Veteran Enterprise**
10. **“Honorably Discharged Veteran” has the same meaning as set forth in section 34.069, RSMo.**
11. **“Honorably Discharged Veteran Enterprise”** has the same meaning as “Honorably Discharged Veteran Business” set forth in section 34.069, RSMo.

B. MBE/WBE/SDVE/HDVE General Requirements:

1. For all bids greater than \$100,000, the Bidder shall obtain MBE, WBE, SDVE or HDVE participation in an amount equal to or greater than the percentage goals set forth in the Invitation for Bid and the Bid Form, unless the Bidder is granted a Good Faith Effort waiver by the Director of the Division, as set forth below. If the Bidder does not meet the MBE, WBE, SDVE or HDVE goals, or make a good faith effort to do so, the Bidder shall be nonresponsive, and its bid shall be rejected.
2. The Bidder should submit with its bid all the information requested in the MBE/WBE/SDVE/HDVE Compliance Evaluation Form for every MBE, WBE, SDVE, or HDVE subcontractor or material supplier the Bidder intends to use for the contract work. The Bidder is required to submit all MBE/WBE/SDVE/HDVE documentation before the stated time and date set forth in the Invitation for Bid. If the Bidder fails to provide such information by the specified date and time, the Owner shall reject the bid.
3. The Director reserves the right to request additional information from a Bidder to clarify the Bidder’s proposed MBE, WBE, SDVE, or HDVE participation. The Bidder shall submit the clarifying information requested by the Owner within two (2) working days of receiving the request for clarification.
4. Pursuant to section 34.069, RSMo and section 34.074, RSMo, a Prime Bidder that qualifies as an SDVE or HDVE shall receive a three-percentage point bonus preference in the contract award evaluation process. The bonus preference will be calculated and applied by reducing the bid amount of the eligible SDVE or HDVE by three percent of the apparent low responsive Bidder’s bid. Based on this calculation, if the eligible SDVE’s or HDVE’s evaluation is less than the apparent low responsive Bidder’s bid, the eligible SDVE’s or HDVE’s bid will become the apparent low responsive bid. This reduction is for evaluation purposes only and will have no impact on the actual amount(s) of the bid or the amount(s) of any contract awarded. In order to be eligible for the SDVE or HDVE preference, the Bidder must complete and submit with its bid the Missouri Service-Disabled Veteran Business Form or the Missouri Honorably Discharged Veterans Business Form, and any information required by the form.

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

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

MBE and WBE participation.) For the remaining contract amount to be counted towards the MBE, WBE or SDVE goal, the Bidder must complete the MBE/WBE/SDVE/HDVE Compliance Evaluation Form (Section 004337) identifying itself as an MBE, WBE, SDVE or HDVE.

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

D. Certification of MBE/WBE/SDVE/HDVE Subcontractors:

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

E. Waiver of MBE/WBE/SDVE/HDVE Participation:

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

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

F. Contractor MBE/WBE/SDVE/HDVE Obligations

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



State of Missouri Construction Contract

THIS AGREEMENT is made (DATE) by and between:

Contractor Name and Address

hereinafter called the "Contractor," and the **State of Missouri**, hereinafter called the "**Owner**", represented by the Office of Administration, Division of Facilities Management, Design and Construction.

WITNESSETH, that the Contractor and the Owner, for the consideration stated herein agree as follows:

ARTICLE 1. STATEMENT OF WORK

The Contractor shall furnish all labor and materials and perform all work required for furnishing and installing all labor, materials, equipment and transportation and everything necessarily inferred from the general nature and tendency of the plans and specifications for the proper execution of the work for:

Project Name: **Water Supply System
Bryant Creek State Park
Ava, Missouri**

Project Number: **X2409-01**

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

ARTICLE 3. LIQUIDATED DAMAGES

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

ARTICLE 4. CONTRACT SUM

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

Base Bid: \$

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

TOTAL CONTRACT AMOUNT: (\$CONTRACT AMOUNT)

UNIT PRICES: The Owner accepts the following Unit Prices:

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

ARTICLE 5. PREVAILING WAGE RATE

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

DAVIS-BACON ACT: If this Project is financed in whole or in part from Federal funds (as indicated in the Instructions to Bidders or other bid or contract documents for this Project), then this contract shall be subject to all applicable federal labor statutes, rules and regulations, including provisions of the Davis-Bacon Act, 40 U.S.C. §3141 et seq., and the "Federal Labor Standards Provisions," as further set forth in Section 007333 – Supplementary General Conditions for Federally Funded/Assisted Construction Projects, which is incorporated into the contract by reference. Where the Missouri Prevailing Wage Law and the Davis-Bacon Act require payment of different wages for work performed under this contract, the Contractor and all Subcontractors shall pay the greater of the wages required under either law, on a classification-by-classification basis.

ARTICLE 6. MINORITY/WOMEN/SERVICE DISABLED VETERAN BUSINESS ENTERPRISE PARTICIPATION

The Contractor has been granted a waiver of the 0% MBE and 0% WBE, 3% SDVE, or HDVE 3% participation goals. The Contractor agrees to secure the MBE/WBE/SDVE/HDVE participation amounts for this project as follows: (OR)

The Contractor has met the MBE/WBE/SDVE/HDVE participation goals and agrees to secure the MBE/WBE/SDVE/HDVE participation amounts for this project as follows:

MBE/WBE/SDVE/HDVE Firm:	Subcontract Amt:\$
MBE/WBE/SDVE/HDVE Firm:	Subcontract Amt:\$
MBE/WBE/SDVE/HDVE Firm:	Subcontract Amt:\$
	Total \$

MBE/WBE/SDVE/HDVE 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/HDVE firms listed above when such disputes impact the subcontract amounts shown above.

ARTICLE 7. CONTRACT DOCUMENTS

The following documents are hereby incorporated into this contract by reference (all division/section numbers and titles are as utilized in the Project Manual published by the Owner for this Project):

1. Division 0 – Procurement and Contracting Information, including, but not limited to:
 - a. Invitation for Bid (Section 001116)
 - b. Instructions to Bidders (Section 002113)
 - c. Supplementary Instructions to Bidders (if applicable) (Section 002213)
 - d. The following documents as completed and executed by the Contractor and accepted by the Owner, if applicable:
 - i. Bid Form (Section 004113)
 - ii. Unit Prices (Section 004322)
 - iii. Proposed Contractors Form (Section 004336)
 - iv. MBE, WBE, SDVE, HDVE Compliance Evaluation Form(s) (Section 004337)
 - v. MBE, WBE, SDVE, HDVE Eligibility Determination Form for Joint Ventures (Section 004338)
 - vi. MBE, WBE, SDVE, HDVE Good Faith Effort (GFE) Determination Form (Section 004339)
 - vii. Missouri Service-Disabled Veteran Business Form (Section 004340)
 - viii. Missouri Honorably Discharged Veteran Business Form (Section 004340.1)
 - ix. Affidavit of Work Authorization (Section 004541)
 - e. Performance and Payment Bond, completed and executed by the Contractor and surety (Section 006113)
 - f. General Conditions (Section 007213)
 - g. Supplementary Conditions (Section 007300)
 - h. Supplementary General Conditions for Federally Funded/Assisted Construction Projects (Section 007333), if applicable
 - i. Wage Rate(s) (Section 007346)
2. Division 1 – General Requirements
3. All Drawings identified in the Project Manual
4. All Technical Specifications included in the Project Manual
5. Addenda, if applicable

ARTICLE 8 – CERTIFICATION

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

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

APPROVED:

Crystal Wessing, Director
Division of Facilities Management,
Design and Construction

Contractor's Authorized Signature

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

Corporate Secretary

SECTION 006113 - PERFORMANCE AND PAYMENT BOND FORM

KNOW ALL MEN BY THESE PRESENTS, THAT we _____

as principal, and _____

_____ as Surety, are held and firmly bound unto the

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

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

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

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

(Insert Project Title and Number)

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

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

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

AS APPLICABLE:

AN INDIVIDUAL

Name: _____

Signature: _____

A PARTNERSHIP

Name of Partner: _____

Signature of Partner: _____

Name of Partner: _____

Signature of Partner: _____

CORPORATION

Firm Name: _____

Signature of President: _____

SURETY

Surety Name: _____

Attorney-in-Fact: _____

Address of Attorney-in-Fact: _____

Telephone Number of Attorney-in-Fact: _____

Signature Attorney-in-Fact: _____

NOTE: Surety shall attach Power of Attorney



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

PROJECT NUMBER

PROJECT TITLE AND LOCATION

CHECK APPROPRIATE BOX

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

FROM: BIDDER/CONTRACTOR (PRINT COMPANY NAME)

TO: ARCHITECT/ENGINEER (PRINT COMPANY NAME)

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

SPECIFIED PRODUCT OR SYSTEM

SPECIFICATION SECTION NO.

SUPPORTING DATA

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

QUALITY COMPARISON

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

PREVIOUS INSTALLATIONS

PROJECT	ARCHITECT/ENGINEER
LOCATION	DATE INSTALLED

SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

REASON FOR SUBSTITUTION	
DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?	
☐ YES ☐ NO	
IF YES, EXPLAIN	
SUBSTITUTION REQUIRES DIMENSIONAL REVISION OR REDESIGN OF STRUCTURE OR A/E WORK	
☐ YES ☐ NO	
BIDDER'S/CONTRACTOR'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:	
We have investigated the proposed substitution. We believe that it is equal or superior in all respects to specified product, except as stated above; that it will provide the same Warranty as specified product; that we have included complete implications of the substitution; that we will pay redesign and other costs caused by the substitution which subsequently become apparent; and that we will pay costs to modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning as a result of the substitution.	
BIDDER/CONTRACTOR	DATE
REVIEW AND ACTION	
☐ Resubmit Substitution Request with the following additional information:	
☐ Substitution is accepted.	
☐ Substitution is accepted with the following comments:	
☐ Substitution is not accepted.	
ARCHITECT/ENGINEER	DATE



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

PROJECT NUMBER

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

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

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

DOES HEREBY:

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

DATED this day of , 20 .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents



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

MBE/WBE/SDVE/HDVE PROGRESS REPORT

Remit with ALL Progress and Final Payments

(Please check appropriate box) ☐CONSULTANT ☐CONSTRUCTION

PAY APP NO.	PROJECT NUMBER
CHECK IF FINAL ☐ FINAL	DATE

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

☐ MBE ☐ WBE ☐ SDVE ☐ HDVE	\$	\$	
--	----	----	--

Revised 06/2023

INSTRUCTIONS FOR MBE/WBE/SDVE/HDVE PROGRESS REPORT

CONTRACTOR OR CONSULTANT TO FILL OUT AND REMIT WITH EACH PAY APPLICATION:

The MBE/WBE/SDVE/HDVE Progress Report for the project is issued with the contract comprising values reported in the consultant's Proposal or on the successful contractor's Section 004337 Compliance Evaluation Forms.

At Initial Pay Application fill in the following:

1. Pay App No. Start with 1.
2. Fill in the Project Number and Date.
3. Enter Project Title, Project Location, and Firm.
4. Fill in the "Original Contract Sum" and "Total Contract Sum To Date" (Reference applicable Line Items on Form A of Application for Payment).
5. Indicate the Total Participation Dollar Amount from the Original Contract.
6. Select MBE, WBE, SDVE, or HDVE for each Consultant/Subconsultant or Contractor/Subcontractor/Supplier.
7. Enter the "Total Amount of Subcontract", "\$ Amount (Paid-To-Date)", and Company Name.

For all subsequent Pay Applications fill in the following:

1. Pay App No.
2. If Final Pay App, check box.
3. Fill in the Project Number and Date.
4. Enter Project Title, Project Location, and Firm
5. At each Pay App fill in the "Original Contract Sum" and "Total Contract Sum To Date" (reference applicable Line Items on Form A of Application for Payment).
6. Indicate the Total Participation Dollar Amount from the Original Contract.
7. Select MBE, WBE, SDVE, or HDVE for each Consultant/Subconsultant or Contractor/Subcontractor/Supplier
8. Enter the "Total Amount of Subcontract", "\$ Amount (Paid-To-Date)", and Company Name.



STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION
AFFIDAVIT – COMPLIANCE WITH PREVAILING WAGE LAW

PROJECT NUMBER

Before me, the undersigned Notary Public, in and for the County of _____

State of _____ personally came and appeared _____

(NAME)

of the _____

(POSITION)

(NAME OF THE COMPANY)

(a corporation) (a partnership) (a proprietorship) and after being duly sworn did depose and say that all provisions and requirements set out in Chapter 290, Sections 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on public works project have been fully satisfied and there has been no exception to the full and completed compliance with said provisions and requirements and with Wage Determination No: _____ issued by the

Department of Labor and Industrial Relations, State of Missouri on the _____ day of _____ 20 ____

in carrying out the contract and working in connection with _____

(NAME OF PROJECT)

Located at _____ in _____ County

(NAME OF THE INSTITUTION)

Missouri, and completed on the _____ day of _____ 20 ____

SIGNATURE

NOTARY INFORMATION

NOTARY PUBLIC EMBOSSEY OR
BLACK INK RUBBER STAMP SEAL

STATE

COUNTY (OR CITY OF ST. LOUIS)

SUBSCRIBED AND SWORN BEFORE ME, THIS

DAY OF

YEAR

USE RUBBER STAMP IN CLEAR AREA BELOW

NOTARY PUBLIC SIGNATURE

MY COMMISSION
EXPIRES

NOTARY PUBLIC NAME (TYPED OR PRINTED)

FILE: Closeout Documents

GENERAL CONDITIONS

INDEX

ARTICLE:

1. General Provisions

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

2. Owner/Designer Responsibilities

3. Contractor Responsibilities

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

4. Changes in the Work

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

5. Construction and Completion

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

6. Bond and Insurance

6.1. Bond

6.2. Insurance

7. Termination or Suspension of Contract

7.1. For Site Conditions

7.2. For Cause

7.3. For Convenience

SECTION 007213 - GENERAL CONDITIONS

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

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

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

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

ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

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

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

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

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

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

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

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

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

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

ARTICLE 1.5 - ANTI-KICKBACK

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

ARTICLE 1.6 - PATENTS AND ROYALTIES

A. The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liabilities of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article or appliance manufactured or used in the performance of this contract, including its use by the Owner, unless otherwise specifically stipulated in the contract documents.

B. If the Contractor uses any design, device or materials covered by letters, patent or copyright, the Contractor shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, without exception, that the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract and shall indemnify the Owner for any cost, expense or damage it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

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

ARTICLE 1.8 - COMMUNICATIONS

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

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

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

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

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

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

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

ARTICLE 1.11 - INDEMNIFICATION

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

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

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

ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES

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

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

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

ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES

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

ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS

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

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

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

ARTICLE 3.2 -- SUBMITTALS

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

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

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

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

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

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

ARTICLE 3.3 – AS-BUILT DRAWINGS

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

ARTICLE 3.4 – GUARANTY AND WARRANTIES

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

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

B. Extended Warranty

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

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

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

2. Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.
 3. Equipment List: List of all major equipment as installed shall be prepared to include model number, capacities, flow rate, name plate data, shop drawings and air and water balance reports.
 4. Service Instructions: Provide the following information for all pieces of equipment.
 - a. Recommended spare parts including catalog number and name of local supplier or factory representative.
 - b. Belt sizes, types, and lengths.
 - c. Wiring diagrams.
 5. Manufacturer's Certificate of Warranty as described in Article 3.4.
 6. Prior to the final payment, furnish to the Designer three (4) copies of parts catalogs for each piece of equipment furnished by him/her on the project with the components identified by number for replacement ordering.
- B. Submission of operating instructions shall be done in the following manner.
1. Manuals shall be in quadruplicate, and all materials shall be bound into volumes of standard 8½" x 11" hard binders. Large drawings too bulky to be folded into 8½" x 11" shall be separately bound or folded and in envelopes, cross referenced and indexed with the manuals.
 2. The manuals shall identify project name, project number, and include the name and address of the Contractor, subcontractors and manufacturers who were involved with the activity described in that particular manual.
 3. Internally subdivide the binder contents with permanent page dividers, logically organized with tab titles clearly printed under reinforced laminated plastic tabs.
 4. Contents: Prepare a Table of Contents for each volume, with each product or system description identified.
- ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES**
- A. The Contractor shall keep on site, during progress of the work, a competent superintendent satisfactory to the Construction Representative. The superintendent shall represent the Contractor and all agreements made by the superintendent shall be binding. The superintendent shall carefully study and compare all drawings, specifications and other instructions and shall promptly notify the Construction Representative and Designer, in writing, any error, inconsistency or omission which may be discovered. The superintendent shall coordinate all work on the project. Any change of the superintendent shall be approved by the Construction Representative.
- B. Contractor shall, at all times, enforce strict discipline and good order among his employees, and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him/her.
- C. The Contractor shall supply sufficient labor, material, plant and equipment and pay when due any laborer, subcontractor or supplier for supplies furnished and otherwise prosecute the work with diligence to prevent work stoppage and ensure completion thereof within the time specified.
- D. The Contractor and each of his subcontractors shall submit to the Construction Representative, through the Designer such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.
- E. The Contractor, subcontractors, and material suppliers shall upon written request, give the Owner access to all time cards, material invoices, payrolls, estimates, profit and loss statements, and all other direct or indirect costs related to this work.
- F. The Contractor shall be responsible for laying out all contract work such as layout of architectural, structural, mechanical and electrical work, which shall be coordinated with layouts of subcontractors for general construction work. The Contractor is also responsible for unloading, uncrating and handling of all materials and equipment to be erected or placed by him/her, whether furnished by Contractor or others. No extra charges or compensation will be allowed as a result of failure to verify dimensions before ordering materials or fabricating items.
- G. The Contractor must notify the Construction Representative at least one working day before placing concrete or burying underground utilities, pipelines, etc.
- H. Contractors shall prearrange time with the Construction Representative for the interruption of any facility operation. Unless otherwise specified in these documents, all connections, alterations or relocations as well as all other portions of the work will be performed during normal working hours.

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

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

ARTICLE 3.7 -- SUBCONTRACTS

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

ARTICLE 4 -- CHANGES IN THE WORK

4.1 CHANGES IN THE WORK

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

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

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

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

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

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

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

ARTICLE 4.2 – CHANGES IN COMPLETION TIME

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

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT

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

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

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

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

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

ARTICLE 5.2 -- PROJECT CONSTRUCTION

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

with the requirements outlined in Section 013200 – Schedules.

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

ARTICLE 5.3 -- PROJECT COMPLETION

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

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

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

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

DEFAULT AND BE GROUNDS FOR CONTRACT TERMINATION AND DEBARMENT.

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

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

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

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

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

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

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

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

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

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

ARTICLE 6 -- INSURANCE AND BONDS

ARTICLE 6.1 -- BOND

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

ARTICLE 6.2 – INSURANCE

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

B. Minimum Scope and Extent of Coverage

1. General Liability

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

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

2. Automobile Liability

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

3. Workers' Compensation and Employer's Liability

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

4. Builder's Risk or Installation Floater Insurance

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

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

C. Minimum Limits of Insurance

1. General Liability

Contractor

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

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

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

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

D. Deductibles and Self-Insured Retentions

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

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

E. Other Insurance Provisions and Requirements

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

1. General Liability

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

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

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

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

2. Automobile Insurance

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

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

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

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

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

3. Workers' Compensation/Employer's Liability

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

4. All Coverages

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

F. Insurer Qualifications and Acceptability

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

G. Verification of Insurance Coverage

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

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

ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

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

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

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

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

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

ARTICLE 7.3 -- FOR CONVENIENCE

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

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

B. Upon receipt of notification, the Contractor shall:

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

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

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

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

SECTION 007300 - SUPPLEMENTARY CONDITIONS

1.0 GENERAL:

- A. These Supplementary General Conditions clarify, add, delete, or otherwise modify standard terms and conditions of DIVISION 00, BIDDING AND CONTRACTING REQUIREMENTS.

2.0 CONTACTS:

Project Manager: Nathan Graessle
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, MO 65101
Telephone: 573-508-6646
Email: nathaniel.graessle@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 SAFETY REQUIREMENTS

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

TO: ADS

RE: Water Supply System
Bryant Creek State Park
Ava, Missouri
PROJECT NO. X2409-01

FROM: Mandy Roberson

DATE: 9/18/26

Here is the list of addresses for the Entities indicated on the Distribution of Bidding Documents Printing Request Checklist:

AGENCY CONTACT: JR Glenn
Department of Natural Resources
1659 East Elm Street
Jefferson City, MO, 65101
Telephone: 573-522-1027
Email: john.glenn@dnr.mo.gov

CONTRACT SPECIALIST: Mandy Roberson
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, MO 65101
Telephone: 573-690-9411
Email: mandy.roberson@oa.mo.gov

PROJECT MANAGER: Nathan Graessle
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, MO 65101
Telephone: 573-508-6646
Email: nathaniel.graessle@oa.mo.gov

CONSTRUCTION
ADMINISTRATOR: Dustin Cooper
Division of Facilities Management, Design and Construction
301 W. High Street
Jefferson City, MO 65101
Telephone: 573-536-1692
Email: dustin.cooper@oa.mo.gov

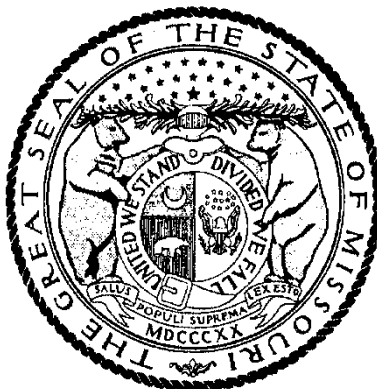
A/E DESIGNER: Travis Heier
HDR Engineering, Inc.
187 E. David St.
Forsyth, MO, 65653
Telephone: 417-546-2131
Email: travis.heier@hdrinc.com

FACILITY CONTACT: Nicholas Kromrie
Bryant Creek State Park
1204 Private Drive 3422
Ava, MO , 65608
Telephone: 417-334-4704
Email: nicholas.kromrie@dnr.mo.gov

Missouri

Division of Labor Standards

WAGE AND HOUR SECTION



MIKE KEHOE, Governor

Annual Wage Order No. 33

Section 034
DOUGLAS COUNTY

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

Original Signed by

Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: March 10, 2026

Last Date Objections May Be Filed: April 9, 2026

Prepared by Missouri Department of Labor and Industrial Relations

DOUGLAS COUNTY

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	\$22.63*
Boilermaker	\$22.63*
Bricklayer - Stone Mason	\$56.45
Carpenter	\$53.00
Lather	
Linoleum Layers & Cutter	
Millwright	
Pile Driver	
Cement Mason	\$22.63*
Plasterer	
Communication Technician	\$22.63*
Electrician (Inside Wireman)	\$22.63*
Electrician (Outside Lineman)	\$22.63*
Outside - Groundman	
Outside - Groundman Tree Trimmer	
Outside - Lineman Operator	
Outside - Lineman Tree Trimmer	
Elevator Constructor	\$22.63*
Glazier	\$22.63*
Iron Worker	\$22.63*
Laborer	\$44.91
Laborer - First Semi-Skilled	
Laborer - General	
Laborer - Second Semi-Skilled	
Laborer - Skilled	
Mason	\$22.63*
Marble Finisher	
Marble Mason	
Terrazzo Finisher	
Terrazzo Worker	
Tile Finisher	
Tile Setter	
Operating Engineer	\$22.63*
Operating Engineer - Group I	
Operating Engineer - Group II	
Operating Engineer - Group III	
Operating Engineer - Group III - A	
Operating Engineer - Group IV	
Operating Engineer - Group V	
Painter	\$22.63*
Plumber	\$60.45
Pipe Fitter	
Roofer/WaterProofer	\$22.63*
Sheet Metal Worker	\$22.63*
Sprinkler Fitter - Fire Protection	\$22.63*
Truck Driver	\$22.63*
Truck Control Service Driver	
Truck Driver, Teamsters Group I	
Truck Driver, Teamsters Group II	
Truck Driver, Teamsters Group III	
Truck Driver, Teamsters Group IV	

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

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

DOUGLAS COUNTY

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	\$22.63*
Millwright	
Pile Driver	
Electrician (Outside Lineman)	\$22.63*
Outside - Groundman	
Outside - Groundman Tree Trimmer	
Outside - Lineman Operator	
Outside - Lineman Tree Trimmer	
Laborer	\$48.11
Laborer - General	
Laborer - Skilled	
Operating Engineer	\$22.63*
Operating Engineer - Group I	
Operating Engineer - Group II	
Operating Engineer - Group III	
Operating Engineer - Group IV	
Truck Driver	\$22.63*
Truck Control Service Driver	
Truck Driver, Teamsters Group I	
Truck Driver, Teamsters Group II	
Truck Driver, Teamsters Group III	
Truck Driver, Teamsters Group IV	

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

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

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

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

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

OVERTIME and HOLIDAYS

OVERTIME

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

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

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

HOLIDAYS

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

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

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Project consists of Bryant Creek State Park Water Systems.
- B. Project Location: Bryant Creek State Park (1204 Private Drive 3422, Ava, MO 65608).
- C. 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.
- D. Contract Documents dated **March 10, 2026** were prepared for the Project by HDR Engineering, Inc., PO Box 969, 187 E. David St., Forsyth, MO 65653.
- E. The Work consists of new water systems for the north and south day use areas including potable wells, well houses, pressure tanks, chlorination systems, piping, yard hydrants, and appurtenances.
- F. The Work will be constructed under a single prime contract.

1.3 WORK UNDER OTHER CONTRACTS

- A. Separate Contract: The Owner has awarded a separate contract for performance of certain construction operations at the site. Those operations are scheduled to be substantially complete before work under this Contract begins. The separate contract includes the following:
 - 1. Contract: A separate contract has been awarded to White River Valley Electric Cooperative to provide electrical service to the well sites.
- B. Cooperate fully with separate contractors so that work under those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

1.4 FUTURE WORK

- A. Future Contract: None.

1.5 WORK SEQUENCE

- A. The Work will be conducted in **one** phase.

1.6 CONTRACTOR USE OF PREMISES

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

- B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.
 - 1. Owner Occupancy: Allow for Owner occupancy and use by the public.
 - 2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage cause by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period..

1.7 OCCUPANCY REQUIREMENTS

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

1.8 OWNER-FURNISHED PRODUCTS

- A. The Owner will furnish no products.

1.9 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF PRODUCTS ORDERED IN ADVANCE

END OF SECTION 011000

SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 WEATHER ALLOWANCE

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

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

1.4 FACILITY INTERRUPTION ALLOWANCE

- A. Included within the completion period for this project are a specified number of “Facility Interruption” days (see Schedule of Allowances).
- B. The Contractor’s progress schedule shall clearly indicate the facility interruption day allowance as an “activity” or “activities”. In the event facility interruptions 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 facility interruption 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 “facility interruption” 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 “facility interruption” 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 “facility interruption” day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the “facility interruption” 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 “facility interruption” day allowance.
- E. Once this allowance is depleted, a no cost Change Order time extension will be executed for “facility interruption days” days, as defined above, encountered during the remainder of the Project.

1.5 SELECTION AND PURCHASE

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

1.6 SUBMITTALS

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

1.7 COORDINATION

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

1.8 LUMP-SUM ALLOWANCES

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

- A. Weather Allowance: Included within the completion period for this Project ten (10) "bad weather" days.
- B. Facility Interruption: Included within the completion period for this Project zero (0) "facility interruption" 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 Change Orders.

1.3 DEFINITIONS

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

1.4 PROCEDURES

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Unit Price No. 1 -2" Water Main:

1. Description: 2" Water Main according to Division 33 Section "33 05 31.16 -PVC Pressure Pipe for Water Transmission and Distribution (A WW A C900)."
2. Unit of Measurement: Linear Feet
3. Base Bid Quantity: 1,792 Linear Feet

B. Unit Price No. 2 – Frost-Free Hydrant

1. Description: Frost-free Hydrant according to Division 33 Section "33 05 31.16 - PVC Pressure Pipe for Water Transmission and Distribution (A WW A C900)."
2. Unit of Measurement: Each
3. Base Bid Quantity: 6 Each

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

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

1.4 PROCEDURES

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1: *Drill well, install casing pipe, install well pump for north day use area.*
- B. Alternate No. 2: *Construct well house, pressure tank, chlorination system, and appurtenances for north day use area.*

C. Alternate No. 3: *Install water main piping and frost-free hydrants for north day use area.*

END OF SECTION 012300

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 REQUESTS FOR INFORMATION

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

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

1.4 MINOR CHANGES IN THE WORK

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

1.5 PROPOSAL REQUESTS

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

1.6 CHANGE ORDER PROCEDURES

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 013100 – COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 COORDINATION

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

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

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

1.4 SUBMITTALS

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

1.5 PROJECT MEETINGS

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

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

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013115 - PROJECT MANAGEMENT COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Project Management Communications: The Contractor shall use the Internet web-based project management communications tool, Trimble Unity Construct® (Formerly eBuilder) ASP software, and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.
 - 1. Project management communications is available through Trimble Unity Construct® (Formerly eBuilder) as provided by "Trimble Unity Construct®" in the form and manner required by the Owner.
 - 2. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited
- B. Support: Trimble Unity Construct® (Formerly eBuilder) will provide on-going support through on-line help files.
- C. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD/BIM files, processes or design information distributed in this system is intended only for the project specified herein.
- D. Purpose: The intent of using Trimble Unity Construct®(Formerly eBuilder) is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files
- E. Authorized Users: Access to the web site will be by individuals who are authorized users.

1. Individuals shall complete the Trimble Unity Construct (Formerly eBuilder) New Company/User Request Form located at the following web site: <https://oa.mo.gov/facilities/vendor-links/contractor-forms>. Completed forms shall be emailed to the following email address: OA.FMDCE-BuilderSupport@oa.mo.gov.
 2. Authorized users will be contacted directly and assigned a temporary user password.
 3. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.
- F. Administrative Users: Administrative users have access and control of user licenses and all posted items. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE! Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).
- G. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using Trimble Unity Construct® (Formerly eBuilder) to send messages. Communication functions are as follows:
1. Document Integrity and Revisions:
 - a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
 - b. The system shall make it easy to identify revised or superseded documents and their predecessors.
 - c. Server or Client-side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
 2. Document Security:
 - a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties communication except for Administrative Users. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!
 3. Document Integration:
 - a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
 4. Reporting:
 - a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
 5. Notifications and Distribution:

- a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.
- 6. Required Document Types:
 - a. RFI, Request for Information.
 - b. Submittals, including record numbering by drawing and specification section.
 - c. Transmittals, including record of documents and materials delivered in hard copy.
 - d. Meeting Minutes.
 - e. Application for Payments (Draft or Pencil).
 - f. Review Comments.
 - g. Field Reports.
 - h. Construction Photographs.
 - i. Drawings.
 - j. Supplemental Sketches.
 - k. Schedules.
 - l. Specifications.
 - m. Request for Proposals
 - n. Designer's Supplemental Instructions
 - o. Punch Lists
- H. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents shall be submitted by transmission in electronic form to the Trimble Unity Construct® (Formerly eBuilder) web site by licensed users.
 - a. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Subcontractors and suppliers at every tier shall respond to documents received in electronic form on the web site and consider them as if received in paper document form.
 - b. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Subcontractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.
 - c. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Subcontractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.
- I. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable.)

END OF SECTION 013115

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

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

SECTION 013200 – SCHEDULE – BAR CHART

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS – (Not Applicable)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

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

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

3.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE

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

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

3.3 SCHEDULE OF SUBMITTALS

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

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

3.4 SCHEDULE OF INSPECTIONS AND TESTS

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

END OF SECTION 013200

SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 SUBMITTAL PROCEDURES

- A. The Contractor shall comply with the General and Supplementary Conditions and other applicable sections of the Contract Documents. The Contractor shall submit, with such promptness as to cause no delay in his work or in that of any other contractors, all required submittals indicated in Part 3.1 of this section and elsewhere in the Contract Documents. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
 - a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.
- B. Each drawing and/or series of drawings submitted must be accompanied by a letter of transmittal giving a list of the titles and numbers of the drawings. Each series shall be numbered consecutively for ready reference and each drawing shall be marked with the following information:
 - 1. Date of Submission
 - 2. Name of Project
 - 3. Location
 - 4. Section Number of Specification
 - 5. State Project Number
 - 6. Name of Submitting Contractor
 - 7. Name of Subcontractor
 - 8. Indicate if Item is submitted as specified or as a substitution

1.4 SHOP DRAWINGS

- A. Comply with the General Conditions, Article 3.2.
- B. The Contractor shall submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
- C. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings including the following information:
 - 1. Dimensions
 - 2. Identification of products and materials included by sheet and detail number
 - 3. Compliance with specified standards
 - 4. Notation of coordination requirements

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

1.5 PRODUCT DATA

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

1.6 SAMPLES

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

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

1.7 QUALITY ASSURANCE DOCUMENTS

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

1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REQUIRED SUBMITTALS

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

SPEC SECTION	TITLE	CATEGORY
01 32 00	Schedules	Construction Schedule, Schedule of Values, List of Subcontractors, Major Material Suppliers
03 31 30	Concrete Materials	Product Data
33 11 13	Well Pump	Product Data
06 10 00	Rough Carpentry	Product Data
07 21 00	Building Insulation	Product Data
07 26 00	Under Slab Vapor Retarder	Product Data
08 11 00	Hollow Metal Doors and Frames	Product Data
32 92 00	Seeding	Product Data
33 05 31.16	Water Mains	Product Data
33 11 13	Well Drilling Materials	Product Data
33 11 13	Well Pump	Product Data
33 14 11	Hydrants	Product Data
33 14 11	Pipe Bedding Material	Product Data
33 16 23	Pressure Tank	Product Data
40 05 31	Piping	Product Data
40 05 52	Valves	Product Data
46 33 11	Chemical Feed System	Product Data

END OF SECTION 013300

SECTION 013513.31 - SITE SECURITY AND HEALTH REQUIREMENTS (DNR)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 SUBMITTALS

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ACCESS TO THE SITE

- A. The Contractor shall arrange with Facility Representatives to establish procedures for the controlled entry of workers and materials into the work areas at the Facility.
- B. The Contractor shall establish regular working hours with Facility Representatives. The Contractor must report changes in working hours or overtime to Facility Representatives and obtain approval twenty-four (24) hours ahead of time. The Contractor shall report emergency overtime to Facility Representatives as soon as it is evident that overtime is needed. The Contractor must obtain approval from Facility Representatives for all work performed after dark.

- C. The Contractor shall provide the name and phone number of the Contractor's employee or agent who is in charge onsite; this individual must be able to be contacted in case of emergency. The Contractor must be able to furnish names and address of all employees upon request.
- D. All construction personnel shall visibly display issued identification badges.

3.2 FIRE PROTECTION, SAFETY, AND HEALTH CONTROLS

- A. The Contractor shall take all necessary precautions to guard against and eliminate possible fire hazards.
 - 1. Onsite burning is prohibited.
 - 2. The Contractor shall store all flammable or hazardous materials in proper containers located outside the buildings or offsite, if possible.
 - 3. The Contractor shall provide and maintain, in good order, during construction fire extinguishers as required by the National Fire Protection Association. In areas of flammable liquids, asphalt, or electrical hazards, 15-pound carbon dioxide or 20-pound dry chemical extinguishers shall be provided.
- B. The Contractor shall not obstruct streets or walks without permission from the Owner's Construction Representative and Facility Representatives.
- C. The Contractor's personnel shall not exceed the speed limit of 15 mph while at the Facility unless otherwise posted.
- D. The Contractor shall take all necessary, reasonable measures to reduce air and water pollution by any material or equipment used during construction. The Contractor shall keep volatile wastes in covered containers and shall not dispose of volatile wastes or oils in storm or sanitary drains.
- E. The Contractor shall keep the project site neat, orderly, and in a safe condition at all times. The Contractor shall immediately remove all hazardous waste and shall not allow rubbish to accumulate. The Contractor shall provide onsite containers for collection of rubbish and shall dispose of it at frequent intervals during the progress of the Work.
- F. Fire exits, alarm systems, and sprinkler systems shall remain fully operational at all times, unless written approval is received from the Owner's Construction Representative and the appropriate Facility Representative at least twenty-four (24) hours in advance. The Contractor shall submit a written time schedule for any proposed shutdowns.
- G. For all hazardous materials brought onsite, Material Safety Data Sheets shall be on site and readily available upon request at least a day before delivery.
- H. Alcoholic beverages or illegal substances shall not be brought upon the Facility premises. The Contractor's workers shall not be under the influence of any intoxicating substances while on the Facility premises.

3.3 DISRUPTION OF UTILITIES

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

3.4 PROTECTION OF PERSONS AND PROPERTY

A. SAFETY PRECAUTIONS AND PROGRAMS

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

B. SAFETY OF PERSONS AND PROPERTY

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

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

11. In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.
12. The Contractor shall maintain at his own cost and expense, adequate, safe and sufficient walkways, platforms, scaffolds, ladders, hoists and all necessary, proper, and adequate equipment, apparatus, and appliances useful in carrying on the Work and which are necessary to make the place of Work safe and free from avoidable danger for clients, staff, the public and construction personnel, and as may be required by safety provisions of applicable laws, ordinances, rules regulations and building and construction codes.

END OF SECTION 013513.31

SECTION 015000 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 SUBMITTALS

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

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

1.4 QUALITY ASSURANCE

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

1.5 PROJECT CONDITIONS

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

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

2.2 EQUIPMENT

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

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

PART 3 - EXECUTION

3.1 INSTALLATION

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

3.2 TEMPORARY UTILITY INSTALLATION

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

- B. Temporary Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.
 - 1. Sterilization: Sterilize temporary water piping prior to use.
- C. Temporary 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.
- D. 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.
- E. 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.
- F. 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. Storage Facilities: Limited areas for storage of building materials are available onsite. Available storage areas are available near the construction site. 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.

- C. Construction Parking: Parking at the site will be provided in the areas designated at the Pre-Construction Meeting.
- D. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.
- E. 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.
- F. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.
- G. 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.
- H. Rodent Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Designer.
- B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonable predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations”.
 - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each usable stairwell.
 - 2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
 4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
- C. 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.
- D. 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.
3. 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.
- E. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
 2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- C. Termination and Removal: Unless the Designer requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances as required by the governing authority.
3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:
 - a. Replace air filters and clean inside of ductwork and housing.
 - b. Replace significantly worn parts and parts subject to unusual operating conditions.
 - c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 015000

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

- A. General
 - 1. Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.
 - 2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.
 - 3. At least ~~once~~**<twice>** each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.
 - 4. Provide adequate storage for all items awaiting removal from the job site, 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 on the site. Re-stack, tidy, or otherwise service all material arrangements.
 - 3. Maintain the site in a neat and orderly condition at all times.

C. Structures:

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

3.2 FINAL CLEANING

- A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for the entire Project or a portion of the Project.
1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and foreign substances.
 2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 3. Remove petrochemical spills, stains, and other foreign deposits.
 4. Remove tools, construction equipment, machinery, and surplus material from the site.
 5. Remove snow and ice to provide safe access to the building.
 6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 8. Broom clean concrete floors in unoccupied spaces.
 9. Vacuum clean carpet and similar soft surfaces removing debris and excess nap. Shampoo, if required.
 10. Clean transparent material, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 11. Remove labels that are not permanent labels.
 12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

13. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 14. Clean plumbing fixtures to a sanitary condition free of stains, including stains resulting from water exposure.
 15. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 16. Clean ducts, blowers, and coils if units were operated without filters during construction
 17. Clean, food-service equipment to a sanitary condition, ready and acceptable for its intended use.
 18. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.
 19. Leave the Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests. Comply with regulations of local authorities.
- D. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.
- E. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.
1. Where extra materials of value remain after Final Acceptance by the Owner, they become the Owner's property.

END OF SECTION 017400

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 INFORMATIONAL SUBMITTALS

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

1.4 CLOSEOUT SUBMITTALS

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

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

1.5 QUALITY ASSURANCE

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

1.6 COORDINATION

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

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

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

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

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

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTRUCTION

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

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

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

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

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

END OF SECTION 017900

SECTION 03 05 05
CONCRETE TESTING AND INSPECTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Contractor requirements for testing of concrete and grout.
 - 2. Definition of Owner provided testing.
 - 3. Acceptance criteria for concrete.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 03 21 00 - Reinforcement.
 - 2. Section 03 31 30 - Concrete, Materials and Proportioning.
 - 3. Section 03 31 31 - Concrete Mixing, Placing, Jointing and Curing.

1.2 RESPONSIBILITY AND PAYMENT

- A. Contractor will hire an independent Testing Agency/Service Provider to perform the following testing and inspection and provide test results to the Engineer and Owner.
 - 1. Testing and inspection of concrete and grout produced for incorporation into the work during the construction of the Project for compliance with the Contract Documents.
 - 2. Additional testing or retesting of materials occasioned by their failure, by test or inspection, to meet requirements of the Contract Documents.
 - 3. Strength testing on concrete required by the Engineer or Special Inspector when the water-cement ratio exceeds the water-cement ratio of the typical test cylinders.
 - 4. In-place testing of concrete as may be required by Engineer when strength of structure is considered potentially deficient.
 - 5. Other testing services needed or required by Contractor such as field curing of test specimens and testing of additional specimens for determining when forms, form shoring or reshoring may be removed.
- B. Contractor shall hire a qualified testing agency to perform the following testing and provide test results to the Engineer.
 - 1. Testing of materials and mixes proposed by the Contractor for compliance with the Contract Documents and retesting in the event of changes.
 - 2. Additional testing and inspection required because of changes in materials or proportions requested by Contractor.
 - 3. Pay for services defined in Paragraphs 1.2B.1. and 1.2B.2.
- C. Duties and Authorities of Testing Agency/Service Provider:
 - 1. Any Testing Agency/Service Provider or agencies and their representatives retained by Contractor or Owner for any reason are not authorized to revoke, alter, relax, enlarge, or release any requirement of Contract Documents, nor to reject, approve or accept any portion of the Work.
 - 2. Testing Agency/Service Provider shall inform the Contractor and Engineer regarding acceptability of or deficiencies in the work including materials furnished and work performed by Contractor that fails to fulfill requirements of the Contract Documents.
 - 3. Testing Agency to submit test reports and inspection reports to Engineer and Contractor immediately after they are performed.
 - a. All test reports to include exact location in the work at which batch represented by a test was deposited.
 - b. Reports of strength tests to include detailed information on storage and curing of specimens prior to testing.

4. Owner retains the responsibility for ultimate rejection or approval of any portion of the Work.

1.3 QUALITY ASSURANCE

- A. Referenced Standards:
 1. American Concrete Institute (ACI):
 - a. 318, Building Code Requirements for Structural Concrete.
 2. ASTM International (ASTM):
 - a. ASTM Cement and Concrete Reference Laboratory (CCRL).
 - b. C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - c. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - d. C42, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - e. C94, Standard Specification for Ready-Mixed Concrete.
 - f. C143, Standard Test Method for Slump of Hydraulic-Cement Concrete.
 - g. C172, Standard Practice for Sampling Freshly Mixed Concrete.
 - h. C1019, Standard Test Method for Sampling and Testing Grout.
 - i. C1218, Standard Test Method for Water-Soluble Chloride in Mortar and Concrete.
 - j. E329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- B. Qualifications:
 1. Contractor's Testing Agency:
 - a. Meeting requirements of ASTM E329 and ASTM C94.
 - b. Provide evidence of recent inspection by CCRL of NBS, and correction of deficiencies noted.
- C. Use of Testing Agency and approval by Engineer of proposed concrete mix design shall in no way relieve Contractor of responsibility to furnish materials and construction in full compliance with Contract Documents.

1.4 DEFINITIONS

- A. Testing Agency/Service Provider: An independent professional testing/inspection firm or service hired by Contractor or by Owner to perform testing, inspection or analysis services as directed, and as provided in the Contract Documents.

1.5 SUBMITTALS

- A. Shop Drawings:
 1. Product technical data including:
 - a. Concrete materials and concrete mix designs proposed for use.
 - 1) Include results of all testing performed to qualify materials and to establish mix designs.
 - 2) Place no concrete until approval of mix designs has been received in writing.
 - 3) Submittal for each concrete mix design to include:
 - a) Sieve analysis and source of fine and coarse aggregates.
 - b) Test for aggregate organic impurities.
 - c) Proportioning of all materials.
 - d) Type of cement with mill certificate for the cement.
 - e) Brand, quantity and class of fly ash proposed for use along with other submittal data as required for fly ash by Specification Section 03 31 30.
 - f) Slump.
 - g) Brand, type and quantity of air entrainment and any other proposed admixtures.
 - h) Shrinkage test results.

- i) Total water soluble chloride ion concentration in hardened concrete from all ingredients determined per ASTM C1218.
 - j) 28-day compression test results and any other data required by Specification Section 03 31 30 to establish concrete mix design.
- 2. Certifications:
 - a. Testing Agency qualifications.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION

3.1 TESTING SERVICES TO BE PERFORMED SERVICE PROVIDER/TESTING AGENCY

- A. The following concrete testing will be performed by the Service Provider/Testing Agency:
 - 1. Concrete strength testing:
 - a. Secure concrete samples in accordance with ASTM C172.
 - 1) Obtain each sample from a different batch of concrete on a random basis, avoiding selection of test batch other than by a number selected at random before commencement of concrete placement.
 - b. For each strength test, mold and cure cylinders from each sample in accordance with ASTM C31.
 - 1) Record any deviations from requirements on test report.
 - 2) Cylinder size: Per ASTM C31.
 - a) 4 inches cylinders shall not be used for concrete mixes with maximum aggregate size larger than 1 inch.
 - b) Use the same size cylinder for all tests for each concrete mix.
 - 3) Quantity:
 - a) 6 inches diameter by 12 inches high: Four cylinders.
 - b) 4 inches diameter by 8 inches high: Six cylinders.
 - c. Field cure one cylinder for the seven day test.
 - 1) Laboratory cure the remaining.
 - d. Test cylinders in accordance with ASTM C39.
 - 1) 6 inches diameter cylinders:
 - a) Test two cylinders at 28 days for strength test result and the one field cured sample at seven days for information.
 - b) Hold remaining cylinder in reserve.
 - 2) 4 inches diameter cylinders:
 - a) Test three cylinders at 28 days for strength test result and the one field cured cylinder at seven days for information.
 - b) Hold remaining cylinders in reserve.
 - e. Strength test result:
 - 1) Average of strengths of two, 6 inches diameter cylinders or three, 4 inches diameter cylinders from the same sample tested at 28 days.
 - 2) If one cylinder in a test manifests evidence of improper sampling, molding, handling, curing, or testing, discard and test reserve cylinder(s); average strength of remaining cylinders shall be considered strength test result.
 - 3) Should all cylinders in any test show any of above defects, discard entire test.
 - f. Frequency of tests:
 - 1) Concrete sand cement grout: One strength test for each 4 hour period of grout placement or fraction thereof.
 - a) Test grout in accordance with ASTM C1019.
 - 2) Concrete topping, concrete fill and lean concrete: One strength test for each 10 CUYD of each type of concrete or fraction thereof placed.
 - 3) All other concrete:

- a) One strength test to be taken not less than once a day, nor less than once for each 60 cubic yards or fraction thereof placed in any one day.
 - b) Once for each 5000 square feet of slab or wall surface area placed each day
 - c) If total volume of concrete on Project is such that frequency of testing required in above paragraph will provide less than five strength tests for each concrete mix, tests shall then be made from at least five randomly selected batches or from each batch if fewer than five batches are provided.
- 2. Slump testing:
 - a. Determine slump of concrete sample for each strength test.
 - 1) Determine slump in accordance with ASTM C143.
 - b. If consistency of concrete appears to vary, the Engineer or Owner's Representative shall be authorized to require a slump test for each concrete truck.
 - 1) This practice shall continue until three consecutive batches are determined to be consistent and meet the slump requirements specified.
- 3. Air content testing: Determine air content of concrete sample for each strength test in accordance with ASTM C231, ASTM C173, or ASTM C138.
- 4. In-place concrete testing (if required).

3.2 SPECIAL INSPECTIONS

- A. Formwork Special Inspections:
 - 1. Shape, location, and dimensions.
 - a. Inspect in accordance with dimensions and details on Drawings.
 - b. Frequency: Inspect prior to each concrete pour.
- B. Reinforcing Special Inspections:
 - 1. Reinforcing size, spacing, lap length and concrete cover.
 - a. Inspect in accordance with Drawings and Specification.
 - b. Frequency: Inspect prior to each concrete pour.
 - 2. Reinforcing adhesive anchoring system:
 - a. Inspect in accordance with ICC-ES report.
 - b. Frequency:
 - 1) Inspect all adhesive anchors for the first [4] hours of installation.
 - 2) Inspect approximately 25% of adhesive anchors thereafter.
 - 3) Additional inspection will be required for different installer or if the quality of installation appears to vary.
 - 3. Mechanical splices:
 - a. Inspect in accordance with ICC-ES report.
 - b. Frequency:
 - 1) Inspect all mechanical splices prior to placing concrete.
 - 2) Inspect approximately 25% of mechanical splices thereafter.
 - 3) Additional inspection will be required for different installer or if the quality of installation appears to vary.
- C. Mixing, Placing, Jointing, and Curing Special Inspections:
 - 1. Perform concrete tests per the requirements of this Specification Section.
 - 2. Verification of proper mix design.
 - a. Frequency: Periodically, prior to each concrete pour.
 - 3. Proper concrete placement techniques.
 - a. Inspect per requirements of Section 03 31 31.
 - b. Frequency: During each concrete pour.
 - 4. Proper curing temperature and techniques.
 - a. Inspect per requirements of Section 03 31 31.
 - b. Frequency: Periodically, but not less than every third day.
 - 5. Joints:
 - a. Inspect joints for proper joint type, dimensions, reinforcing, dowel alignment, surface preparation and location.

- b. Frequency: Prior to each concrete pour.
 - 6. Waterstops:
 - a. Visually inspect waterstops for proper location, continuity, installation to prevent displacement, cleanliness and damage to waterstop.
 - b. Frequency:
 - 1) Prior to each concrete pour.
- D. Anchorage to Concrete Special Inspection:
 - 1. Post installed anchors as required by the building code, ICC-ES Evaluation Reports, and as specified by the Engineer.
 - a. Frequency: Per ICC-ES Report.
 - 2. Cast-in-place concrete anchors, including anchor size, embedment, material and location.
 - a. Frequency: Prior to each concrete pour.

3.3 SAMPLING ASSISTANCE AND NOTIFICATION FOR OWNER

- A. To facilitate testing and inspection, perform the following:
 - 1. Furnish any necessary labor to assist Testing Agency in obtaining and handling samples at site.
 - 2. Provide and maintain for sole use of Testing Agency adequate facilities for safe storage and proper curing of test specimens on site for first 24 hours as required by ASTM C31.
 - 3. Take samples at point of placement into concrete member.
- B. Notify Engineer and Contractor's Testing Agency sufficiently in advance of operations (minimum of 24 hours) to allow for assignment of personnel and for scheduled completion of quality tests.

3.4 ACCEPTANCE

- A. Completed concrete work which meets applicable requirements will be accepted without qualification.
- B. Completed concrete work which fails to meet one or more requirements but which has been repaired to bring it into compliance will be accepted without qualification.
- C. Completed concrete work which fails to meet one or more requirements and which cannot be brought into compliance may be accepted or rejected as provided in these Contract Documents.
 - 1. In this event, modifications may be required to assure that concrete work complies with requirements.
 - 2. Modifications, as directed by Engineer, to be made at no additional cost to Owner.
- D. Dimensional Tolerances:
 - 1. Formed surfaces resulting in concrete outlines smaller than permitted by tolerances shall be considered potentially deficient in strength and subject to modifications required by Engineer.
 - 2. Formed surfaces resulting in concrete outlines larger than permitted by tolerances may be rejected and excess material subject to removal.
 - a. If removal of excess material is permitted, accomplish in such a manner as to maintain strength of section and to meet all other applicable requirements of function and appearance.
 - 3. Concrete members cast in wrong location may be rejected if strength, appearance or function of structure is adversely affected or misplaced items interfere with other construction.
 - 4. Inaccurately formed concrete surfaces exceeding limits of tolerances and which are exposed to view, may be rejected.
 - a. Repair or remove and replace if required.
 - 5. Finished slabs exceeding tolerances may be required to be repaired provided that strength or appearance is not adversely affected.
 - a. High spots may be removed with a grinder, low spots filled with a patching compound, or other remedial measures performed as permitted or required.

- E. Appearance:
1. Concrete surfaces exposed to view with defects which, in opinion of Engineer, adversely affect appearance as required by specified finish shall be repaired by approved methods.
 2. Concrete not exposed to view is not subject to rejection for defective appearance unless, in the opinion of the Engineer, the defects impair the long-term strength or function of the member.
- F. High Water-Cement Ratio:
1. Concrete with water in excess of the specified maximum water-cement ratio will be rejected.
 2. Remove and replace concrete with high water-cement ratio or make other corrections as directed by Engineer.
- G. Strength of Structure:
1. Strength of structure in place will be considered potentially deficient if it fails to comply with any requirements which control strength of structure, including but not necessarily limited to following:
 - a. Low concrete strength:
 - 1) Test results for standard molded and cured test cylinders to be evaluated separately for each mix design.
 - a) Such evaluation shall be valid only if tests have been conducted in accordance with specified quality standards.
 - b) For evaluation of potential strength and uniformity, each mix design shall be represented by at least three strength tests.
 - c) A strength test shall be the average of two, 6 inches diameter cylinders or three, 4 inches diameter cylinders from the same sample tested at 28 days.
 - 2) Acceptance:
 - a) Strength level of each specified compressive strength shall be considered satisfactory if both of the following requirements are met:
 - (1) Average of all sets of three consecutive strength tests equal or exceed the required specified 28 day compressive strength.
 - (2) No individual strength test falls below the required specified 28 day compressive strength by more than 500 psi.
 - b. Reinforcing steel size, configuration, quantity, strength, position, or arrangement at variance with requirements in Specification Section 03 21 00 or requirements of the Contract Drawings or approved Shop Drawings.
 - c. Concrete which differs from required dimensions or location in such a manner as to reduce strength.
 - d. Curing time and procedure not meeting requirements of this Specification Section.
 - e. Inadequate protection of concrete from extremes of temperature during early stages of hardening and strength development.
 - f. Mechanical injury, construction fires, accidents or premature removal of formwork likely to result in deficient strength.
 - g. Concrete defects such as voids, honeycomb, cold joints, spalling, cracking, etc., likely to result in deficient strength or durability.
 2. Structural analysis and/or additional testing may be required when strength of structure is considered potentially deficient.
 3. In-place testing of concrete may be required when strength of concrete in place is considered potentially deficient.
 - a. Testing by impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer to determine relative strengths at various locations in the structure or for selecting areas to be cored.
 - 1) Such tests shall not be used as a basis for acceptance or rejection.
 - b. Core tests:
 - 1) Where required, test cores will be obtained in accordance with ASTM C42.

- a) If concrete in structure will be dry under service conditions, air dry cores (temperature 60 to 80 degrees F, relative humidity less than 60%) for seven days before test then test dry.
- b) If concrete in structure will be wet or subjected to high moisture atmosphere under service conditions, test cores after immersion in water for at least 40 hours and test wet.
- c) Testing wet or dry to be determined by Engineer.
- 2) Three representative cores may be taken from each member or area of concrete in place that is considered potentially deficient.
 - a) Location of cores shall be determined by Engineer so as least to impair strength of structure.
 - b) If, before testing, one or more of cores shows evidence of having been damaged subsequent to or during removal from structure, damaged core shall be replaced.
- 3) Concrete in area represented by a core test will be considered adequate if average strength of three cores is equal to at least 85% of specified strength and no single core is less than 75% of specified strength.
- 4) Fill core holes with non-shrink grout and finish to match surrounding surface when exposed in a finished area.
- 4. If core tests are inconclusive or impractical to obtain or if structural analysis does not confirm safety of structure, load tests may be required and their results evaluated in accordance with ACI 318, Chapter 27.
- 5. Correct or replace concrete work judged inadequate by structural analysis or by results of core tests or load tests with additional construction, as directed by Engineer, at Contractor's expense.
- 6. Contractor to pay all costs incurred in providing additional testing and/or structural analysis required.

END OF SECTION

SECTION 03 11 13

FORMWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formwork requirements for concrete construction.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 03 05 05 - Concrete Testing and Inspection.
 - 2. Section 03 31 31 - Concrete Mixing, Placing, Jointing, and Curing.
 - 3. Section 03 35 00 - Concrete Finishing and Repair of Surface Defects.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Concrete Institute (ACI):
 - a. CT-13, Concrete Terminology.
 - b. 117, Specification for Tolerances for Concrete Construction and Materials.
 - c. 347R, Guide to Formwork for Concrete.
- B. Qualifications:
 - 1. Formwork, shoring and reshoring to be designed by a licensed professional engineer currently registered or having a minimum of three years of experience in this type of design work.
 - a. Above qualifications apply to slabs and beams not cast on the ground.
- C. Miscellaneous:
 - 1. Design and engineering of formwork, shoring and reshoring as well as its construction is the responsibility of the Contractor.
 - 2. Design requirements:
 - a. Design formwork for loads, lateral pressures and allowable stresses outlined in ACI 347R and for design considerations, wind loads, allowable stresses and other applicable requirements of the controlling local building code.
 - 1) Where conflicts occur between the above two standards, the more stringent requirements shall govern.
 - b. Design formwork to limit maximum deflection of form facing materials reflected in concrete surfaces exposed to view to 1/240 of span between structural members.
 - 3. For slabs and beams not cast on the ground, develop a procedure and schedule for removal of shores [and installation of reshores] and for calculating the loads transferred to the structure during this process in accordance with ACI 347R.
 - a. Perform structural calculations as required to prove that all portions of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its own weight plus the loads placed thereon. Calculations shall be performed by a licensed professional engineer.
 - b. When developing procedure, schedule and structural calculations, consider the following at each stage of construction:
 - 1) The structural system that exists.
 - 2) Effects of all loads during construction.
 - 3) Strength of concrete.
 - 4) The influence of deformations of the structure and shoring system on the distribution of dead loads and construction loads.
 - 5) The strength and spacing of shores or shoring systems used, as well as the method of shoring, bracing, shore removal, and reshoring including the minimum time intervals between the various operations.

- 6) Any other loading or condition that affects the safety or serviceability of the structure during construction.

1.3 DEFINITIONS

- A. Words and terms used in these Specifications are defined in ACI CT-13.
- B. SCC: Self-Consolidating Concrete.

1.4 SUBMITTALS

- A. Shop Drawings:
 1. Product technical data including:
 - a. Manufacturer and type of proposed form ties.
- B. Samples:
 1. A 12 inches SQ sample of each of the following form finishes.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Forms for Surfaces Exposed to View:
 1. Wood forms:
 - a. 5/8 or 3/4 inches 5-ply structural plywood of concrete form grade.
 - b. Built-in-place or prefabricated type panel.
 2. Metal forms:
 - a. Metal forms may be used except for aluminum in contact with concrete.
 - b. Forms to be tight to prevent leakage, free of rust and straight without dents to provide members of uniform thickness.
- B. Forms for Surfaces Not Exposed to View:
 1. Wood or metal sufficiently tight to prevent leakage.
 2. Do not use aluminum forms.

2.2 ACCESSORIES

- A. Form Ties:
 1. Commercially fabricated for use in form construction.
 - a. Field fabricated ties are unacceptable.
 2. Constructed so that ends or end fasteners can be removed without causing spalling at surfaces of the concrete.
 3. Embedded portion of ties to be not less than 1-1/2 inches from face of concrete after ends have been removed.
 4. Cone size:
 - a. 3/4 inches minimum diameter cones on both ends.
 - b. Depth of cone not to exceed the concrete reinforcing cover.
 5. Provide ties with built-in waterstops in all walls that will be in contact with below grade soil.
 6. Through-wall ties that are designed to be entirely removed are not allowed in all walls that will be in contact with liquids during plant operation.
- B. Form Release Material:
 1. If project contains self-consolidating concrete, provide reactive, vegetable based product, not barrier type.
- C. Void Forms:
 1. Material: Corrugated paper or corrugated plastic. Where void forms may reasonably be subjected to damp conditions, such as precipitation, groundwater, surface water, or other source of moisture, provide void forms impervious to moisture. Capable of resisting moisture with no loss of load carrying strength or change in depth or configuration.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Form Surface Treatment:
 - 1. Before placing of reinforcing steel or concrete, cover surfaces of forms with an approved release material that will effectively prevent absorption of moisture and prevent bond with concrete, will not stain concrete or prevent bonding of future finishes.
 - a. A field applied form release agent or sealer of approved type or a factory applied nonabsorptive liner may be used.
 - 2. Do not allow excess form release material to stand in puddles in forms nor in contact with hardened concrete against which fresh concrete is to be placed.
- B. Apply form release material to minimize bugholes and pinholes. Follow manufacturer's printed installation instructions specific to the form facing material.
- C. Provide temporary openings at base of column and wall forms and at other points where necessary to facilitate cleaning and observation immediately before concrete is placed, and to limit height of free fall of concrete to prevent aggregate segregation.
 - 1. Temporary openings to limit height of free fall of concrete shall be spaced no more than 8 feet apart.
- D. Clean surfaces of forms, reinforcing steel and other embedded materials of any accumulated mortar or grout from previous concreting and of all other foreign material before concrete is placed.

3.2 ERECTION

- A. Install products in accordance with manufacturer's instructions.
- B. Tolerances:
 - 1. Conform to ACI 117.
 - 2. Variation from plumb:
 - a. In lines and surfaces of columns, piers, walls, and in risers.
 - 1) Maximum in any 10 feet of height: 1/4 inches.
 - 2) Maximum for entire height: 1/2 inches.
 - b. For exposed corner columns, control-joint grooves, and other exposed to view lines:
 - 1) Maximum in any 20 feet length: 1/4 inches.
 - 2) Maximum for entire length: 1/2 inches.
 - 3. Variation from level or from grades specified:
 - a. In slab soffits, ceilings, beam soffits and in arises, measured before removal of supporting shores.
 - 1) Maximum in any 10 feet of length: 1/4 inches.
 - 2) Maximum in any bay or in any 20 feet length: 3/8 inches.
 - 3) Maximum for entire length: 3/4 inches.
 - b. In exposed lintels, sills, parapets, horizontal grooves, and other exposed to view lines:
 - 1) Maximum in any bay or in 20 feet length: 1/4 inches.
 - 2) Maximum for entire length: 1/2 inches.
 - 4. Variation of linear structure lines from established position in plan and related position of columns, walls, and partitions:
 - a. Maximum in any bay: 1/2 inches.
 - b. Maximum in any 20 feet of length: 1/2 inches.
 - c. Maximum for entire length: 1 inch.
 - 5. Variation in sizes and location of sleeves, floor openings, and wall openings: Maximum of +1/2 inches.
 - 6. Variation in horizontal plan location of beam, column and wall centerlines from required location: Maximum of +1/2 inches.
 - 7. Variation in cross sectional dimensions of columns and beams and in thickness of slabs and walls: Maximum of -1/4 inches, +1/2 inches.

8. Footings and foundations:
 - a. Variations in concrete dimensions in plan: -1/2 inches, +2 inches.
 - b. Misplacement or eccentricity:
 - 1) 2% of footing width in direction of misplacement but not more than 2 inches.
 - c. Thickness:
 - 1) Decrease in specified thickness: 5%.
 - 2) Increase in specified thickness: No limit except that which may interfere with other construction.
9. Variation in steps:
 - a. In a flight of stairs:
 - 1) Rise: +1/8 inches.
 - 2) Tread: +1/4 inches.
 - b. In consecutive steps:
 - 1) Rise: +1/16 inches.
 - 2) Tread: +1/8 inches.
10. Establish and maintain in an undisturbed condition and until final completion and acceptance of Project, sufficient control points and benchmarks to be used for reference purposes to check tolerances.
11. Regardless of tolerances listed allow no portion of structure to extend beyond legal boundary of Project.
12. To maintain specified tolerances, camber formwork to compensate for anticipated deflections in formwork prior to hardening of concrete.
- C. Make forms sufficiently tight to prevent loss of mortar from concrete.
- D. Place 3/4 inches chamfer strips in exposed to view corners of forms to produce 3/4 inches wide beveled edges.
- E. At construction joints, overlap contact surface of form sheathing for flush surfaces exposed to view over hardened concrete in previous placement by at least 1 inch.
 1. Hold forms against hardened concrete to prevent offsets or loss of mortar at construction joint and to maintain a true surface.
 2. Where possible, locate juncture of built-in-place wood or metal forms at architectural lines, control joints or at construction joints.
- F. Where circular walls are to be formed and forms made up of straight sections are proposed for use, provide straight lengths not exceeding 2 feet wide.
 1. Brace and tie formwork to maintain correct position and shape of members.
- G. Construct wood forms for wall openings to facilitate loosening, if necessary, to counteract swelling.
- H. Anchor formwork to shores or other supporting surfaces or members so that movement of any part of formwork system is prevented during concrete placement.
- I. Provide runways for moving equipment with struts or legs, supported directly on formwork or structural member without resting on reinforcing steel.
- J. Provide positive means of adjustment (wedges or jacks) of shores and struts and take up all settlement during concrete placing operation.
 1. Securely brace forms against lateral deflection.
 2. Fasten wedges used for final adjustment of forms prior to concrete placement in position after final check.

3.3 REMOVAL OF FORMS

- A. No construction loads shall be supported on, nor any shoring removed from, any part of the structure under construction except when that portion of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its weight and loads placed thereon.

- B. When required for concrete curing in hot weather, required for repair of surface defects or when finishing is required at an early age, remove forms as soon as concrete has hardened sufficiently to resist damage from removal operations or lack of support.
- C. Remove top forms on sloping surfaces of concrete as soon as concrete has attained sufficient stiffness to prevent sagging.
 - 1. Perform any needed repairs or treatment required on such sloping surfaces at once, followed by curing specified in Specification Section 03 31 31.
- D. Loosen wood forms for wall openings as soon as this can be accomplished without damage to concrete.
- E. Formwork for columns, walls, sides of beams, and other parts not supporting weight of concrete may be removed as soon as concrete has hardened sufficiently to resist damage from removal.
- F. Where no reshoring is planned, leave forms and shoring used to support weight of concrete in place until concrete has attained its specified 28-day compressive strength.
 - 1. Where a reshoring procedure is planned, supporting formwork may be removed when concrete has reached the concrete strength required by the formwork designer's structural calculations.
- G. When shores and other vertical supports are so arranged that non-load-carrying form facing material may be removed without loosening or disturbing shores and supports, facing material may be removed when concrete has sufficiently hardened to resist damage from removal.

3.4 RESHORING

- A. No construction loads shall be supported on, nor any shoring removed from, any part of the structure under construction except when that portion of the structure in combination with remaining forming and shoring system has sufficient strength to safely support its weight and loads placed thereon.
- B. While reshoring is underway, no superimposed dead or live loads shall be permitted on the new construction.
- C. During reshoring do not subject concrete in structural members to combined dead and construction loads in excess of loads that structural members can adequately support.
- D. Place reshores as soon as practicable after stripping operations are complete but in no case later than end of working day on which stripping occurs.
- E. Tighten reshores to carry their required loads without overstressing.
- F. Shoring, reshoring and supporting formwork may be removed when concrete has reached the concrete strength required by the formwork designer's structural calculations.
- G. For floors supporting shores under newly placed concrete leave original supporting shores in place or reshore.
 - 1. Reshoring system shall have a capacity sufficient to resist anticipated loads.
 - 2. Locate reshores directly under a shore position above.
- H. In multi-story buildings, extend reshoring over a sufficient number of stories to distribute weight of newly placed concrete, forms, and construction live loads in such a manner that design superimposed loads of floors supporting shores are not exceeded.

3.5 FIELD QUALITY CONTROL

- A. Special Inspection:
 - 1. See Section 03 05 05.

END OF SECTION

SECTION 03 15 19

ANCHORAGE TO CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Requirements for anchorages in concrete, including: cast-in-place anchor bolts, anchor rods, reinforcing anchorage adhesive, and post-installed concrete anchors required for the Project but not specified elsewhere in the Contract Documents.
 2. Delegated design requirements for concrete anchors not expressly shown or indicated on the Drawings or elsewhere in the Contract Documents, including, but not limited to, anchorages in concrete for the following structural and nonstructural components:
 - a. Structural members and accessories.
 - b. Metal, wood, and plastic fabrications.
 - c. Architectural Work, including building components, finishes, specials, facility equipment and conveying equipment, furnishings, and special construction Work.
 - d. Mechanical and electrical Work, including process-mechanical Work, site and infrastructure Work, electrical Work, communications Work, electronic safety and security systems Work, and others.
 - e. Fire suppression, plumbing, and HVAC Work.
 - f. Other components requiring anchorages to concrete.
- B. Related Requirements: Include but are not necessarily limited to:
1. Section 03 05 05 - Concrete Testing and Inspection.

1.2 REFERENCES

- A. Definitions and Terminology:
1. This provision presents definitions and terminology, which have the meanings indicated in this provision, applied to the singular or plural thereof, and without regard to use of initial capital letters.
 - a. Adhesive Anchors:
 - 1) Post-installed anchors developing their strength primarily from chemical bond between the concrete and the anchor.
 - 2) Includes anchors using acrylics, epoxy and other similar adhesives.
 - b. Anchor Bolt: Any cast-in-place anchorage that is made of a headed (i.e. bolt) material.
 - c. Anchor Rod: Any cast-in-place or post-installed anchorage made from unheaded, threaded, rod or deformed bar material.
 - d. Concrete Anchor: Generic term for either an anchor bolt or an anchor rod.
 - e. Galvanizing: Hot-dip galvanizing in accordance with ASTM A123, ASTM A153 or ASTM F2329 with minimum coating of 2.0 ounces of zinc per square foot of metal (average of specimens) unless noted otherwise or dictated by reference standard.
 - f. Hardware: As defined in ASTM A153.
 - g. MPII: Manufacturer's printed installation instructions.
 - h. Mechanical Anchors:
 - 1) Post-installed anchors developing their strength from attachment other than thru adhesives or chemical bond to concrete.
 - 2) Includes expansion anchors, expansion sleeve, screw anchors, undercut anchors, specialty inserts and other similar types of anchorages.
 - 3) Drop-in anchors and other similar non-ICC ES approved anchors are unacceptable.
 - i. Post-Installed Anchor: Adhesive or mechanical anchor installed into previously placed and adequately cured concrete.
- B. Reference Standards:

1. American Concrete Institute (ACI):
 - a. 318, Building Code Requirements for Structural Concrete and Commentary.
2. American Concrete Institute/Concrete Reinforcing Steel Institute (ACI-CRSI):
 - a. Adhesive Anchor Installation Certification Program: Adhesive Anchor Installer.
3. American Institute of Steel Construction (AISC):
 - a. 303, Code of Standard Practice for Steel Buildings and Bridges.
 - b. 355.2, Seismic Testing of Post-Installed Concrete and Masonry Anchors in Cracked Concrete.
 - c. 355.4, Qualification of Post-Installed Adhesive Anchors in Concrete.
4. ASTM International (ASTM):
 - a. A36, Standard Specification for Carbon Structural Steel.
 - b. A108, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
 - c. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - d. A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - e. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - f. A496, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
 - g. A563, Standard Specification for Carbon and Alloy Steel Nuts.
 - h. A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - i. F436, Standard Specification for Hardened Steel Washers.
 - j. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - k. F594, Standard Specification for Stainless Steel Nuts.
 - l. F1554, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
 - m. F2329, Standard Specification for Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy Steel Bolts, Screws, Washers, Nuts, and Special Threaded Fasteners
5. International Code Council Evaluation Service (ICC-ES):
 - a. AC193, Acceptance Criteria for Mechanical Anchors in Concrete Elements.
 - b. AC308, Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements:
 1. Code-required Special Instructions:
 - a. Special Inspection is required in accordance with the building code for all concrete anchorages.
 - b. Notify the Special Inspector that an inspection is required prior to concrete placement (or during post-installed anchorage installation).
 - c. See the "Field Quality Control" Article in "Part 3 – Execution" of this Section for additional requirements.
- B. Qualifications:
 1. Installer:
 - a. Installer for post-installed anchors shall be trained by the manufacturer or certified by a training program approved by the Engineer.
 - b. Installer for adhesive anchors installed in horizontal, upward incline, or overhead applications shall be certified by ACI-CRSI Adhesive Anchor Installation Certification Program.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
 1. Shop Drawings:

- a. Submit schedule (table or listing) of types, sizes (diameter, length, embedment length), material, finish, and proposed manufacturers of anchorages to concrete to be provided. Apportion by Project-specific application (for example, "Anchorages for cooling water pumps in basement") and indicate where anchorages are fully-designed by Engineer and those for which final design was prepared by delegated design professional.
 - b. Engineer's approval of such Shop Drawing will be only for anchorages fully designed by Engineer. For anchorages for which final design is by delegated design professional, include on such Shop Drawing delegated design professional's approval stamp.
 2. Product Data: Submit as Action Submittals product data for anchorages to concrete fully designed by Engineer. For anchorages to concrete for which final design is by delegated design professional, submit as Informational Submittals bearing approval stamp of delegated design professional.
 - a. Manufacturer's express, written acknowledgement that proposed items comply with referenced standards indicated in this Section and, as applicable, by delegated design professional.
 - b. Manufacturer published data and information for each anchor.
 - 1) Clearly indicate items that are proposed for the Work. Neatly strike out or obscure materials and products not proposed.
 - c. Manufacturer's published installation instructions and instructions for code-required special inspections and tests.
 - d. Post-Installed Anchors: In addition, submit for each post-installed anchor system current ICC-ES report, indicating the following:
 - 1) Manufacturer's certification that anchors comply with requirements indicated in the Contract Documents.
 - 2) Performance data indicating that anchor is approved by its manufacturer for use in cracked concrete.
 - 3) Seismic design categories for which anchor system is approved by ICC-ES report.
 - e. Anchorage layout drawings and details:
 - 1) Drawings showing location, configuration, spacing and edge distance.
 3. Samples:
 - a. Submit representative Samples of anchorages to concrete, when requested by Engineer. Engineer's approval of Samples will be for type and finish only.
- B. Informational Submittals: Submit the following:
1. Shop Drawings and Product Data Approved by Delegated Design Professional:
 - a. Submit with delegated design professional's approval stamp those Shop Drawings and product data Submittals indicated in this Article but for which final design was performed by delegated design professional.
 2. Calculations by Delegated Design Professional:
 - a. Submit sealed and signed calculations for sizing and determining embedment length of anchorages to concrete not fully designed by Engineer.
 - b. Post-Installed Anchors Designed by Delegated Design Professional: In addition, also submit design calculations:
 - 1) Indicate design load to each anchor.
 - 2) When design load is not indicated on the Drawings, include calculations to develop anchor forces based on performance and design criteria indicated in this Section.
 3. Supplier's Instructions:
 - a. Submit manufacturer's published instructions for installation.
 4. Field Quality Control Submittals:
 - a. Submit written results of required field quality control activities indicated in this Section.
 5. Reports of Supplier's Visits to Site:
 - a. Submit each written report of visit to the Site by Supplier's factory trained representative and delegated design professional. For each, indicate date and time of

- visit, purpose of visit, observations made, decisions made, problems encountered, and other pertinent information.
6. Qualifications Statements:
 - a. Delegated design professional.
 - b. Each installer.

PART 2 - PRODUCTS

2.1 MATERIALS – ALL ANCHORAGES

- A. Materials – General:
 1. This Article applies to all anchorages to concrete, regardless of whether fully designed by Engineer or delegated design professional. Requirements for delegated designs are in the following Article.
 2. Additional requirements for anchorages fully designed by Engineer are indicated in the Article following requirements for delegated design anchorages.
 3. For structural applications, do not use powder actuated fasteners and other types of bolts or fasteners not specified in this Section unless approved by Engineer or otherwise required by the Contract Documents.
- B. Description:
 1. Provide anchorages to concrete, of the types shown or indicated, to secure to concrete materials, equipment, and appurtenances installed as part of the Work.
 2. Locations where anchorages are required are generally shown or indicated on the Drawings. Where not shown or indicated on the Drawings provide anchorages or the types required for materials, equipment, and systems where such materials, equipment, and systems are shown on the Drawings.
 3. Anchorages required include those for materials, equipment, and systems shown on the structural Drawings and Drawing other than the structural Drawings.
 4. Design loads for concrete anchorages are shown or indicated on the Drawings for anchorages where design responsibility is delegated to Contractor's delegated design professional. For such anchorages, embedment depths are not shown or indicated.
- C. Cast-in-place Concrete Anchors:
 1. Buildings, non-building structures, and equipment, unless otherwise specified:
 - a. ASTM F1554, Grade 36 or Grade 55 with weldability supplement S1 for galvanized [or non-galvanized] threaded rods.
 - b. ASTM A307, Grade A for galvanized headed bolts.
 2. All other cast-in-place concrete anchors:
 - a. Stainless steel with matching nut and washer.
 - b. Submerged application: ASTM F593, Type 316, minimum yield strength of 45,000 psi.
 - c. Non-submerged application: ASTM F593, Type 304 or Type 316, minimum yield strength of 45,000 psi.
- D. Post-Installed Mechanical and Adhesive Concrete Anchors:
 1. Submerged application: ASTM F593, Type 316, minimum yield strength of 45,000 psi with matching nut and washer.
 2. Non-submerged application: ASTM F593, Type 304 or Type 316, minimum yield strength of 45,000 psi with matching nut and washer.
 3. Post-installed anchors and related materials shall be listed by ICC-ES or Engineer-approved equivalent.
- E. Reinforcing: Comply with Section 03 21 00 - Reinforcement.
- F. Headed Studs: ASTM A108 with a minimum yield strength of 50,000 psi and a minimum tensile strength of 60,000 psi.
- G. Deformed Bar Anchors: ASTM A496 with minimum yield strength of 70,000 psi and a minimum tensile strength of 80,000 psi.

- H. Washers:
 - 1. ASTM F436 unless indicated otherwise, finish to match bolt.
 - 2. When stainless steel anchorage is provided for cast-in-place anchorages, provide washers of the same material and alloy as in the associated anchorage.
 - 3. Plate washers: Minimum 1/2 inch thick fabricated ASTM A36 square plates as required.
 - 4. Comply with manufacturer's written instructions for all post-installed anchorages.
- I. Nuts:
 - 1. ASTM A563 for cast-in-place anchorages.
 - 2. When stainless steel anchorages are provided for cast-in-place anchorages, nuts shall comply with ASTM F594 and shall match material and alloy of the associated anchorage.
 - 3. Follow manufacturer's requirements if using post-installed anchorage.
- J. Galvanizing Repair Paint:
 - 1. High zinc dust content paint for regalvanizing welds and abrasions.
 - 2. ASTM A780.
 - 3. Zinc content: Minimum 92 percent in dry film.
 - 4. Products and Manufacturers: "ZRC Cold Galvanizing", by ZRC; or "High Performance Zinc Spray", by Clearco; or equal.

2.2 DELEGATED DESIGN ANCHORAGES TO CONCRETE

- A. Manufacturers:
 - 1. Post-installed anchor systems for indicated manufacturers are acceptable only when a current ICC-ES evaluation report is furnished as a Submittal and the subject anchorage system is approved by delegated design professional.
 - a. Hilti.
 - b. Dewalt.
 - c. Simpson Strong-Tie.
 - d. Or equal.
- B. Description: Perform delegated design for anchorages when one or more of the following applies:
 - 1. Design load for concrete anchorage is shown or indicated on the Drawings and anchorage embedment depth is not shown or indicated.
 - 2. When specifically required by the Contract Documents.
 - 3. When an anchorage is necessary but is not shown or indicated on the Drawings.
 - 4. Anchorages shown on the Drawings other than the structural Drawings.
- C. Performance and Design Criteria for Delegated Design Anchorages:
 - 1. Determine design loads, including wind and seismic loads, in accordance with applicable building code and other Laws and Regulations.
 - 2. For anchorage of equipment and non-structural components, use actual dead load and operating loads obtained by Contractor or delegated design professional from manufacturer. Design loads shall include operating conditions when equipment or element of the Work is in operation, dynamic loads, and other loads as appropriate or required by the building code or other Laws or Regulations.
 - 3. Design assuming cracked concrete.

2.3 ANCHORAGES FULLY DESIGNED BY ENGINEER

- A. When size, length, and details of anchorage are shown or indicated on the structural Drawings, such anchorages are considered as fully designed by Engineer and delegated design of such anchorage is not required.
- B. Manufacturers:
 - 1. For post-installed anchor systems regardless of whether proposed manufacturer is indicated below, furnish as Submittal current evaluation agency report and anchor system is certified by ICC-ES for cracked concrete conditions.
 - 2. Mechanical Anchors:

- a. Hilti:
 - 1) Kwik Bolt TZ (ICC-ES ESR-1917).
 - b. Dewalt:
 - 1) Power-Stud+ SD1 (ICC-ES ESR-2818).
 - c. Simpson Strong-Tie:
 - 1) Strong-Bolt 2 (ICC-ES ESR-3037).
 - d. Or equal.
3. Adhesive Anchors for Concrete:
- a. Hilti:
 - 1) HIT RE 500 V3 (ICC ESR-3814).
 - b. Dewalt:
 - 1) PURE110+ (ICC-ES ESR-3298).
 - c. Simpson Strong-Tie:
 - 1) SET-3G (ICC ES 4057)
 - d. Or equal.
4. Screw Anchors for Concrete:
- a. Hilti:
 - 1) Kwik HUS-EZ Screw (ICC-ES ESR-3027).
 - b. Dewalt:
 - 1) Screw-Bolt+ (ICC-ES ESR-3889).
 - c. Simpson Strong-Tie:
 - 1) Titen HD (ICC-ES ESR-2713).
 - d. Or equal.
5. Requests, if any, for Engineer's approval of "or-equals" or substitutes shall indicate proposed anchor has at least the same tension and shear strength as the associated anchorage products indicated by name in this Article.

PART 3 - EXECUTION

3.1 PREPARATION

- A. For cast-in-place concrete anchorages, allow adequate time for proper installation, inspection, and observation prior to placing concrete.
- B. Prior to installation, inspect and verify areas and conditions under which concrete anchorages will be installed.
 - 1. Notify Engineer of conditions detrimental to proper and timely completion of the Work.
 - 2. Do not proceed with the Work until unsatisfactory conditions are properly remedied.

3.2 INSTALLATION

- A. Installation Requirements - General:
 - 1. Install items in accordance with the Contract Documents, manufacturer's written instructions, and Laws and Regulations. Where such requirements conflict, obtain interpretation or clarification from Engineer prior to commencing the associated Work.
 - 2. Perform the following unless shown or indicated otherwise:
 - a. Provide stainless steel anchorages for connecting aluminum and steel members to concrete and masonry.
 - b. Provide washers for all anchorages.
 - c. Where exposed, extend threaded anchorage [a maximum of 0.75 inch and] a minimum of 0.5 inch above top of fully-engaged nut. If anchorage is cut off to required maximum height, dress the threads to allow nuts to be removed without damage to nuts.
 - 3. Tightening of nuts: Do the following after nuts are snug-tightened down:
 - a. Upset anchorage threads to prevent nuts from backing off. Provide double nut or lock nut in lieu of upset threads for items that may require future removal.
 - b. For cast-in-place anchorages (excluding post-installed anchorages), tighten nuts an additional 1/8 turn beyond snug tight to prevent nuts from backing off.

- c. When two nuts are used per concrete anchor above the base plate, tighten top nut an additional 1/8 turn to "lock" the two nuts together.
 - d. For post-installed anchorages, comply with MPII.
 - 4. Secure architectural components to avoid aesthetic distortion and to avoid overstressing fasteners from expansion, contraction, or installation.
- B. Cast-in-Place Anchorages:
 - 1. Provide where anchor rods or anchor bolts are indicated on the Drawings, unless another anchor type is approved by Engineer.
 - 2. Provide concrete anchorages as shown on the Drawings or as required to secure the Work to concrete.
 - 3. Tie cast-in-place anchorage in position to embedded reinforcing steel using wire.
 - 4. Tack welding of anchorage is prohibited.
 - 5. Chase threads as required and coat projected portion of carbon steel anchors and nut threads with a heavy coat of clean grease after concrete has cured.
 - 6. Anchorage location Tolerance: in accordance with AISC 303.
 - 7. Provide steel or durable wood templates for all column and equipment anchorages. Place templates above top of concrete; do not impede proper concrete placement and consolidation.
- C. Mechanical Anchorages:
 - 1. Use only where specifically indicated on the Drawings or when approved for use by the Engineer.
 - 2. Do not use where subjected to vibration.
 - 3. May be used in overhead applications.
 - 4. Contact Engineer for clarification when anchors will not be installed in compliance with manufacturer's printed installation requirements.
- D. Post-installed Anchorages:
 - 1. For post-installed anchors, comply with MPII regarding hole diameter and depth required to fully develop the tensile strength of anchor or reinforcing bar.
 - 2. Use hammer drills to create holes.
 - 3. Properly clean out holes in accordance with the associated ICC-ES report using non-metallic, fiber bristle brush and compressed air, or as otherwise necessary to remove all loose material from each hole prior to installing anchor in the presence of Special Inspector.
 - 4. Adhesive Anchorages:
 - a. Provide only where specifically indicated on the Drawings or when approved for use by Engineer.
 - b. May be provided where subjected to vibration or at buried or submerged locations.
 - c. Do not install for overhead applications or sustained tension loading conditions such as utility hangers.
 - d. Install adhesive anchors in concrete aged not less than 21 days.
- E. Ensure that embedded items are protected from damage and are not filled in with concrete or related materials.

3.3 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 - 1. Comply with Section 03 05 05 - Concrete Testing and Inspection.
 - 2. Tests and inspections of anchorages shall comply with ACI 355.2 and/or ACI 355.4 as applicable.
 - 3. Owner reserves the right to inspect and test completed anchorages.
- B. Supplier's services:
 - 1. Post-installed anchor manufacturer's representative shall demonstrate and observe the proper installation procedures for the post-installed anchors.
- C. Defective Work:

1. Anchorages that do not successfully pass required field tests and inspections or that are otherwise deemed defective by Engineer shall be remedied, in accordance with the Contract Documents, at no cost to Owner.

3.4 CLEANING

- A. After concrete has been placed, remove protection and clean all anchorage of all concrete, dirt, and other foreign matter.
- B. Provide surface acceptable to receive field applied paint coatings when specified.

END OF SECTION

SECTION 03 21 00

REINFORCEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Reinforcing bar requirements for concrete construction.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 03 05 05 - Concrete Testing and Inspection.
 - 2. Section 03 15 19 - Anchorage to Concrete.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Concrete Institute (ACI):
 - a. SP 66, ACI Detailing Manual.
 - b. 117, Specification for Tolerances for Concrete Construction and Materials.
 - c. 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
 - d. 318, Building Code Requirements for Structural Concrete.
 - 2. ASTM International (ASTM):
 - a. A36, Standard Specification for Carbon Structural Steel.
 - b. A276, Standard Specification for Stainless Steel Bars and Shapes.
 - c. A615, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - d. A706, Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
 - e. A970, Standard Specification for Headed Steel Bars for Concrete Reinforcement.
 - f. A1064, Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - 3. Concrete Reinforcing Steel Institute (CRSI):
 - a. Manual of Standard Practice.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Mill certificates for all reinforcing.
 - d. Manufacturer and type of proprietary reinforcing mechanical splices.
 - 2. Qualifications of welding operators, welding processes and procedures.
 - 3. Reinforcing number, sizes, spacing, dimensions, configurations, locations, mark numbers, lap splice lengths and locations, concrete cover and reinforcing supports.
 - 4. Sufficient reinforcing details to permit installation of reinforcing.
 - 5. Reinforcing details in accordance with ACI SP 66 and ACI 315.
 - 6. Locations where proprietary reinforcing mechanical splices are required or proposed for use.
 - 7. Shop Drawings shall be in sufficient detail to permit installation of reinforcing without reference to Contract Drawings.
 - a. Shop Drawings shall not be prepared by reproducing the plans and details indicated on the Contract Drawings but shall consist of completely redrawn plans and details as necessary to indicate complete fabrication and installation of all reinforcing steel.

- b. Where multiple types of supports for reinforcing steel (such as chairs, runners, bolsters, and other types of supports) will be used in the Work, clearly indicate on the Shop Drawings the support types and materials of supports.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Support and store all reinforcing above ground.
- B. Ship to jobsite with attached plastic or metal tags with permanent mark numbers which match the Shop Drawing mark numbers.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURES

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Reinforcing adhesive anchors:
 - a. See Specification Section 03 15 19.
 - 2. Reinforcing mechanical splices:
 - a. Lenton Rebar Splicing by Erico, Inc.
 - b. Richmond dowel bar splicer system by Richmond Screw and Anchor Co., Inc.
 - c. Bar-Grip Systems by Barsplice Products, Inc.

2.2 MATERIALS

- A. Reinforcing Bars: ASTM A615, grade 60, deformed.
- B. Reinforcing Bars to be Welded: ASTM A706, Grade 60, deformed.
- C. Welded Wire Reinforcement: ASTM A1064 [or ASTM A1022 where noted on Drawings].
- D. Smooth Dowel Bars:
 - 1. Water containing structures: ASTM A276, Type 304.
 - 2. All other locations: ASTM A36, with metal end cap to allow longitudinal movement equal to joint width plus 1 inch.
- E. Proprietary Reinforcing Mechanical Splices: To develop in tension and compression a minimum of 125% of the yield strength of the reinforcing bars being spliced.
- F. Headed Deformed Bars:
 - 1. ASTM A970, Class A.
- G. Reinforcing Adhesive Anchors:
 - 1. See Specification 03 15 19.

2.3 ACCESSORIES

- A. Chairs, Runners, Bolsters, Spacers, Hangers, and Other Reinforcing Supports:
 - 1. Metal fabrications with plastic-coated tips in contact with forms.
 - a. Plastic coating meeting requirements of CRSI Manual of Standard Practice.
 - 2. All plastic construction meeting the requirements of CRSI Manual of Standard Practice.
 - a. 100% non-metallic, non-corrosive.
 - b. Required for all walls and elevated construction exposed to liquid containing structures.
- B. Protective plastic caps at mechanical splices.

2.4 FABRICATION

- A. Tolerances:
 - 1. Conforms to ACI 117, except as modified herein.
 - 2. Sheared lengths: +1 inches.
 - 3. Overall dimensions of stirrups, ties and spirals: +1/2 inches.

4. All other bends: +0 inches, -1/2 inches.
- B. Minimum diameter of bends measured on the inside of the reinforcing bar to be as indicated in ACI 318 Paragraph 7.2.
- C. Ship reinforcing to jobsite with attached plastic or metal tags.
 1. Place on each tag the mark number of the reinforcing corresponding to the mark number indicated on the Shop Drawing.
 2. Mark numbers on tags to be so placed that the numbers cannot be removed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Tolerances:
 1. Conform to ACI 117, except as modified herein.
 2. Reinforcing placement:
 - a. Clear distance to formed surfaces: +1/4 inches.
 - b. Minimum spacing between bars: -1/4 inches.
 - c. Top bars in slabs and beams:
 - 1) Members 8 inches deep or less: +1/4 inches.
 - 2) Members between 8 inches and 2 feet deep: -1/4 inches, +1/2 inches.
 - 3) Members more than 2 feet deep: -1/4 inches, +1 inches.
 - d. Crosswise of members: Spaced evenly within +1 inches.
 - e. Lengthwise of members: +2 inches.
 3. Minimum clear distances between reinforcing bars:
 - a. Beams, walls and slabs: Distance equal to bar diameter or 1 inch, whichever is greater.
 - b. Columns: Distance equal to 1-1/2 times the bar diameter or 1-1/2 inches, whichever is greater.
 - c. Beam and slab reinforcing shall be threaded through the column vertical rebars without displacing the column vertical bars and still maintaining the clear distances required for the beam and slab reinforcing bars.
- B. Minimum concrete protective covering for reinforcement: As shown on Drawings.
- C. Unless indicated otherwise on Drawings, provide splice lengths for reinforcing as follows:
 1. For reinforcing: Class B splice meeting the requirements of ACI 318.
 2. For welded wire reinforcement:
 - a. Splice lap length measured between outermost cross wires of each fabric sheet shall not be less than one spacing of cross wires plus 2 inches, nor less than 1.5 x development length nor less than 6 inches.
 - b. Development length shall be as required for the yield strength of the welded wire reinforcement in accordance with ACI 318.
 3. Provide splices of reinforcing not specifically indicated or specified subject to approval of Engineer.
 - a. Mechanical proprietary splice connectors may only be used when approved or indicated on the Contract Drawings.
- D. Welding:
 1. Welding reinforcing is not permitted.
- E. Placing Reinforcing:
 1. Assure that reinforcement at time concrete is placed is free of mud, oil or other materials that may affect or reduce bond.
 2. Reinforcement with rust, mill scale or a combination of both will be accepted as being satisfactory without cleaning or brushing provided dimensions and weights including heights of deformations on a cleaned sample is not less than required by applicable ASTM specification that governs for the reinforcing supplied.
 3. Reinforcing support:

- a. Uncoated reinforcing:
 - 1) Support reinforcing and fasten together to prevent displacement by construction operations.
 - a) Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - b) Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
 - c) Reinforcement shown on the Contract Documents may not be repositioned for use as a support for reinforcement. Additional drop bars may be provided for support of reinforcing.
 - 2) Reinforcing supported on ground:
 - a) Slab on grade and other members with only one mat of reinforcing:
 - (1) Provide metal bar supports with bottom plate.
 - (2) Do not use concrete blocks to support slab-on-grade reinforcing.
 - b) All other members: Provide supporting concrete blocks or metal bar supports with bottom plate.
 - 3) Reinforcing supported on formwork:
 - a) Concrete surfaces in contact with or over process liquid: All-Plastic chairs, runners and bar supports.
 - b) All other formed surfaces:
 - (1) Provide plastic-coated metal chairs, runners, bolsters, spacers, hangers and other reinforcing support.
 - (2) Only tips in contact with the forms need to be plastic coated.
4. Support reinforcing over cardboard void forms by means of concrete supports which will not puncture or damage the void forms during construction nor impair the strength of the concrete members in any way.
5. Where parallel horizontal reinforcement in beams is indicated to be placed in two or more layers, bars in the upper layers shall be placed directly above bars in the bottom layer with clear distance between layers to be 1 inch.
 - a. Place spacer bars at 3 feet maximum centers to maintain the required 1 inch clear distance between layers.
6. Extend reinforcement to within 2 inches of concrete perimeter edges.
 - a. If perimeter edge is formed by earth [or stay-in-place forms], extend reinforcement to within 3 inches of the edge.
7. To assure proper placement, furnish templates for all column vertical bars and dowels.
8. Do not bend reinforcement after embedding in hardened concrete unless approved by Engineer.
 - a. Do not bend reinforcing by means of heat.
9. Do not tack weld reinforcing.
10. Embed reinforcing into hardened concrete utilizing adhesive anchor system specifically manufactured for such installation:
 - a. See Specification Section 03 15 19.

3.2 FIELD QUALITY CONTROL

- A. Reinforcement Congestion and Interferences:
 1. Notify Engineer whenever the specified clearances between bars cannot be met.
 2. Do not place any concrete until the Engineer submits a solution to reinforcing congestion problem.
 3. Reinforcing may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items.
 4. If bars are moved more than one bar diameter, obtain Engineer's approval of resulting arrangement of reinforcing.
 5. No cutting of reinforcing shall be done without written approval of Engineer.
- B. Special Inspection:
 1. See Section 03 05 05.

END OF SECTION

SECTION 03 31 30
CONCRETE MATERIALS AND PROPORTIONING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Requirements for concrete materials, including:
 - a. Materials, including various types of grout, admixtures, cement, sand, aggregate, and other materials.
 - b. Concrete strength and proportioning, including design mixes for:
 - 1) Normal weight concrete.
 - 2) Mass concrete.
 - 3) Grout.
- B. Scope:
1. Unless shown or indicated otherwise in the Contract Documents, concrete Work shall comply with:
 - a. ACI 301.
 - b. Laws and Regulations, including applicable building code.
 2. In this Section, material is apportioned into the following grouting types:
 - a. Base plates for columns and equipment.
 - b. As otherwise shown or indicated in the Contract Documents.
 3. This Section addresses materials for concrete. Other Specifications sections present other requirements for complete concrete Work, including, but not necessarily limited to:
 - a. Section 03 05 05 - Concrete Testing and Inspection.
 - b. Section 03 11 13 - Formwork.
 - c. Section 03 21 00 - Reinforcement.
 - d. Section 03 31 31 - Concrete Mixing, Placing, Jointing, and Curing.
 - e. Section 03 35 00 - Concrete Finishing and Repair of Surface Defects.
 - f. Others as indicated in the Contract Documents.
- C. Related Requirements: Include but are not necessarily limited to:
1. Section 03 05 05 - Concrete Testing and Inspection.
 2. Section 03 15 19 - Anchorage to Concrete.
 3. Section 03 21 00 - Reinforcement.
 4. Section 03 31 31 - Concrete Mixing, Placing, Jointing, and Curing.

1.2 REFERENCES

- A. Abbreviations and Terminology:
1. Abbreviations: The following abbreviations are used in this Section:
 - a. "AAR" means deleterious "alkali-aggregate reaction", resulting from either alkali-silica reactive (ASR) or alkali-carbonate reactive (ACR) aggregates.
 - b. "SCM" means "supplementary cementitious materials", with the meaning indicated below.
 - c. "CLSM" means controlled low strength material in accordance with requirements of this Section.
 2. Terminology: Terminology indicated below are not defined terms and are not indicated with initial capital letters, but when used in this Section have the meanings indicated below:
 - a. "Supplementary cementitious materials" (SCM) means fly ash, silica fume, and GGBFS.
 - b. "Water-bearing concrete" is concrete surface to be in contact (whether continuously or intermittently) with water, process liquid, or slurries during intended operation of the

facility, including, but not limited to, concrete tanks, channels, wet wells, distribution chambers, and secondary containment structures.

- c. Independent Laboratory:
 - 1) Testing shall be performed by an independent laboratory complying with requirements of the generally recognized accrediting entity for the jurisdiction where the Site is located.
 - 2) Testing laboratory shall obtain all concrete samples and waterproofing product samples from the manufacturer of the associated product or material.

B. Reference Standards:

- 1. American Concrete Institute (ACI):
 - a. CT-13, Concrete Terminology.
 - b. 117, Specification for Tolerances for Concrete Construction and Materials.
 - c. 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
 - d. 212.3R, Chemical Admixtures for Concrete.
 - e. 232.2R, Use of Fly Ash in Concrete.
 - f. 301, Specifications for Structural Concrete for Buildings.
- 2. ASTM International (ASTM):
 - a. C33, Standard Specification for Concrete Aggregates.
 - b. C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - c. C94/C94M, Standard Specification for Ready-Mixed Concrete.
 - d. C125, Terminology Relating to Concrete and Concrete Aggregates.
 - e. C150, Standard Specification for Portland Cement.
 - f. C157, Standard Test Method for Length Change of Hardened Hydraulic-Cement, Mortar, and Concrete.
 - g. C192, Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
 - h. C260, Standard Specification for Air-Entraining Admixtures for Concrete.
 - i. C494, Standard Specification for Chemical Admixtures for Concrete.
 - j. C595, Standard Specification for Blended Hydraulic Cements.
 - k. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 - l. C1107, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
 - m. C1116, Standard Specification for Fiber-Reinforced Concrete.
 - n. C1399, Standard Test Method for Obtaining Average Residual-Strength of Fiber-Reinforced Concrete.
 - o. C1609, Standard Test Method for Flexural Performance of Fiber-Reinforced Concrete (Using Beam With Third-Point Loading).
 - p. C1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
 - q. C1778, Standard Guide for Reducing Risk of Deleterious Alkali-Aggregate Reaction in Concrete.
- 3. Steel Deck Institute (SDI):
 - a. Design Manual for Composite Decks, Form Decks and Roof Decks.

1.3 SUBMITTALS

A. Action Submittals: Submit the following:

- 1. Shop Drawings:
 - a. Schedule (table) of concrete materials proposed, listed by each specified grouping of concrete Work, including, but not limited to, aggregates, sand, cement (by type), SCM, admixtures, synthetic fibers, grouts, and other materials. For each separate material and product, indicate manufacturer and type of material.
 - b. Mix Designs:

- 1) Proposed mix design for each concrete grouping required. For each, indicate concrete designation (type) indicated in the Contract Documents, proposed materials and proportioning, and intended special uses, such as concrete intended for placement in cold weather or warm weather, concrete to be placed by pumping, concrete intended for specific locations in the Work, and others.
 - 2) Engineer's approval of mix design Shop Drawing is only for limited purposes indicated in the Contract Documents, including the General Conditions, and in no way reduces or mitigates Contractor's responsibility for construction means, methods, techniques, procedures, and sequences.
2. Product Data:
- a. Written affidavit stating materials proposed comply with requirements of reference standards indicated in this Section and, where applicable, compliance with [state department of transportation] standard specifications for highway and bridge construction in the jurisdiction of the Site. Clearly indicate specific reference standards [and department of transportation standard specifications item designation] applicable to each specific material.
 - b. For aggregate and sand, indicate source (quarry) and gradation of materials proposed for use. Indicate the specific concrete mix design(s) proposed for each.
 - c. For cement and SCM, indicate material source and submit manufacturer's technical data (except safety data sheets).
 - d. For each proposed admixture and type of grout material (including non-shrink grouts, epoxy grout, and grout cure/seal compound), submit manufacturer's published technical data (except safety data sheets).
- B. Informational Submittals: Submit the following:
1. Certifications: Submit concurrent with, but separate from, associated Shop Drawings and product data Submittals:
 - a. Certification of standard deviation, in units of pounds per square inch, for ready mix plant furnishing concrete.
 - b. SCM: Certification that SCM complies with quality requirements of this Section, and SCM Supplier's certified test reports of SCM delivered to concrete Supplier.
 - c. ASTM C33: Certification that class of coarse aggregate complies with ASTM C33 for type and location of concrete Work.
 - d. Aggregate:
 - 1) Certification of aggregate gradation.
 - 2) Certification of coarse aggregate impurities relative to alkali-aggregate reactivity in accordance with ASTM C1778.
 - e. Certification of shrinkage test results.
 2. Test Reports:
 - a. Cement and SCM mill certificates for all materials to be supplied.
 - b. Test results for AAR impurities of coarse aggregates within proposed mixes, in accordance with ASTM standards cited in this Section.
 3. Supplier's Instructions: Submit concurrent with, but separate from, associated product data Submittals:
 - a. Manufacturer's written instructions on proper storage, handling, mixing, and use of materials furnished.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Storage of Materials:
1. Admixtures:
 - a. Store admixtures in manner that avoids contamination, evaporation, and damage.
 - b. For admixtures used in form of suspensions or non-stable solutions, perform agitating as recommended by manufacturer to ensure uniform distribution of ingredients.
 - c. Protect liquid admixtures from freezing and temperature changes that adversely affect admixture characteristics and performance.
 2. Cement and SCM:

- a. Store cement and SCM in containers in weathertight space that prevent contamination with moisture and other contaminants.
- 3. Aggregates:
 - a. Store and access aggregates in manner avoiding excessive segregation and preventing contamination with other materials and other sizes of like aggregate.
 - b. Do not use frozen or partially frozen aggregate.
- 4. Sand: Allow natural sand to drain until sand has relatively uniform moisture content, prior to use.
- 5. If stockpiled materials contact the ground, unless such materials are stored on a clean, firm, reasonably impervious surface such as concrete or asphalt paving, do not use in the concrete Work bottom six inches of stockpiled materials.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cement:
 - 1. Provide ASTM C150, Type I/II cement, unless otherwise required by the Contract Documents.
 - 2. Cement type provided shall match cement type used in associated approved mix design.
- B. SCM:
 - 1. Fly Ash:
 - a. ASTM C618, Class F or Class C.
 - b. Non-staining.
 - c. Appropriate for providing hardened concrete of uniform, light-gray color.
 - d. Compatible with all other concrete ingredients. Fly ash shall have no deleterious effect on hardened concrete Work.
 - e. Produced by source approved, by state department of transportation in the same jurisdiction as the Site, for use in concrete for highway bridges.
 - f. Evaluate and use in accordance with ACI 232.2R.
 - 2. SCM type used shall match SCM type used in associated approved mix design.
- C. Admixtures:
 - 1. Admixtures – General:
 - a. Provide admixtures of same type, manufacturer and quantity as used in establishing required concrete proportions in mix design approved by Engineer.
 - b. Provide admixtures certified by manufacturers as compatible with other admixtures proposed.
 - 2. Air Entraining Admixtures: Comply with ASTM C260.
 - 3. Water Reducing Admixtures:
 - a. Provide water-reducing admixtures in all concrete mixes to provide and maintain required water-to-cement ratio without additional cement.
 - b. Water Reducing, Retarding and Accelerating: Comply with ASTM C494 Types A through E, and ACI 212.3R.
 - c. High Range Water Reducers (Superplasticizers):
 - 1) Required for pumped concrete.
 - 2) Comply with ASTM C494 Types F and G.
 - 4. Hydration Stabilizer:
 - a. Comply with ASTM C494 Type D.
 - 5. Admixture Chlorides – General:
 - a. Provide chloride-free admixtures.
 - b. Do not use calcium chloride.
- D. Crystalline Cementitious Waterproofing:
 - 1. Products and Manufacturers: Subject to compliance with the Contract Documents, the following are acceptable.

- a. Xypex Chemical Corporation, C-500.
 - b. Kryton International Inc, Krystol Internal Membrane (KIM).
 - c. Euclid Chemical Company, Eucon Vandex AM-10.
 - d. Or equal.
2. Description: Factory blended dry powder compound consisting of Portland cement, treated aggregate, and active chemicals.
 3. Dosage rate shall be not less than 2 percent by weight of cementitious materials or additional as necessary to comply with the performance requirements indicated below.
 4. Required Locations: Provide crystalline cementitious waterproofing admixture in concrete as follows: at locations shown or indicated on the Drawings.
 5. Performance Criteria:
 - a. Mix waterproofing material in proportions recommended by manufacturer.
 - b. Submit to Engineer, together with product data Submittal, results of tests (previously performed for manufacturer) by independent third-party testing entity.
 - c. Crystalline cementitious waterproofing material, identical to that proposed for use in the Work, shall have been tested in accordance with the following:
 - 1) DIN 1048/ EN 12390, Water Impermeability of Concrete:
 - a) Prepare and test untreated samples (“control samples”) and treated samples, all of the same concrete mix design. Test not less than three control samples and three treated samples.
 - b) Each sample shall be not less than 120 mm thick.
 - c) Subject samples to test pressure of water not less than design hydrostatic pressure to which concrete will be subject after Substantial Completion, for test duration of not less than 72 hours. However, test duration and pressure shall be sufficient for control samples to have not less than 100 mm of water penetration (average for all control samples tested).
 - d) Treated samples shall demonstrate not less than 90 percent reduction in depth of water penetration (average of all treated samples tested compared with average of all untreated control samples tested).
 - 2) Permeability: Supplier shall retain independent testing entity to perform permeability testing in accordance with USCOE CRD-C48 - Mod Permeability of Concrete.
 - a) Test samples of concrete, of identical mix design, using mix design similar to that used for the Work. Test untreated samples (“control samples”) and samples treated with the admixture.
 - b) Samples shall each be not greater than two inches thick.
 - c) Subject samples to water at test pressure of 150 psi.
 - d) When compared with control samples, the treated samples shall exhibit no measurable leakage. Control samples shall exhibit full saturation and measurable leakage.
- E. Macro Synthetic Fibers:
1. Manufacturers and Products: Subject to compliance with the Contract documents, the following are acceptable:
 - a. Master Builders Solutions, MasterFiber MAC Series.
 - b. GCP Applied Technologies, Strux 90/40.
 - c. Euclid Chemical Company, Tuf-Strand SF.
 - d. Or equal.
 2. Comply with ASTM C1116.
 3. Provide dosage to obtain average residual strength (at net deflection of L/150) of not less than 170 psi, in accordance with ASTM C1609 and ASTM C1399.
- F. Micro Synthetic Fibers:
1. Manufacturers and Products: Subject to compliance with the Contract Documents, the following are acceptable:
 - a. Master Builders Solutions, MasterFiber F or M Series.

- b. Euclid Chemical Company, Fiberstrand.
 - c. GPC Applied Technologies, Gilco Fibers.
 - d. Or equal.
 - 2. Comply with ASTM C1116.
 - 3. Provide average residual strength (at net deflection of L/150) of not greater than: 170 psi, in accordance with ASTM C1609.
- G. Water:
- 1. Potable in accordance with Laws and Regulations.
 - 2. Clean and free from deleterious substances.
 - 3. Free of oils, acids, and organic matter. Comply with ASTM C1602.
- H. Aggregates for Normal Weight Concrete:
- 1. Comply with ASTM C33.
 - 2. Fine aggregates and coarse aggregates are separate ingredients.
 - 3. Provide aggregates acceptable for bridge construction in accordance with the third-party standard specifications indicated below in this provision.
 - 4. Blended aggregates are unacceptable.
 - 5. Coarse Aggregate:
 - a. Material shall be well-graded, washed aggregate, free of organic material.
 - b. Gradation: In accordance with Table 03 31 30-A in this section's "Mixes" Article.
 - c. Mass Concrete:
 - 1) Specific Gravity not less than 2.57.
 - 2) Limestone or granite.
 - 6. Alkali-Reactive Aggregates:
 - a. Aggregates that may be deleteriously reactive, when combined with alkalis in cement, are unacceptable.
 - b. Evaluate proposed aggregates for potential deleterious alkali-aggregate reaction in concrete in accordance with ASTM C1778.
 - 1) Submit to Engineer results of source quality control testing for alkali-aggregate reactivity presenting the following:
 - a) Analysis and classification of aggregates in accordance with ASTM C1778
 - b) Results of source quality control analysis of aggregates.
 - c) Include the flow from Figure 1 of ASTM C 1778 indicating test results sequence.
 - d) Field performance history alone shall not be submitted to document acceptable aggregate performance.
- I. Maximum total water-soluble chloride ion content for concrete mix including all ingredients measured as weight percent of cement in accordance with ASTM C1218:
- 1. Prestressed concrete: 0.06.
 - 2. All other concrete: 0.10.
- J. Sand Cement Grout (termed "Grout" on the Drawings):
- 1. Description: Typical use is for filling keyways in precast construction, and as otherwise required by the Contract Documents.
 - 2. Performance Criteria:
 - a. Minimum 28 day compressive strength:
 - b. 3,000 PSI.
 - c. Strength shall be not less than strength of adjacent concrete to which grout is applied.
 - 3. Materials:
 - a. Provide sand cement grout as approximately three parts sand to one part Portland cement, 4.5 percent to 7.5 percent entrained air and water to provide slump allowing grout to completely fill required spaces and surround adjacent reinforcing.
 - b. Provide sand in accordance with requirements for fine aggregate for concrete.
- K. Non-shrink Grout:

1. Manufacturers and Products: Subject to compliance with the contract Documents, the following are acceptable:
 - a. Master Builders Solutions, Masterflow, 713.
 - b. Euclid Chemical Company, NS Grout.
 - c. Sika, Sika Grout 212.
 - d. Or equal.
 2. Description:
 - a. This provision requires non-shrink, non-metallic grout. Unless otherwise shown or indicated in the Contract Documents, references to “non-shrink grout” refer to non-shrink, non-metallic grout required by this provision.
 3. Performance Criteria:
 - a. Non-shrink grout shall produce a positive but controlled expansion.
 - b. Mass expansion shall not be created by gas liberation or by other means.
 - c. Minimum 28-day Compressive Strength: 7,000 PSI.
 4. Material:
 - a. Provide material that is non-shrink, non-metallic, non-corrosive, and non-staining.
 - b. Comply with ASTM C1107, Grade B.
 - c. Premixed with water only. Add water in accordance with manufacturer’s written instructions.
- L. Epoxy Grout:
1. Manufacturers and Products: Subject to compliance with the Contract Documents, the following are acceptable:
 - a. Master Builders Solutions, Masterflow 648.
 - b. Five Star Products, DP Five Start Epoxy Grout.
 - c. Euclid Chemical Company, E3 Flowable.
 - d. Sika, Sikadur 42, Grout Pak.
 - e. Or equal.
 - f. One manufacturer shall furnish both aggregate and adhesive.
 2. Description:
 - a. Three-component epoxy resin system, comprised of two liquid epoxy components and one inert aggregate filler component.
 - b. Indication of locations where epoxy grout is required are indicated in the grout schedule in Section 03 31 31 - Concrete Mixing, Placing, Jointing, and Curing.
 - c. Furnish each component in separate package for mixing at the Site.
 3. Performance Criteria:
 - a. Minimum 28-day Compressive Strength: 13,000 psi.
 4. Materials:
 - a. Aggregate shall be compatible with adhesive.

2.2 MIXES

- A. Mixes - General:
1. Provide concrete capable of: (a) being placed without segregation of aggregate from other components, and (b) developing all properties necessary and required.
 2. Provide ready-mix concrete in accordance with ASTM C94/C94M.
 3. Batching and other tolerances shall be in accordance with ACI 117.
 4. All concrete shall be normal weight concrete [except where lightweight concrete is expressly shown or indicated on the Drawings], unless otherwise required by the Contract Documents. Normal weight concrete shall weigh approximately 145 to 150 pounds per cubic foot (without reinforcing steel), measured 28 days after placing.
- B. Concrete Mixes:
1. Mix design requirements are indicated in this Section’s Table 03 31 30-A, below.
- C. Air Entrainment:
1. Provide air entrainment in concrete providing total air content, expressed as percent by volume, in accordance with this Section’s Table 03 31 30-A, below.

2. Adjust dosage rate as necessary to compensate for shrinkage reducing admixtures and concrete placing method.
- D. Slump:
1. Slump – General:
 - a. Measure slump at point of discharge of wet concrete into final location.
 - b. Compensate for slump loss due to placing method.
 - c. Concrete with slump less than minimum required may be used provided such concrete can be properly placed and consolidated.
 - d. Slump of Concrete to be Placed by Pumping:
 - 1) Provide water or water-reducing admixture at ready-mix plant for concrete to be placed by pumping, to allow for slump loss due to pumping.
 - 2) Provide additional water sufficient only so that slump of concrete at discharge end of pump hose does not exceed: (a) maximum allowable slump indicated, and (b) maximum specified water-to-cement ratio.
 - e. Slump Adjustment at the Site:
 - 1) Slump may be adjusted at the Site by providing water reducers.
 - 2) Dosing shall be performed by experienced quality control technician employed by concrete Supplier. Concrete mixing thereafter shall be directed by the same technician.
 - f. Slump tolerances shall comply with ACI 117.
 2. Concrete for Walls and Columns:
 - a. 8 inches maximum; 4 inches minimum.
 - b. Slump shall be obtained by use of mid-range or high-range water reducer complying with ASTM C494.
 3. All Other Members:
 - a. Concrete using water reducer in accordance with ASTM C494: 8 inches maximum; 4 inches minimum.
 - b. Concrete without water reducer in accordance with ASTM C494: 5 inches maximum, one inch minimum.
- E. Proportioning:
1. Proportioning - General:
 - a. Proportion components of concrete to provide mixture that can be placed: (a) into corners and angles of forms, and around reinforcing, by placing and consolidation methods employed, (b) without component materials becoming segregated, and (c) without excessive, free water to collecting on concrete surface or other surfaces.
 - b. Proportion component elements of concrete to provide proper concrete Work, including concrete durability, strength, and other necessary and required properties.
 2. Normal Weight Concrete:
 - a. Normal weight concrete target cementitious materials contents and maximum water to-cementitious ratios shall be in accordance with this Section's Table 03 31 30-A, below.
 - b. Target cementitious materials contents indicated in the Contract Documents are intended to provide crack-free, durable, finished concrete Work, rather than concrete Work of excessive strength.
 3. SCM:
 - a. SCM – General:
 - 1) Based on results of AAR testing by Supplier (performed in accordance with ASTM C1778) and alkali content of cement, SCM content (in accordance with this Section) may be adjusted in lieu of the indicated percentages to reduce risk associated with AAR.
 - 2) Use only one type of SCM in a given mix unless expressly required or approved by Engineer.
 - 3) Water-to-cementitious (i.e., total of SCM plus cement) ratio shall not exceed required maximum water-to-cement ratio indicated in this Section.
 - b. Fly Ash:

- 1) For cast-in-place concrete only, maximum of 25 percent by weight of Portland cement content, per cubic yard, may be fly ash, at rate of one pound fly ash for one pound cement.
4. Water-Reducing, Water-Retarding, and Water-Accelerating Admixtures:
 - a. Provide in accordance with admixture manufacturer's written instructions.
 - b. Add to mix at ready-mix plant.
 - c. Use hydration stabilizer admixture, or AAR-inhibiting admixture, in concrete, as necessary and required, for placing and workability.
 - 1) Water reducers are required to maintain required maximum water-to-cement ratios.
5. High Range Water Reducers (Superplasticizers):
 - a. Superplasticizers are required in:
 - 1) Concrete to be pumped, except slabs-on-grade and mats.
 - 2) Concrete for water-bearing structures.
 - 3) Other concrete Work at Contractor's option.
 - b. Maximum concrete slump, before addition of admixture, shall be three inches. Maximum slump after addition of superplasticizer admixture shall be eight inches.
 - c. Comply with Section 03 31 31 - Concrete Mixing, Placing, Jointing, and Curing, relative to superplasticizers.
6. Normal Weight Concrete Mix Proportioning:
 - a. Method 1:
 - 1) Use Method 1 when combination of concrete component materials and mixes will be evaluated and selected via trial-and-error.
 - 2) Provide mixes with suitable proportions and properties in accordance with ACI 211.1, using not less than three different water-to-cementitious ratios providing a range of concrete compressive strengths, including required average compressive strength.
 - 3) Trial mixes shall have slump within 0.75 inches of maximum allowed in the Contract Documents. For air-entrained concrete, air content of trial batches shall be within 0.5 percent of air entrainment required by the Contract Documents.
 - 4) For each water-to-cementitious ratio:
 - a) Provide not less than three trial compressive strength tests for concrete test age required, and cure in accordance with ASTM C192.
 - b) Cylinder Size: In accordance with ASTM C31.
 - c) Test for compressive strength at 28 days, in accordance with ASTM C39.
 - (1) Quantity of cylinders shall comply with one of the following trial strength test:
 - (a) 6-inch diameter cylinders: Two.
 - (b) 4-inch diameter cylinders: Three.
 - 5) From results of such required tests, plot curve showing relationship between water-to-cementitious ratio and compressive strength.
 - 6) Based on required curve, select water-to-cementitious ratio for the Work, that will provide concrete of required average compressive strength.
 - 7) Provide cementitious content and mixture proportions so maximum water cement ratio is not exceeded when slump is equal to maximum allowed in the Contract Documents.
 - 8) Required average compressive strength is indicated below in this Section.
 - b. Method 2:
 - 1) In lieu of trial mixes required by Method 1, field test results from prior projects, for concrete made using identical or substantively identical concrete component materials and proportioning, may be used by concrete supplier in determining proposed mix proportions, provided the test results are within a year of project start date.
 - 2) Use of proposed concrete mix proportions based on field test results from prior projects are subject to approval by Engineer. Engineer's decision will be based on information in such Submittals and demonstrated ability, of such concrete

- successfully provided on such prior projects, to provide required average compressive strength.
- 3) Requirements for Submittals of Concrete Test Results from Prior Projects:
 - a) Submittals of field test results from prior projects shall clearly indicate all materials, proportions, and conditions, and clearly indicate where such matters are similar to those required for the concrete Work on the Project.
 - b) Changes in the materials, proportions, and conditions within submitted test results from prior projects shall have been not more restricted than those for the subject, proposed concrete mix.
 - 4) Concrete proportions for the concrete Work may be determined from test results of prior projects via interpolation (by Contractor and concrete Supplier) between compressive strengths and proportions of two or more test results from prior projects, each in accordance with requirements of the Contract Documents for this Project.
 7. Required average compressive strength shall exceed required 28-day compressive strength by the extent determined in accordance with ACI 318, Chapter 5 using the standard deviation of concrete ready-mix plant proposed for the Work as described in ACI 318, Chapter 5.
- F. Flowable Fill:
1. Provide mixture of cement, SCM, fine sand, water, and air, with consistency allowing flow under a very low pressure (low head).
 2. Approximate quantities of each component per cubic yard of mixed material:
 - a. Cement (Type I or Type II): 50 pounds.
 - b. SCM: 200 pounds.
 - c. Fine Sand: 2,700 pounds.
 - d. Water (approximate): 420 pounds.
 - e. Air Content (approximate): 10 percent.
 3. Adjust actual quantities to provide yield of one cubic yard with materials used.
 4. Approximate compressive strength shall be 85 to 175 psi.
 5. Sand Gradation: Fine sand shall be evenly graded material with not less than 95 percent passing No. 4 sieve and not more than five percent passing No. 200 sieve.
- G. Allowable Shrinkage:
1. Provide in accordance with Table 03 31 30-A of this Section, tested in accordance with ASTM C157 at [28] days.
 2. Continue testing for 64 weeks in accordance with ASTM C157 and submit results to Engineer as Informational Submittals.
 3. Perform for concrete Work for all structures unless expressly indicated otherwise in the Contract Documents.

TABLE 03 31 30-A							
Type of Concrete	28-day Compressive Strength	Max. W/C Ratio	Target Total Cement (pounds)	SCM	ASTM C33 Size No.	Air Content (%)	Allowable Shrinkage Limit
Normal weight lean concrete	3000 PSI	[0.45] [0.50]	517	Note 1	7	[5.5 to 8] [0 to 2]	[NA]
Normal weight concrete fill [utility encasement concrete]	3000 PSI	0.45 [0.50]	517	Note 1	57	[4.5 to 7.5]	[NA]
Normal weight concrete topping	4000 PSI	0.45	564	Note 1	7	[5.5 to 8]	[NA]
Normal weight precast concrete	5000 PSI	0.42	611		57	[4.5 to 7.5]	[NA]
Normal weight concrete w/ power trowel finish	4000 PSI	0.45	564	Note 1	[57] [67]	[0 to 2]	[0.048] percent
Normal weight water-bearing concrete	4500 PSI	0.40	564	Note 3	[57] Note 2[67] [467]	[4.5 to 7.5]	[0.042][0.032] percent
Drilled pier concrete	[4000 PSI] [4500 PSI]	[0.45] [0.42]	564	Note 1	[57]	[4.5 to 7.5]	NA
Normal weight all other concrete	[4000 PSI]	0.45	564	Note 1	[57] [67]	[4.5 to 7.5]	[0.048] percent
Mass Concrete	4500 PSI at 56 days	0.36 to 0.40	500		[57] [67]	[4.5 to 7.5]	0.032 percent
Normal weight concrete integral wearing course	6000 PSI	0.40	658	Note 1	67	[4.5 to 7.5]	[None]
Self-Consolidating Concrete	4500 PSI	[0.42] [0.40]	564		[67]	[5 to 7]	[0.048] percent
Normal weight all other concrete with oversized aggregate	[4000 PSI] [4500 PSI]	[0.45] [0.42]	[564] [611]		[467] [357]	[4.5 to 7.5]	

Table 03 31 30-A Notes:

1. If fly ash [or GGBFS] is proposed for use, the weight of fly ash [or GGBFS] plus weight of Portland cement shall be used to comply with total target cement content.
2. Unless otherwise indicated, larger aggregate (No. 467) is required for concrete slabs or foundations on grade; optional elsewhere.
3. SCM is required for all water bearing concrete.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Field Testing and Inspections:

1. Contractor-Performed Field Testing and Inspections:
 - a. Where concrete testing and inspection is required by the Contract Documents and is not part of the code-required tests and special inspections by Owner or other entity for whom Owner is responsible, such tests and inspections shall be by Contractor.
 - b. Perform concrete testing and inspections in accordance with Section 03 05 05 - Concrete Testing and Inspection.

- c. Aggregates and Other Stockpiled Materials: To ensure stockpiles at the concrete mixing location are not contaminated and otherwise comply with Contract requirements, perform tests on such materials at the concrete ready-mix plant.
- d. Perform strength test on all concrete to which water or superplasticizer, above the amount stated in concrete mix design Submittal approved by Engineer, has been added.
 - 1) Perform sampling after water or superplasticizer has been added and additional mixing has been performed.

END OF SECTION

SECTION 03 31 31
CONCRETE MIXING, PLACING, JOINTING, AND CURING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Mixing, placing, jointing, and curing of concrete construction.
- B. Related Requirements: Include but are not necessarily limited to:
 - 1. Section 03 05 05 - Concrete Testing and Inspection.
 - 2. Section 03 11 13 - Formwork.
 - 3. Section 03 21 00 - Reinforcement.
 - 4. Section 03 31 30 - Concrete, Materials and Proportioning.
 - 5. Section 03 35 00 - Concrete Finishing and Repair of Surface Defects.

1.2 REFERENCES

- A. Terminology:
 - 1. Terminology: Terminology indicated below are not defined terms and are not indicated with initial capital letters, but when used in this Section have the meanings indicated below:
 - a. Unless obviously meant or intended otherwise, certain words and terms used in this Section have meanings indicated in ACI CT-13.
 - b. "Water-bearing concrete" means concrete surface to be in contact (whether continuously or intermittently) with water, process liquid, or slurries during intended operation of the facility, including, but not limited to, concrete tanks, channels, wet wells, distribution chambers, and secondary containment structures.
- B. Reference Standards: Standards referenced in this Section include, but are not necessarily limited to, the following:
 - 1. American Concrete Institute (ACI):
 - a. CT-13, Concrete Terminology.
 - b. 117, Specification for Tolerances for Concrete Construction and Materials.
 - c. 304R, Guide for Measuring, Mixing, Transporting and Placing Concrete.
 - d. 304.2R, Placing Concrete by Pumping Methods.
 - e. 305R, Guide to Hot Weather Concreting.
 - f. 305.1, Specification for Hot Weather Concreting.
 - g. 306R, Guide to Cold Weather Concreting.
 - h. 306.1, Standard Specification for Cold Weather Concreting.
 - i. 308.1, Specification for Curing Concrete.
 - j. 309R, Guide for Consolidation of Concrete.
 - k. 318, Building Code Requirements for Structural Concrete and Commentary.
 - l. 360R, Guide to Design of Slabs-on-Ground.
 - 2. ASTM International (ASTM):
 - a. C94/C94M, Standard Specification for Ready-Mixed Concrete.
 - b. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - c. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
 - d. D994, Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
 - e. D1056, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
 - f. D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

3. National Ready Mixed Concrete Association (NRMCA):
 - a. Checklist for Certification of Ready Mixed Concrete Production Facilities.
4. United States Army Corps of Engineers (USACE):
 - a. CRD-C572, Specifications for Polyvinylchloride Waterstop.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 1. Coordinate concrete placement Work with other Work, and work of other contractors (if any), that must be installed prior to placement of concrete.
 2. Inform other contractors, if any, affected by the concrete Work of intended date(s) of placement of concrete. Provide sufficient advance notice to allow other contractors to perform their work that is to be completed prior to placing of concrete.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 1. Concrete Supplier:
 - a. Ready-mix concrete batch plant shall be certified by NRMCA.
 - b. Ready mix plant shall comply with NRMCA Checklist for Certification of Ready Mixed Concrete Production Facilities.

1.5 SUBMITTALS

- A. Action Submittals: Submit the following:
 1. Shop Drawings:
 - a. Scaled (minimum 1/8 inch per foot) drawings showing proposed locations of construction joints, control joints, expansion joints (as applicable) and joint profile dimensions for each joint type.
 - b. Drawing indicating location, size and type of prefabricated waterstop joints.
 2. Product Data including:
 - a. Manufacturers and types:
 - 1) Joint fillers.
 - 2) Curing agents.
 - 3) Construction joint bonding adhesive.
 - 4) Prefabricated waterstops.
 - b. Acknowledgement that products submitted meet requirements of standards referenced.
 3. Samples:
 - a. Sample of each type of prefabricated waterstop proposed for the Work, when requested by Engineer.
 4. Monitoring Procedures:
- B. Informational Submittals: Submit the following:
 1. Delivery Tickets:
 - a. Copies of concrete delivery tickets.
 2. Supplier Instructions:
 - a. Procedure for adding high-range water reducer at the Site.
 - b. Instructions for handling and installing products approved by Engineer.
 3. Field Quality Control Submittals:
 - a. Results of tests, inspections, and other quality control activities required by the Contract Documents, including Section 03 05 05 - Concrete Testing and Inspections, and this Section's "Field Quality Control" Article performed at the Site.
 4. Supplier Site Visit Reports:
 - a. Report of each visit to the Site by Supplier, summarizing purpose of visit, activities while onsite, problems encountered, advice given to Contractor or Subcontractor, and actions taken.
 5. Special Procedure Submittals:
 - a. Description of proposed curing methods.
 6. Qualifications:

- a. Ready-mix plant certification, in accordance with this Section's "Quality Assurance" Article.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Concrete Delivery:
 - 1. Prepare a delivery ticket for each load of ready mixed concrete.
 - 2. Truck operator shall hand ticket to Contractor at the time of delivery.
 - 3. Ticket to show:
 - a. Mix identification.
 - b. Quantity delivered.
 - c. Quantity of material in each batch.
 - d. Outdoor temperature in the shade at location of concrete placement.
 - e. Time at which cement was added.
 - f. Time of delivery.
 - g. Time of discharge.
 - h. Quantity of water that may be added at the site without exceeding the specified water-cement ratio.
 - i. Quantity of any water added at the Site.

1.7 PROJECT CONDITIONS

- A. Adjust concrete mix design when material characteristics, job conditions, weather, strength test results or other circumstances warrant.
 - 1. Do not use revised concrete mixes until submitted to and approved by Engineer.

1.8 SEQUENCING AND SCHEDULING

- A. Do not begin concrete production until proposed concrete mix design has been approved by Engineer.
 - 1. Engineer's approval of concrete mix design does not relieve Contractor of responsibility to provide concrete that meets the requirements of the Contract Documents.

PART 2 - PRODUCTS

2.1 PRODUCTS

- A. Subject to compliance with the Contract Documents, the manufacturers listed in this article are acceptable.
- B. Neoprene Expansion Joint Fillers:
 - 1. Acceptable manufacturers:
 - a. Permaglaze.
 - b. Rubatex.
 - c. Williams Products.
 - d. Or equal.
 - 2. Materials:
 - a. Closed cell neoprene.
 - b. ASTM D1056, Type 2, Class A or C.
 - c. Grade: Compression deflection as required to limit deflection to 25 percent of joint thickness under pressure from concrete pour height.
- C. Asphalt Expansion Joint Fillers:
 - 1. Acceptable manufacturers:
 - a. W.R Meadows.
 - b. J and P Petroleum Products.
 - c. Or equal.
 - 2. Materials: ASTM D994.
- D. Fiber Expansion Joint Fillers:

1. Materials: ASTM D1751.
- E. Waterstops, PVC Type:
1. Acceptable manufacturers:
 - a. Sika Greenstreak Plastic Products.
 - b. W.R Meadows.
 - c. Vinylex Corporation.
 - d. Bometals, Inc.
 - e. Or equal.
 2. Materials:
 - a. Virgin polyvinyl chloride compound not containing scrap or reclaimed materials or pigment.
 - b. Cast-in-place type: USACE CRD-572.
 3. Approved profiles as listed.
 - a. Construction joints:
 - 1) Ribbed: 6 inches wide by 3/8 inch.
 - 2) Sika Greenstreak Plastic Products Style #679, or equal.
 - b. Control joints:
 - 1) 6-inch wide by 3/8 inch thick with ribs and center bulb.
 - 2) Sika Greenstreak Plastic Products Style #705, or equal.
 - c. Expansion joint:
 - 1) 9 inches wide by 3/8 inch thick center bulb two inch outside diameter.
 - 2) Sika Greenstreak Plastic Products Style #739, or equal.
 4. Provide factory-made waterstop fabrications at all changes in direction, intersections and transitions, leaving only straight butt splices for the field. Butt welds to be a minimum six inches clear of the intersection.
 5. Factory prepunched (less than 1.5 feet on centers, each edge, staggered) for wire supports.
 - a. Provide hog rings or grommets at all punched holes along the length of the waterstop.
 6. See Drawings for application and other requirements.
- F. Waterstops, Preformed Strip Type:
1. Acceptable manufacturers:
 - a. Sika Greenstreak Plastics, Inc. (Hydrotite).
 - b. Adeka Ultra Seal USA (MC-2010MN).
 - c. DeNeef (Swellseal 2010).
 - d. Or equal.
 2. Hydrophilic, non-bentonite composition.
 3. Manufactured solely for the purpose of preventing water from traveling through construction joints.
 4. Volumetric expansion limited to three times maximum.
 5. See the Drawings for locations, applications, and other requirements.
- G. Water Swelling Sealant:
1. Required adhesive for use with strip-type waterstop.
 2. Compatible with strip-type waterstop.
 3. Single component, gun applied.
 4. Moisture cured.
 5. Minimum 70 percent volumetric expansion swelling capability.
- H. Curing Materials shall comply with one or more of the following:
1. Absorbent Covers.
 2. Moisture Retaining Covers.
 3. Dissipating curing compound:
 - a. Fugitive dye, waterborne, membrane-forming.
 - b. ASTM C309, Type 1D, Class A or B, shall be composed of hydrocarbon resins, and dissipating agents that begin to break down upon exposure to UV light, and traffic, approximately four to six weeks after applications, providing a film that is removable

with standard degreasing agents, and mechanized scrubbing actions to not impair the later addition and performance of applied finishes.

- c. Products and Manufacturers:
 - 1) Dayton Superior Corporation; Day Chem Rez Cure (J-11-WD).
 - 2) Euclid Chemical Company; Kurez DR VOX.
 - 3) L&M Construction Chemicals, Inc.; L&M Cure R.
 - 4) Or equal.
- 4. Clear, water-borne, membrane-forming curing and sealing compound:
 - a. ASTM C1315, Type 1, Class A.
 - b. Moisture loss shall be not more than 0.40 kilograms per square meter when applied at 300 square feet per gallon.
 - c. Manufacturer's certification is required.
 - d. Subject to Project requirements, provide one of the following products:
 - 1) Solvent-based:
 - a) Euclid Chemical Company; Super Diamond Clear, Luster Seal 300 (exterior), Super Rez-Seal (interior).
 - b) L&M Construction Chemicals, Inc.; Lumiseal Plus.
 - c) W.R. Meadows, Inc.; CS-309/30.
 - d) Or equal.
 - 2) Water-based:
 - a) Euclid Chemical Company; Super Diamond Clear VOX.
 - b) L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
 - c) W.R. Meadows, Inc.; Vocomp-30.
 - d) Or equal.
- I. Sand cement grout, non-shrink grout and epoxy grout: Comply with Section 03 31 30 - Concrete Materials and Proportioning.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installing the Work constitutes Contractor's approval of underlying work, substrates, and field conditions prevailing at the time of the Work.

3.2 PREPARATION

- A. Preparation – General:
 - 1. Materials and construction shall comply with the tolerances as specified in ACI 117.
 - 2. Complete formwork.
 - a. Perform formwork in accordance with Section 03 11 13 - Formwork.
 - 3. Remove earth, snow, ice, water, foreign matter, and other extraneous materials from areas that will receive concrete.
 - 4. Secure reinforcement in place.
 - a. Provide reinforcing in accordance with Section 03 21 00 - Reinforcement.
 - 5. Provide expansion joint material, anchors and other embedded items.
 - 6. Prior to placing concrete, obtain Engineer's concurrence that associated formwork and reinforcing appear to be in accordance with the Contract Documents. However, in no event will Engineer's observations, comments, or concurrence that any part of the Work appears to be in accordance with the Contract Documents modify or reduce Contractor's sole responsibility for providing Work in accordance with the Contract Documents.
 - 7. Do not place concrete during rain, sleet, snow, or other adverse ambient or environmental conditions unless adequate protection is provided by Contractor and such placement is acceptable to Engineer.
 - a. Provide sufficient quantity of competent, experienced workers with due regard for effects of concrete temperature and atmospheric conditions on rate of hardening of concrete as required to obtain good surfaces and avoid unplanned cold joints.

- b. Do not allow precipitation or storm water runoff to increase mixing water nor to damage surface finish.
 - 8. Remove hardened concrete and foreign materials from inner surfaces of conveying equipment and formwork.
 - 9. Provide slabs and beams of minimum indicated required depth when sloping structural foundation base slabs and elevated slabs to drains.
 - a. For floor slabs on grade, slope top of subgrade to provide slab of required uniform thickness.
- B. Preparation of Subgrade for Slabs On Ground:
 - 1. Subgrade shall be wetted without standing water immediately prior to placing concrete.
 - 2. Obtain Engineer's acceptance of subgrade compaction density prior to placing slabs on ground.
- C. Edge Forms and Screeds:
 - 1. Set accurately to produce designated elevations and contours of finished surface.
 - 2. Sufficiently strong to support vibrating screeds or roller pipe screeds, if required.
 - 3. Use strike off templates, or acceptable vibrating type screeds, to align concrete surfaces to contours of screed strips.

3.3 CONCRETE MIXING

- A. Concrete Mixing - General:
 - 1. Provide concrete materials from one ready-mix batch plant qualified in accordance with this Section's "Quality Assurance" Article.
 - 2. Batch, mix, and transport in accordance with ASTM C94/C94M.
- B. Control of Admixtures:
 - 1. Control at ready-mix plant:
 - a. Admixtures shall be introduced at the ready-mix plant in accordance with manufacturer's recommendations.
 - b. Charge admixtures into mixer as solutions.
 - 1) Measure by means of an appropriate mechanical dispensing device.
 - 2) Liquid considered a part of mixing water.
 - 3) Admixtures that cannot be added in solution may be weighed or measured by volume if so recommended by manufacturer.
 - c. Add separately, when two or more admixtures are used in concrete, to avoid possible interaction that might interfere with efficiency of either admixture, or adversely affect concrete.
 - d. Complete performing addition of retarding admixtures within one minute after addition of water to cement has been completed, or prior to beginning of last three quarters of required mixing, whichever occurs first.
 - 2. Control of Admixtures at the Site:
 - a. Additional quantities of admixtures (with the exception of retarders) may be added at the Site provided:
 - 1) Addition of admixtures shall be under the supervision of the ready-mix plant's quality control representative.
 - 2) Addition of each admixture shall be documented on the delivery ticket.
 - 3) Provide additional mixing in accordance with ASTM C94.
- C. Tempering and Control of Mixing Water:
 - 1. Mix concrete only in quantities for immediate use.
 - 2. Discard concrete which has set.
 - 3. Discharge concrete from ready-mix delivery vehicles within time limit stated in ASTM C94.
 - 4. Addition of water at the Site:
 - a. Comply with Section 03 31 30 - Concrete Materials and Proportioning, for specified water cement ratio and slump.
 - b. Do not exceed maximum specified water cement ratio or slump.

- c. Incorporate water by additional mixing equal to at least half of total mixing required.

3.4 PLACING OF CONCRETE

A. Placing of Concrete - General:

1. Place concrete as a rate such that concrete, which is being integrated with fresh concrete, is “workable”.
 - a. Provide sufficient, competent, skilled workers for timely delivery of concrete into forms to avoid unintended cold joints and placement consolidation issues.
2. Comply with ACI 304R, ACI 304.2R, and ACI 301.
3. Do not begin placing concrete during rain, sleet, snow, or other adverse weather or environmental conditions that may be detrimental to concrete placement.
 - a. Protect fresh concrete from ensuing inclement weather and other environmental conditions that may be detrimental to concrete.
4. Time between concrete batching and final placement shall not exceed 90 minutes, [unless indicated otherwise by the ready-mix plant or noted on the delivery ticket].
 - a. Selection of time limit to end of discharge should consider ambient conditions, types of cementitious materials and admixtures used, placement procedures, and projected transportation time between ready-mix plant and the point of delivery.
 - b. If discharge is acceptable after more than 90 minutes have elapsed since batching, verify that air content of air-entrained concrete, slump, and temperature of concrete are as specified.
5. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials.
6. Begin work only when work of other trades affecting concrete is complete.
7. When pumping concrete, do not use excess grout or mortar to lubricate concrete conveyance piping.
8. Do not use excess water for workability or any reason when placing concrete by freefall.
9. Deposit concrete continuously to avoid cold joints.
10. Provide construction joints at locations shown or indicated in the Contract Documents, unless otherwise approved by Engineer via Shop Drawing or Contract modification.
 - a. Plan size of crews with due regard for effects of concrete temperature and ambient conditions to avoid unplanned cold joints.
11. Spreaders:
 - a. Temporary: Remove as soon as concrete placing renders their function unnecessary.
 - b. Embedded:
 - 1) Obtain approval of Engineer for their use.
 - 2) Materials: Concrete or metal.
 - 3) Ends of metal spreaders coated with plastic coating two inches from each end.
12. Deposit concrete as nearly as practicable in its final position to avoid segregation.
 - a. Maximum free fall: 4 feet.
 - b. Place concrete by means of hopper, “elephant trunk” or tremie pipe extending to within four feet of surface.
13. Perform the following operations before bleeding water has an opportunity to collect on surface:
 - a. Spread.
 - b. Consolidate.
 - c. Straightedge.
 - d. Darby or bull float.
14. No water shall be added to the concrete surface to ease finishing operation.
15. Do not discharge water into forms.
16. Consider use of form vibrators for certain placement situations.

B. Cold Weather Concrete Placement:

1. Comply with ACI 306.1.
2. Do not place concrete on forms or subgrades that are below 32 degrees F or contain frozen material.

3. Maintain all materials, forms, reinforcement, subgrade and any other items which concrete will come in contact with free of frost, ice or snow at time of concrete placement.
 4. Temperature of concrete when discharged at site: in accordance with ACI 306.1.
 5. Heat subgrade forms, embedments and reinforcement with a cross section area greater than four square inches to between 45 and 70 degrees F, when temperature of surrounding air is 32 degrees F or below, at time concrete is placed.
 - a. Remove frost from subgrade, forms and reinforcement before concrete is placed.
 6. Combine water with aggregate in mixer before cement is added, if water or aggregate is heated above 90 degrees F.
 7. Do not mix cement with water or with mixtures of water and aggregate having a temperature greater than 90 degrees F.
 8. Comply with ACI 306R for specific requirements dealing with elevated steel troweled slabs that will be exposed to freeze-thaw cycles.
- C. Hot Weather Concrete Placement:
1. Comply with ACI 305.1.
 2. Cool ingredients before mixing, or add flake ice or well crushed ice of a size that will melt completely during mixing for all or part of mixing water if high temperature, low slump, flash set, cold joints, or shrinkage cracks are encountered.
 3. Temperature of concrete at point of delivery (i.e. delivery vehicle discharge) when placed:
 - a. Not to exceed 90 degrees F.
 - b. Not so high as to cause:
 - 1) Shrinkage cracks.
 - 2) Difficulty in placement due to loss of slump.
 - 3) Flash set.
 4. Temperature of forms and reinforcing when placing concrete:
 - a. Not to exceed 90 degrees F.
 - b. May be reduced by spraying with water to cool below 90 degrees F.
 - 1) Leave no standing water to contact concrete being placed.
 5. Prevent plastic shrinkage cracking, slab curling, or both due to evaporation.
- D. Consolidating:
1. Consolidate in accordance with ACI 309R except as modified herein.
 2. Consolidate by vibration so that concrete is thoroughly worked around reinforcement, embedded items and into corners of forms.
 - a. Ensure no displacement of reinforcing or other embeds from final position.
 - b. Eliminate:
 - 1) Air or stone pockets.
 - 2) Honeycombing, pitting, or both.
 - 3) Planes of weakness.
 3. Use suitable form vibrators located just below top surface of concrete, where internal vibrators cannot be used in areas of congested reinforcing.
 - a. Size and coordinate external vibrators to specifically match forming system used.
 4. Internal vibrators:
 - a. Minimum frequency of 8000 vibrations per minute.
 - b. Insert and withdraw at points approximately 1.5 feet apart.
 - 1) Allow sufficient duration at each insertion to consolidate concrete but not sufficient to cause segregation.
 - c. Use in:
 - 1) Beams and girders of framed slabs.
 - 2) Columns and walls.
 - 3) Vibrating concrete around all waterstops.
 - d. Size of vibrators shall be in accordance with ACI 309R, Table 5.1.5.
 5. Obtain consolidation of slabs with internal vibrators, vibrating screeds, roller pipe screeds, or other appropriate means.
 6. Do not use vibrators to transport concrete within forms.

7. When placing self-consolidating concrete, the use of form or pencil vibrators is acceptable, provided such methods do not cause aggregate segregation, or otherwise adversely affect the quality of the Work.
 8. Provide sufficient spare vibrators at the Site during all concrete placing operations to ensure continuous vibration.
 9. Bring a full surface of mortar against form by vibration supplemented if necessary by spading to work coarse aggregate back from formed surface, where concrete is to have an as-cast finish.
 10. Prevent construction equipment and machinery, construction operations, and personnel from introducing vibrations into freshly placed concrete after the concrete has been placed and consolidated.
- E. Handle concrete from mixer to place of final deposit by methods which will prevent segregation or loss of ingredients and in a manner which will assure that required quality of concrete is maintained.
1. Use truck mixers, agitators, and non-agitating units in accordance with ASTM C94.
 2. Temporary horizontal belt conveyors:
 - a. Mount at a slope which will not cause segregation or loss of ingredients.
 - b. Protect concrete against undue drying or rise in temperature.
 - c. Use an arrangement at discharge end to prevent segregation.
 - d. Do not allow mortar to adhere to return length of belt.
 - e. Discharge conveyor runs into equipment specially designed for spreading concrete.
 3. Temporary metal or metal lined chutes:
 - a. Slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal.
 - b. Chutes more than 20 feet long and chutes not meeting slope requirements may be used provided they discharge into a hopper before distribution.
 - c. Provide end of each chute with a device to prevent segregation.
 4. Temporary pumping or pneumatic conveying equipment:
 - a. Designed for concrete application and having adequate pumping capacity.
 - b. Control pneumatic placement so segregation is avoided in discharged concrete.
 - c. Loss of slump in pumping or pneumatic conveying equipment shall not exceed 1.5 inches.
 - d. Do not convey concrete through pipe of aluminum or aluminum alloy.
 - e. Provide pumping equipment without Y sections.
- F. Placing of Concrete on Metal Deck:
1. Prior to concrete placement, the metal deck shall be free of soil, debris, standing water, loose mill scale, and other foreign matter.
 2. Care shall be exercised when placing concrete so that the deck will not be subject to construction loads or impact that exceed the design capacity of the deck.
 3. Concrete shall be placed in a uniform manner and spread toward the center of the deck span.
 4. If buggies are used to place concrete, runways shall be planked, and buggies shall only operate on planking.
 - a. Planks shall be of adequate stiffness to transfer loads to the steel supports without damaging the deck.
 5. Deck damage caused by careless placement of concrete shall be repaired or replaced.
 6. Pour concrete to the elevations shown or indicated on the Drawings.

3.5 JOINTS AND EMBEDDED ITEMS

- A. Construction Joints - General:
1. Provide joints at locations as shown or indicated on the Drawings or as shown on approved Shop Drawings approved by Engineer or in an appropriate Contract modification.
 - a. Where construction joint spacing shown on the Drawings exceeds the joint spacing indicated in Paragraph B. below, submit proposed construction joint location in conformance with this Section.

2. Unplanned construction joints are unacceptable.
 - a. If concrete cannot be completely placed between planned construction joints, then it must be removed.
 3. In general, locate joints near middle of spans of slabs, beams and girders unless a beam intersects a girder at this point, in which case, offset joint in girder a distance equal to twice the width of the beam.
 4. Locate joints in walls and columns at underside of floors, slabs, beams, or girders, and at tops of foundations or floor slabs, unless shown otherwise.
 - a. At Contractor's option, beam pockets may be formed into concrete walls.
 - b. Size pockets to allow beam reinforcing to be placed as detailed on the Drawings.
 5. Place beams, girders, column capitals and drop panels at same time as slabs.
 6. Place corbels monolithically with their supporting members.
 - a. Locate wall vertical construction joints midway between corbels.
 - b. Where only a single corbel is located, place it also monolithically with wall and locate wall vertical construction joint a minimum of three feet from face of corbel.
 7. Make joints perpendicular to main reinforcement with all reinforcement continuous across joints.
 8. Provide the following joints unless shown or indicated otherwise on the Drawings:
 - a. Roughen joints: horizontal construction joints.
 - b. Keyed joints: vertical construction joints.
 9. Roughen construction joints:
 - a. Clean the previously hardened concrete interface and remove all laitance.
 - b. Intentionally roughen the interface to a full amplitude of 0.25 inch.
 10. Keyways:
 - a. Construction joint keyways shall have the following dimensions, unless shown or indicated otherwise on the Drawings or as directed by Engineer.
 - b. Wall keys:
 - 1) Keyway width, not less than one-third and not more than one-half the wall thickness measured perpendicular to wall faces.
 - 2) Keyway depth shall be not less than 1.5 inches.
 - 3) Continuous along length of wall.
 - 4) Place keyway in wall center unless otherwise shown or indicated on the Drawings.
 - c. Keyways in footings, foundations, base slabs, and structural or elevated slabs:
 - 1) Keyway height not less than one-third and not more than one-half the footing or slab thickness.
 - 2) Keyway depth not less than 1.5 inches.
 - 3) Continuous along footing or slab.
 - 4) Keyway in footing or slab center unless shown otherwise on the Drawings.
 - d. Beam keyways:
 - 1) Full width of beam.
 - 2) Keyway height not less than 5.5 inches.
 - 3) Keyway depth not less than 1.5 inches.
 - 4) Keyway located in initial beam pour, directly above the bottom reinforcing, unless shown otherwise on the Drawings.
- B. Construction Joints - Spacing Unless Otherwise Specified:
1. Structures not intended to contain liquid:
 - a. Wall vertical construction joints:
 - 1) 50 feet maximum on centers.
 - 2) At wall intersections, four feet minimum from corner.
 - b. Base slab, floor, and roof slab construction joints:
 - 1) Placements to be approximately square and not to exceed 4,000 square feet.
 - 2) Maximum side dimension of a slab pour shall be 90 feet.
 2. Water bearing structures:
 - a. Wall vertical construction joints:
 - 1) 30 feet maximum on centers.

- 2) At wall intersections, 10 feet minimum from corner.
 - b. Wall horizontal construction joints: 18 feet on centers.
 - c. Floor slab, construction joints:
 - 1) Placements to be approximately square and not to exceed 2,000 square feet.
 - 2) Maximum side dimension of a slab pour to be less than:
 - a) Twice the length of the short side.
 - b) 60 feet.
 - d. Elevated slab construction joints:
 - 1) Placements to be approximately square and not to exceed 4,000 square feet.
 - 2) Maximum side dimension of a slab pour to be less than:
 - a) Twice the length of the short side.
 - b) 70 feet.
- C. Construction Joints - Bonding:
- 1. Obtain bond between concrete pours at construction joints by thoroughly cleaning and removing all laitance from construction joints.
 - 2. Before new concrete is placed, all construction joints shall be coated with cement grout, or dampened, as indicated below:
 - 3. Roughen construction joints:
 - a. Roughen the surface of the concrete to expose the coarse aggregate uniformly with 0.25 inch minimum amplitude.
 - 1) Remove laitance, loosened particles of aggregate or damaged concrete at the surface.
 - 4. Keyed construction joints:
 - a. Thoroughly clean construction joints and remove all laitance.
 - b. Dampen the hardened concrete immediately prior to placing of fresh concrete.
- D. Slab On Grade Joints:
- 1. Locate construction and control joints in slabs on grade as shown or indicated on the Drawings.
 - 2. Time cutting properly with set of concrete, if saw cut joints are required or allowed.
 - a. Start cutting as soon as concrete has hardened sufficiently to prevent aggregates being dislodged by saw.
 - b. Complete before shrinkage stresses become sufficient to produce cracking.
- E. Expansion Joints:
- 1. Do not allow reinforcement or other embedded metal items bonded to concrete (except smooth dowels bonded on only one side of joint) to extend continuously through an expansion joint.
 - 2. Use neoprene expansion joint fillers, unless shown or indicated otherwise on the Drawings.
 - 3. Seal expansion joints as shown or indicated on the Drawings.
- F. Waterstops - General:
- 1. Waterstop shall be continuous with splices in accordance with manufacturer's instructions and create water tight joints.
 - 2. Do not mix different types of waterstop materials in the same structure without approval from the Engineer unless shown or indicated on the Drawings.
 - 3. Preformed strip type:
 - a. Locate waterstop at center of wall, unless shown or indicated otherwise on the Drawings.
 - 1) Maintain at least three inches from edge of concrete or as recommended by manufacturer.
 - b. Install in a bed of swelling sealant on smooth surface of hardened concrete by use of nails, adhesive or other means as recommended by manufacturer to prevent movement of waterstop during placement of concrete.
 - c. Roughened joints shall be specially prepared during concrete placement to provide smooth surface for proper water stop installation.

- d. Use in joints against existing concrete where shown or indicated on the Drawings.
- 4. PVC waterstops:
 - a. Pre-position waterstop accurately in joints, with adequate clearance from all reinforcing. Do not push waterstop into wet concrete.
 - b. Secure waterstops in correct position using hog rings or grommets spaced no more than 1.5 feet maximum staggered along each edge full length and passed through the edge of the waterstop.
 - 1) Tie wire to adjacent reinforcing.
 - c. Hold horizontal waterstops in place with continuous supports.
 - d. Install according to manufacturer's instructions.
 - 1) Do not displace reinforcement from required location.
 - e. Splice ends and intersections with perpendicular butt splice using electrical splicing iron in accordance with manufacturer's instructions.
 - 1) Use factory fabricated "T" and corner intersection fittings.
 - 2) Field splice straight runs of material.
 - f. Unless otherwise noted, provide for construction joints in new construction for all structures indicated on the Drawings.
- G. Other Embedded Items:
 - 1. Place sleeves, inserts, anchors, and embedded items required for adjoining work or for its support, prior to initiating concreting.
 - 2. Do not route electrical conduit, drains, or pipes in concrete slabs, walls, columns, foundations, beams or other structural members unless approved by Engineer.
- H. Placing Embedded Items:
 - 1. Support against displacement.
 - 2. Fill voids in sleeves, inserts and anchor slots temporarily with readily removable material to prevent entry of concrete into voids.
 - 3. Provide adequate means for anchoring waterstop in concrete.
 - a. Provide means to prevent waterstops in the forms from being folded over by the concrete as it is placed.

3.6 FINISHING

- A. Comply with Section 03 35 00 - Concrete Finishing and Repair of Surface Defects.
- B. Coordinate mixing and placing with finishing.

3.7 INSTALLATION OF GROUT

- A. Grout Schedule:
 - 1. Sand cement grout:
 - a. Fill keyways in precast HCU.
 - b. Construction joint bedding (base of wall pours with comparable compressive strength to wall).
 - c. General use.
 - d. As shown or indicated on the Drawings.
 - 2. Non-shrinking non-metallic grout:
 - a. Filling form tie holes.
 - b. Under column and beam base plates.
 - c. Other uses shown or indicated on the Drawings.
 - 3. Epoxy grout:
 - a. Patching cavities in concrete.
 - b. Grouting of dowels and anchor bolts into existing concrete.
 - c. Grouting of rotating or oscillating equipment base plates [where driving motor is 500 horsepower and above].
 - d. As shown or indicated on the Drawings.
- B. Grout Installation:

1. Sand cement grout:
 - a. Fill wetted keyways between precast concrete hollow core slabs with sand cement grout.
 - b. Consolidate grout by rodding or by other means to assure complete filling of keyways.
 - c. Cure grout by one of methods specified.
2. Non-shrink non-metallic grout:
 - a. Clean concrete surface to receive grout.
 - b. Saturate concrete with water for 24 hours prior to grouting.
 - c. Mix in a mechanical mixer.
 - d. Use no more water than necessary to produce flowable grout.
 - e. Place in accordance with manufacturer's instructions.
 - f. Provide under beam, column, and equipment base plates, in joints between precast concrete and cast-in-place slabs, and in other locations shown or indicated on the Drawings.
 - g. Completely fill spaces and cavities below the top of base plates.
 - h. Provide forms where base plates and bed plates do not confine grout.
 - i. Where exposed to view, finish grout edges smooth.
 - j. Except where a slope is shown or indicated on the Drawings, finish edges flush at the base plate, bed plate, member or piece of equipment.
 - k. Coat exposed edges of grout with cure or seal compound recommended by the grout manufacturer.
3. Epoxy grout:
 - a. Mix and place in accordance with manufacturer's written instructions.
 - b. Apply only to clean, dry, sound surface.
 - c. Completely fill cavities and spaces around dowels and anchors without voids.
 - d. Grout base and bed plates as specified for non-shrinking, non-metallic grout.
 - e. Obtain manufacturer's field technical assistance as necessary to ensure proper placement.

3.8 CURING AND PROTECTION

- A. Protect concrete from premature drying, excessively hot or cold temperatures, and mechanical damage immediately after placement, and maintain with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement, hardening, and compressive strength gain.
 1. Comply with ACI 308.1 except as modified herein.
 2. Do not impose loads by foot traffic, wheeled traffic, and other loads until concrete has sufficiently cured to carry imposed loads without adversely affecting the concrete. In no event shall concrete be subject to loading or traffic during initial 48 hours of curing, unless otherwise approved by Engineer.
- B. Apply one of the following curing procedures immediately after completion of placement and finishing (surfaces not in contact with forms).
 1. Ponding or continuous sprinkling. Avoid eroding the surface of freshly placed concrete.
 2. Application of wet Absorbent Covers:
 - a. Minimum lap: 12 inches.
 - b. Provide continuous uniform supply of moisture, such as sprinklers or soaker hoses as necessary to keep concrete surface continuously wet.
 - c. Monitor Absorbent Covers as required to prevent cover materials or concrete surface from drying out.
 3. Continuous application of steam (not exceeding 150 degrees F) or mist spray.
 4. Application of Moisture Retaining Cover sheet materials.
 - a. Place as soon as possible after final finishing and without marring the surface.
 - b. Minimum lap: 12 inches.
 - c. Seal edges to make water-tight.
 - d. Place Moisture Retaining Cover in intimate contact with the concrete surface, without wrinkles and weighted to hold in place.

- e. Hold cover and edges in place as necessary to prevent wind from displacing the cover.
 - f. Moisture Retaining Fabric:
 - 1) Install in accordance with manufacturer's written recommendations.
 - 2) Saturate concrete surface and fabric side of cover immediately prior to placing.
 - g. Monitor continuously during the curing period:
 - 1) Repair holes, tears or displaced cover.
 - 2) Rewet as necessary to keep concrete moist under cover.
 - 5. Application of other moisture retaining covering acceptable to Engineer.
 - 6. Water used for curing shall be within 20 degrees F of the concrete temperature.
 - 7. Application of a curing compound.
 - a. Apply curing compound in accordance with manufacturer's written recommendations immediately after any water sheen, which may develop after finishing, has disappeared from concrete surface.
 - b. Do not use on surface against which additional concrete or other material is to be bonded unless it is proven that curing compound will not prevent bond.
 - c. Where a vertical surface is cured with a curing compound, the vertical surface shall be covered with a minimum of two coats of the curing compound.
 - 1) Apply the first coat of curing compound to a vertical surface immediately after form removal.
 - 2) The vertical concrete surface at the time of receiving the first coat shall be damp with no free water on the surface.
 - 3) Allow the preceding coat to completely dry prior to applying the next coat.
 - 4) A vertical surface: Any surface steeper than 1 vertical to 4 horizontal.
 - 8. Surfaces In Contact with Forms:
 - a. Formed surfaces: Cure formed concrete surfaces utilizing final curing methods per ACI 308.1, including underside of beams, supported slabs, and other similar surfaces,
 - 1) See Section 03 11 13 - Formwork.
 - b. Minimize moisture loss from and temperature gain of concrete placed in forms exposed to heating by sun by keeping forms wet and cool until they can be safely removed.
 - c. Make provisions to keep concrete wall moist while stripping forms and until curing measures are in place.
 - d. After form removal, cure concrete until end of time prescribed.
 - e. Use one of the methods listed above.
 - f. Forms left in place shall not be used as a method of curing in hot weather.
 - g. The term "hot weather", where used in these Specifications, is defined in ACI 305.1.
 - h. In hot weather, remove forms from vertical surfaces as soon as concrete has gained sufficient strength so that the formwork is no longer required to support the concrete.
- C. Curing Period:
- 1. Continue curing for at least seven days for all concrete except Type III, high early strength concrete for which period shall be at least three days.
 - a. If one of curing procedures indicated above is used initially, it may be replaced by one of other procedures indicated any time after concrete is two days old, provided concrete is not permitted to become surface dry during transition.
- D. Cold Weather:
- 1. Comply with of ACI 306.1.
 - 2. Maintain temperature of concrete in accordance with ACI 306.1 for a minimum of 72 hours after concrete is placed, when outdoor temperature is 40 degrees F, or less.
 - a. Maximum temperature rate of decrease: In accordance with ACI 306.1.
 - 3. Provide temporary heating, covering, insulating, or housing of the concrete Work to maintain required temperature without damage due to concentration of heat.
 - 4. Do not use combustion heaters unless precautions are taken to prevent exposure of concrete to exhaust gases which contain carbon dioxide.
 - 5. Interior slabs in areas intended to be heated shall be adequately protected so that frost does not develop in the supporting subgrade.

- E. Hot Weather:
 - 1. Comply with ACI 305.1 and ACI 308.1.
 - 2. Provide as necessary cooling forms, reinforcement and concrete, windbreaks, shading, fog spraying, sprinkling, ponding, or wet covering with a light colored material.
 - 3. Provide protective measures as quickly as concrete hardening and finishing operations will allow.
 - 4. Maximum temperature rate of decrease: In accordance with ACI 305.1.
- F. Rate of Temperature Change:
 - 1. Maintain temperature of air immediately adjacent to concrete as uniform as possible, during and immediately following curing.
- G. Protection from Mechanical Damage:
 - 1. Protect concrete from damage of all types, whether or not mechanically imparted including load stresses, heavy shock, and excessive vibration.
 - 2. Protect finished concrete surfaces from all types of damage, including damage by construction equipment and machinery, construction means and methods, precipitation, and running water.
 - 3. Do not load self-supporting structures in such a way as to overstress concrete.

3.9 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Special Inspections in accordance with building code:
 - a. Comply with 03 05 05 - Concrete Testing and Inspection.
- B. Supplier's Onsite Services:
 - 1. Waterstop manufacturer's representative shall provide on-site training of waterstop installation, field splicing, welding and inspection procedures prior to construction.

END OF SECTION

SECTION 03 35 00
CONCRETE FINISHING AND REPAIR OF SURFACE DEFECTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete finishing and repair of surface defects.
 - 2. Chemical Sealers.
 - 3. Polymer Modified Cementitious Coating.
 - 4. Resurfacing Mortar.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 03 11 13 - Formwork.
 - 2. Section 03 31 30 - Concrete, Materials and Proportioning.
 - 3. Section 03 31 31 - Concrete Mixing, Placing, Jointing and Curing.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Concrete Institute (ACI):
 - a. CT, Concrete Terminology.
 - b. 117, Specification for Tolerances for Concrete Construction and Materials.
 - c. 303R, Guide to Cast-in-Place Architectural Concrete Practice.
 - d. 308, Standard Practice for Curing Concrete.
 - 2. ASTM International (ASTM):
 - a. C109, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
 - b. C150, Standard Specification for Portland Cement.
 - c. C157, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
 - d. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - e. C666, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
 - f. C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
 - g. C1315, Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
 - h. D4258, Standard Practice for Surface Cleaning Concrete for Coating.
 - i. D4259, Standard Practice for Abrading Concrete.
 - j. E1155, Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers.
 - k. E1486, Standard Test Method for Determining Floor Tolerances Using Waviness, Wheel Path and Levelness Criteria.
 - 3. International Concrete Repair Institute (ICRI):
 - a. 310.2R, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.
 - 4. National Council Highway Research Program (NCHRP):
 - a. 244, Concrete Sealers for the Protection of Bridge Structures.
 - 5. The Society for Protective Coatings/NACE International (SSPC/NACE):
 - a. SP 13/NACE No. 6, Surface Preparation of Concrete.
- B. Qualifications:
 - 1. Chemical Sealer CS-2:

- a. Applicator shall be factory trained and approved, in writing, by the manufacturer to apply the product.
 - b. Applicator shall have a minimum of five years of experience successfully applying materials specified.
- C. Mock-Ups.
 - 1. General:
 - a. Construct additional mock-ups as required until accepted.
 - b. Mock-ups constitute minimum standard of quality for actual construction.
 - c. Maintain mock-up during construction.
 - d. Remove when directed by Engineer.
 - 2. Construct mock-up for each type of wall finish specified for review and acceptance by Engineer.
 - a. Minimum 4 x 4 feet area for each different wall finish specified.
 - b. Mock-ups shall include:
 - 1) Sample of patched tie hole.
 - 2) Sample of all jointery being used in the walls.
 - c. Include mock-up of wall having polymer modified cementitious coating.
 - 1) Mock-up shall be stepped to show surface preparation, repairs and coating in all stages of application.
 - 3. Construct mock-up floor slab for review and acceptance by Engineer.
 - a. Minimum 10 x 10 feet.

1.3 DEFINITIONS

- A. Vertical Surface Defects:
 - 1. Any void in the face of the concrete deeper than 1/8 inches, such as:
 - a. Tie holes.
 - b. Air pockets (bug holes).
 - c. Honeycombs.
 - d. Rock holes.
 - 2. Scabbing:
 - a. Scabbing is defect in which parts of the form face, including release agent, adhere to concrete.
 - 3. Foreign material embedded in face of concrete.
 - 4. Fins 1/16 inches or more in height.
- B. Installer or Applicator:
 - 1. Installer or applicator is the person actually installing or applying the product in the field at the Project site.
 - 2. Installer and applicator are synonymous.
- C. Other words and terms used in this Specification Section are defined in ACI CT.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - 2. Certifications:
 - a. Certification of aggregate gradation.
 - b. Certification of manufacturer experience qualifications and performance history.
 - c. Certification of applicator's qualifications.
 - 1) Refer to Qualifications paragraph.
 - 2) Provide manufacturer's written approval of applicators.
 - 3) Provide references substantiating specialty experience.
- B. Informational Submittals:

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with manufacturer's recommendations and requirements for materials used.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Bonding Agents:
 - a. Master Builders Solutions.
 - b. Euclid Chemical Co.
 - c. Laticrete - L&M Construction Chemicals.
 - 2. Chemical Sealers:
 - a. Master Builders Solutions.
 - b. Euclid Chemical Co.
 - c. Laticrete - L&M Construction Chemicals.
 - d. Tnemec Chemprobe.
 - 3. Polymer Modified Cementitious Coating:
 - a. Aquafin International.
 - b. Master Builders Solutions.
 - c. Euclid Chemical Co.
 - 4. Patching Mortar:
 - a. Master Builders Solutions.
 - b. Euclid Chemical Co.
 - c. Laticrete - L&M Construction Chemicals.
 - d. Sika Corporation.

2.2 MATERIALS

- A. Chemical Sealer CS-1:
 - 1. High solids, water-based solution containing acrylic copolymers.
 - a. ASTM C1315, Type I, Class A.
 - b. Non-yellowing UV resistant.
 - c. VOC Content: <200 G/L.
 - 2. USDA approved as a concrete floor sealer.
 - 3. Euclid Chemical Super Diamond Clear VOX.
- B. Chemical Sealer CS-2:
 - 1. Water based chemical solution containing a blend of silicate and siliconate polymers designed to seal, harden and dustproof concrete floors.
 - 2. VOC Content: 0 G/L.
 - 3. Performance of treated concrete floor:
 - a. Coefficient of Friction:
 - 1) Dry: 0.81.
 - 2) Wet: 0.72.
 - b. Liquid repellency, RILEM Method 11.4:
 - 1) ≥ 1 mL.
 - 4. Euclid Chemical Euco Diamond Hard.
- C. Chemical Sealer CS-3:
 - 1. Clear, penetrating, breathable, waterborne silane-siloxane solution.
 - 2. VOC content: ≤ 50 G/L.
 - 3. Odorless.
 - 4. Flash point: >200 degrees F.
 - 5. Water absorption: 85% reduction per NCHRP 244.
 - 6. Chloride penetration: 82% reduction per NCHRP 244.

7. Euclid Chemical Baracade WB 244.
- D. Patching Mortar: Trowelable cementitious repair mortar for vertical, overhead, and horizontal repairs.
 1. Portland cement-based, rapid set repair mortar for interior or exterior use.
 2. Compressive Strength, ASTM C109:
 - a. Minimum 3000 psi at 7 days.
 - b. Minimum 5000 psi at 28 days.
 3. Freeze Thaw Durability, ASTM C666: 96.75% at 300 Cycles.
 4. Shrinkage, ASTM C157: 0.069%.
 5. Euclid Chemical Speed Crete Red Line.
- E. Bonding Agents:
 1. For use only on concrete surfaces not receiving liquid water repellent coating:
 - a. High solids acrylic latex base liquid for interior or exterior application as a bonding agent to improve adhesion and mechanical properties of concrete patching mortars.
 - 1) Master Builders MasterEmaco A 660.
 - 2) Euclid Chemical Co. Flex-Con.
 - 3) Laticrete L&M Everbond.
 2. For use only on concrete surface receiving liquid water repellent:
 - a. Non-acrylic base liquid for interior or exterior application as a bonding agent to improve adhesion and mechanical properties of concrete patching mortars.
- F. Cement:
 1. ASTM C150, Type II Portland for areas exposed to sewage.
 2. ASTM C150, Type I Portland elsewhere.
- G. Aggregate:
 1. Sand: Maximum size #30 mesh sieve.
 2. For exposed aggregate finish surfaces: Same as surrounding wall.
- H. Water: Potable.
- I. Polymer modified cementitious coating:
 1. Polymer modified Portland cement based coating for concrete and masonry.
 - a. Waterproof.
 - b. Resistant to both positive and negative hydrostatic pressure.
 - c. Breathable.
 2. Master Builders Solutions MasterSeal 581 or Euclid Chemical Tamoseal.
 - a. Color:
 - 1) Interior surfaces: Standard gray.
 - 2) Exterior surfaces: Standard gray.
 - b. Texture: Fine.
- J. Nonshrink Grout: See Specification Section 03 31 30 and Specification Section 03 31 31.

2.3 MIXES

- A. Bonding Grout: One part cement to one part aggregate.
- B. Patching Mortar:
 1. One part cement to 2-1/2 parts aggregate by damp loose volume.
 - a. Substitute white Portland cement for a part of gray Portland cement to produce color matching surrounding concrete.

PART 3 - EXECUTION

3.1 PREPARATION

- A. For methods of curing, see Specification Section 03 31 31.

- B. Surface Preparation:
 - 1. Clean surfaces in accordance with ASTM D4258 to remove dust, dirt, form oil, grease, or other contaminants prior to abrasive blasting, chipping, grinding or wire brushing.
 - 2. Prepare surfaces in accordance with ASTM D4259 and SSPC SP 13/NACE No. 6 to completely open defects down to sound concrete and remove laitance.
 - a. Provide concrete surface profile (CSP) in accordance with ICRI 310.2:
 - 1) Areas to receive Repair Mortar:
 - a) Areas larger than 1 SF or deeper than 1/4 inches Abrasive blast, scarify or needle scale to CSP No. 6-8.
 - b. If additional chipping or wire brushing is necessary, make edges perpendicular to surface or slightly undercut.
 - c. No feathered edges will be permitted.
 - d. Rinse surface with clean water to remove all dust, dirt, debris, loosened concrete, laitance, and other contaminants.
- C. Preparation of Bonding Grout Mixture:
 - 1. Mix cement and aggregate.
 - 2. Mix bonding agent and water together in separate container in accordance with manufacturer's instructions.
 - 3. Add bonding agent/water mixture to cement/aggregate mixture.
 - 4. Mix to consistency of thick cream.
 - 5. Bonding agent itself may be used as bonding grout if approved by manufacturer and Engineer.
- D. Preparation of Patching Mortar Mixture:
 - 1. Mix specified patching mortar per manufacturer's published recommendations.
 - 2. For repairs exceeding 2 inches in depth, mix with clean, pre-dampened 3/8 inches pea gravel in accordance with the manufacturer's recommendations.
- E. Polymer modified cementitious coating:
 - 1. Mix in accordance with manufacturer's recommendations using bonding agent acceptable to coating manufacturer.

3.2 INSTALLATION AND APPLICATION

- A. Do not repair surface defects or apply wall or floor finishes when temperature is or is expected to be below 50 degrees F.
 - 1. If necessary, enclose and heat area to between 50 and 70 degrees F during repair of surface defects and curing of patching material.
 - a. Use only clean fuel, indirect fired heating apparatus.
 - b. Exhaust combustion byproducts outside of work area.
- B. Chemical Sealer Application:
 - 1. General:
 - a. Immediately prior to Substantial Completion, thoroughly clean floor in accordance with ASTM D4258 and prepare to receive chemical sealer.
 - 1) Remove previously applied membrane curing compounds.
 - 2) Remove soil, oils, stains, discoloration, or any other imperfection having a negative impact on the appearance of the finished floor.
 - b. Apply product to floor areas indicated on the Drawings.
 - c. Apply in accordance with manufacturer's published installation instructions.
 - 2. Chemical Sealer (CS-1):
 - a. Apply two uniform coats at rate recommended by manufacturer.
 - 1) Apply using manufacturer's recommended equipment with a fan-tip nozzle.
 - 2) Do not allow material to puddle.
 - b. Allow first coat to completely dry before applying second coat.
 - c. Spotted or mottled appearances will not be accepted.
 - 3. Chemical Sealer (CS-2):

- a. Apply two uniform coats at rate recommended by manufacturer.
 - 1) Scrub the material into the floor using a mechanical scrubber.
 - a) Keep the surface wet for not less than 30 minutes.
 - b) Continue scrubbing in accordance with manufacturer's application instructions.
 - c) After material has thickened, but not more than 60 minutes after application, remove all excess liquid.
 - 2) Thoroughly rinse with clean water to remove all residue.
 - a) Damp mop with clean water to remove any streaks.
 - b) Do not allow residue to dry on floor surface.
 - 3) Do not track material onto untreated surfaces.
 - b. After rinsing, allow floor to dry completely and apply second coat following the same procedures.
 - c. Final floor finish shall have uniform sheen without streaking, stains or white residue.
 - 4. Chemical Sealer (CS-3):
 - a. Apply uniform coats at rate recommended by manufacturer.
 - 1) Apply with fine, uniform spray or microfiber pad.
 - b. Allow floor to dry completely and remove any dried residue using hot water and mild citric acid.
 - c. Final floor finish shall be uniform, free of residue, and shall repel water.
 - d. Apply additional coat(s) as necessary to achieve water repellent finish.
- C. Repairing Surface Defects:
- 1. This method is to be used on vertical concrete surfaces as indicated in the Concrete Finishes for Vertical Wall Surfaces paragraph of this Specification Section and similar concrete surfaces not otherwise specified to receive another finish or coating.
 - 2. Fill and repair surface defects and tie-holes using patching mortar mix specified in the MATERIALS Article in PART 2.
 - a. Prime exposed reinforcing steel, embeds or other steel surfaces with primer as recommended by patching mortar manufacturer.
 - b. Scrub bond coat:
 - 1) Wet substrate to a saturated surface dry (SSD) condition.
 - 2) Mix patching mortar to a scrub coat or slurry consistency per manufacturer's published recommendations and apply to entire area.
 - c. As an alternate to the scrub bond coat, concrete may be primed with manufacturer's recommended epoxy primer.
 - d. Patching Mortar Application:
 - 1) Mix and apply Patching Mortar per manufacturer's recommendations within the open time of the product scrub coat or any bonding agents.
 - 2) Finish to level of surrounding concrete surface utilizing techniques recommended by manufacturer.
 - 3. Consolidate patching mortar into place and strike off so as to leave patch slightly higher than surrounding surface.
 - 4. Leave undisturbed until mortar has stiffened before finishing level with surrounding surface.
 - a. Do not use steel tools in finishing a patch in a formed wall which will be exposed to view.
 - 5. Cure patching mortar in accordance with ACI 308.
- D. Concrete Finishes for Vertical Wall Surfaces:
- 1. General:
 - a. Give concrete surfaces finish as specified below after removal of formwork and repair of surface defects.
 - b. Finish numbers not listed are "Not Used".
 - 2. Finish #1 - As cast rough form finish:
 - a. Selected forming materials are not required.

- b. Prepare surface in accordance with the PREPARATION Article in PART 3 of this Specification Section.
 - c. Repair the following surface defects using patching mortar specified in PART 2:
 - 1) Tie holes.
 - 2) Honeycombs deeper than 1/4 inches.
 - 3) Air pockets deeper than 1/4 inches.
 - 4) Rock holes deeper than 1/4 inches.
 - d. Chip or rub off fins exceeding 1/4 inches in height.
 - e. Provide at unexposed surfaces such as:
 - 1) Foundations.
 - 2) Below-grade walls not to be waterproofed.
 - 3) Concealed surface of concrete back-up wythe in cavity wall construction.
3. Finish #2 - As cast form finish:
- a. Form facing material shall produce a smooth, hard, uniform texture.
 - 1) Use forms specified for surfaces exposed to view in accordance with Specification Section 03 11 13.
 - b. Prepare surface in accordance with the PREPARATION Article in PART 3 of this Specification Section.
 - 1) Chip or rub off fins exceeding 1/8 inches in height.
 - 2) Abrasive blast surfaces in accordance with ASTM D4259 and SSPC SP 13/NACE No. 6 to completely open defects down to sound concrete and remove laitance.
 - a) Provide ICRI 310.2 Concrete Surface Profile (CSP) No. 3, minimum across the entire surface.
 - (1) For contiguous repair areas larger than 1 SF or deeper than 1/4 inches Abrasive blast, scarify or needle scale to CSP No. 6-8.
 - b) If additional chipping or wire brushing is necessary, make edges perpendicular to surface or slightly undercut.
 - c) No feather edges will be permitted.
 - 3) Rinse surface with clean water and allow surface water to evaporate prior to repairing surface defects.
 - 4) Repair the following surface defects using patching mortar specified in PART 2:
 - a) Tie holes.
 - b) Honeycombs deeper than 1/4 inches or larger than 1/4 inches diameter.
 - c) Air pockets deeper than 1/4 inches or larger than 1/4 inches diameter.
 - d) Rock holes deeper than 1/4 inches or larger than 1/4 inches diameter.
 - e) Scabbing.
 - 5) Brush blast repaired areas to match adjacent surface texture.
 - c. Provide this finish for:
 - 1) Interior walls of pump rooms.
 - 2) Underside of horizontal elements adjacent to the finished surface.
 - 3) Exposed surfaces not specified to receive another finish.
4. Finish #3 - Grout rubbed finish:
- a. Provide this finish for:
5. Finish #4 - Polymer modified cementitious coating:
- a. Form facing material shall produce a smooth, hard, uniform texture.
 - 1) Use forms specified for surfaces exposed to view in accordance with Specification Section 03 11 13.
 - 2) Comply with ACI 303R for formwork accuracy and form joint handling to prevent grout leakage.
 - b. Prepare surface in accordance with the PREPARATION Article in PART 3 of this Specification Section.
 - 1) Chip or rub off fins exceeding 1/8 inches in height.
 - 2) Abrasive blast and repair surface defects in accordance with Concrete Finish #2.
 - c. Apply decorative coating to entire surface.

- 1) As a mixing liquid for the coating, use bonding agent and water mixture as recommended by coating manufacturer.
 - 2) Apply two (2) coats at 2 pounds per square yard per coat.
 - a) During application of first coat, complete fill all voids, depressions or other surface imperfections.
 - d. When second coat is set, float to a uniform texture with a sponge float.
 - e. Provide this finish on all exposed to view:
 - 1) Exterior building surfaces not otherwise indicated to receive [an Architectural Abrasive Blast Finish].
 - 2) Interior walls, columns and similar vertical surfaces where indicated on Room Finish Schedule on the Drawings.
 - 3) Underside of horizontal elements adjacent to the finished surface.
 - f. Construct mock-up per the Mock-Ups paragraph in the QUALITY ASSURANCE Article in PART 1 of this Specification Section.
- E. Related Unformed Surfaces (Except Slabs):
1. Strike smooth and level tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces after concrete is placed.
 2. Float surface to a texture consistent with that of formed surfaces.
 - a. If more than one finish occurs immediately adjacent to unformed surface, provide surface with most stringent formed surface requirement.
 3. Continue treatment uniformly across unformed surfaces.
- F. Concrete Finishes for Horizontal Slab Surfaces:
1. General:
 - a. Tamp concrete to force coarse aggregate down from surface.
 - b. Screed with straightedge, eliminate high and low places, bring surface to required finish elevations; slope uniformly to drains.
 - c. Dusting of surface with dry cement or sand during finishing processes not permitted.
 2. Unspecified slab finish:
 - a. When type of finish is not indicated, use following finishes as applicable:
 - 1) Surfaces intended to receive bonded applied cementitious applications: Scratched finish.
 - 2) Surfaces intended to receive roofing, or waterproofing membranes: Floated finish.
 - 3) Floors: Troweled finish.
 - 4) Garage floors and ramps: Broom finish.
 - 5) Exterior slabs, sidewalks, platforms, steps and landings, and ramps, not covered by other finish materials: Broom finish.
 - 6) All slabs to receive a floated finish before final finishing.
 3. Scratched slab finish: After concrete has been placed, consolidated, struck off, and leveled to a Class B tolerance, roughen surface with stiff brushes or rakes before final set.
 4. Floated finish:
 - a. After concrete has been placed, consolidated, struck off, and leveled to a Class B tolerance, do no further work until ready for floating.
 - b. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit operations.
 - 1) Use wood or cork float.
 - c. During or after first floating, check planeness of entire surface with a 10 feet straightedge applied at not less than two different angles.
 5. Cut down all high spots and fill all low spots to produce a surface with Class B tolerance throughout.
 - a. Refloat slab immediately to a uniform texture.
 6. Troweled finish:
 - a. Float finish surface to true, even plane.
 - b. Power trowel, and finally hand trowel.

- c. First troweling after power troweling shall produce a smooth surface which is relatively free of defects, but which may still show some trowel marks.
- d. Perform additional trowelings by hand after surface has hardened sufficiently.
- e. Final trowel when a ringing sound is produced as trowel is moved over surface.
- f. Thoroughly consolidate surface by hand troweling.
- g. Finish in accordance with the FIELD QUALITY CONTROL Article in PART 3 of this Specification Section.
 - 1) Leave finished surface essentially free of trowel marks, uniform in texture and appearance.
- h. On surfaces intended to support floor coverings, remove any defects that would show through floor covering.
- 7. Broom Finish:
 - a. Provide broom finish for the following concrete surfaces:
 - 1) Concrete surfaces subject to precipitation, including concrete paving that will be transited by vehicles, stoops, stairs, landings, horizontal concrete surfaces intended for pedestrian traffic (including surfaces that will feature handrails, railings, or guardrails), sidewalks, and horizontal surfaces of cast-in-place concrete retaining walls.
 - 2) [Indicate other Project-specific concrete surfaces requiring broom finish].
 - b. Immediately after required float finish is provided, provide scored texture of concrete surface by drawing coarse, stiff-bristled broom across surface.
 - c. Provide broomed finish in transverse direction to intended traffic, unless expressly required otherwise elsewhere in the Contract Documents.
 - d. Amplitude: 1/16-inch to 1/8-inch.
 - e. Uniform spacing. Noticeable spacing between broom strokes is unacceptable.
- 8. Underside of concrete slab finish:
 - a. Match finish as specified for adjacent vertical surfaces.
 - b. If more than one finish occurs immediately adjacent to underside of slab surface, provide surface with most stringent formed surface requirement.

3.3 FIELD QUALITY CONTROL

A. Tolerances:

- 1. Finished floor slabs:
 - a. Provide Floor Flatness (F_F) and Floor Levelness (F_L) in accordance with ACI 117.
 - 1) Measure in accordance with ASTM E1155.
 - b. Slabs not indicated to be sloped:
 - 1) F_F : Equal or greater than 35.
 - 2) F_L : Equal or greater than 25.
 - c. Slabs indicated to be sloped or curved:
 - 1) Measure in accordance with ASTM E1486.
 - 2) Provide slopes or curves as indicated on the Drawings.
 - d. Slabs indicated to receive polished concrete floor:
 - 1) F_F : Equal or greater than 45.
 - 2) F_L : Equal or greater than 35.
 - 3) Refer to Room Finish Schedule on Drawings.
- 2. Horizontal surfaces other than finished floor slabs, including but not limited to, top of footings, top of walls, concrete fill in tankage, channels and similar applications:
 - a. Gap between a 10 feet straightedge placed anywhere and the finished surface shall not exceed:
 - 1) Class A tolerance: 1/4 inches.
 - 2) Class B tolerance: 3/8 inches.
 - 3) Class C tolerance: 1/2 inches.
 - b. Accumulated deviation from intended true plane of finished surface shall not exceed 1/2 inches.

- B. Unacceptable finishes shall be replaced or, if approved in writing by Engineer, may be corrected provided strength and appearance are not adversely affected.
 - 1. High spots to be removed by grinding and/or low spots filled with a patching compound or other remedial measures to match adjacent surfaces.
- C. Provide services of manufacturer's technical representative:
 - 1. A certified manufacturer's representative experienced in the use of the products used shall be present on a full-time basis to observe and oversee all operations associated with the installation.
 - 2. Contractor, along with manufacturer, shall be fully responsible for the proper application, including all means and methods incidental thereto necessary for a sound, secure and complete installation.
 - 3. Manufacturer's representative shall be present for installation of:
 - a. Dry-shake Hardener.
 - b. Heavy-duty Metallic Aggregate Topping.

3.4 PROTECTION

- A. All horizontal slab surfaces receiving chemical sealer shall be kept free of traffic and loads for minimum of 72 hours following installation of sealer.

END OF SECTION

SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Rough carpentry.
- B. Related Specification Sections include but are not necessarily limited to:
 - 1. Section 03 15 19 – Anchorage to Concrete

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. The Engineered Wood Association (APA):
 - a. PRP-108, Performance Standards and Qualification Policy for Structural Use Panels.
 - b. U450, Storage and Handling of APA Trademarked Panels.
 - c. Y510, Plywood Design Specification.
 - 2. ASTM International (ASTM):
 - a. A153/A153M, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - b. D2898, Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.
 - c. D4442, Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
 - d. D4444, Standard Test Method for Laboratory Standardization and Calibration of Hand-Held Moisture Meters.
 - e. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 3. American Wood Protection Association (AWPA):
 - a. M2, Standard for Inspection of Preservative Treated for Industrial Use.
 - b. M3, Standard for the Quality Control of Preservative Treated Products for Industrial Use.
 - c. M4, Standard for the Care of Preservative-Treated Wood Products.
 - d. T1 Processing and Treatment Standard.
 - e. U1, Use Category System: User Specification for Treated Wood.
 - 4. American National Standards Institute/Single Ply Roofing Industry (ANSI/SPRI):
 - a. ES-1, Wind Design Standard for Edge Systems Used with Low Slope Roof Systems.
 - 5. Environmental Protection Agency (EPA).
 - 6. FM Global (FM):
 - a. 1-49, Property Loss Prevention Data Sheets - Perimeter Flashing.
 - 7. National Institute of Standards and Technology (NIST):
 - a. PS 1, Quantitative NMR (Benzoic Acid).
 - b. PS 20, American Softwood Lumber Standard.
 - 8. Underwriters Laboratories, Inc. (UL):
 - a. 723, Standard for Test for Surface Burning Characteristics of Building Materials.
- B. Qualifications:
 - 1. Wood Treatment Plant: AWPA M3.
 - 2. Treated Wood Inspection: AWPA M2.
- C. Miscellaneous:
 - 1. Factory marking:
 - a. Lumber:
 - 1) Identify type, grade, moisture content, inspection service, producing mill, and other qualities specified.

- 2) Marking may be omitted, as allowed by the building code, if certificate of inspection is provided for each shipment.

1.3 SUBMITTALS

- A. Shop Drawings:
 1. Fabrication drawings of all fabricated items.
 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions for all products specified.
 3. Certifications:
 - a. Chemicals used in treatment process are registered with and approved by EPA.
 - b. Moisture content of material prior to treatment: 25% maximum.
 - c. Material has been kiln-dried after treatment (KDAT) to the moisture content specified.
 4. Documentation of treatment of treated material in accordance with standards referenced.

1.4 DELIVERY AND STORAGE

- A. Delivery, storage and handling of untreated wood products:
 1. Lumber: As recommended by the grading agency indicated on the grade stamp.
 2. Plywood: APA U450.
- B. Delivery, storage, handling and disposal of treated wood products: AWP A M4.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.

2.2 MATERIALS

- A. General:
 1. Lumber (for framing, blocking, nailers, furring, grounds and similar members):
 - a. NIST PS 20.
 - b. Species:
 - 1) Treated material: As indicated in the appropriate AWP A standard.
 - a) Provide species of FRTM as necessary to achieve UL rating listed.
 - c. Grade:
 - 1) For nominal sizes up to and including 2 x 4: Standard and better.
 - 2) For nominal sizes up to 2 inches thick and wider than 4 inches: #2 and better.
 2. Non-structural plywood:
 - a. NIST PS 1.
- B. Preservative Treated Material:
 1. Moisture content:
 - a. Prior to treatment: 25%.
 - b. Kiln-dry after treatment (KDAT), ASTM D4442 and ASTM D4444:
 - 1) Lumber: 19% maximum.
 - 2) Plywood: 18% maximum.
 2. Preservative:
 - a. Waterborne: AWP A T1.
 - b. As indicated in the appropriate AWP A standard.
 3. Pressure-treat material in accordance with AWP A U1.
 4. Wherever practicable, material to be treated shall be manufactured in its final form prior to treatment.
- C. Fire-Retardant Treated Material (FRTM):
 1. Acceptable manufacturer:

- a. Hoover Treated Wood Products, Inc.:
 - 1) Interior: "Pyro-Guard".
 - 2) Exterior: "Exterior Fire-X".
 - 2. Maximum moisture content:
 - a. Prior to treatment: 25%.
 - b. Kiln-dry after treatment (KDAT), ASTM D4442 and ASTM D4444:
 - 1) Lumber: 19% (KDAT).
 - 2) Plywood: 15% (KD-15).
 - 3. Fire-retardant preservative:
 - a. Provide protection against decay:
 - 1) EPA registered for use as a wood preservative.
 - b. Shall not bleed-through or adversely affect bond of any finish.
 - 4. Pressure-treat material in accordance with AWPA U1.
 - 5. UL Classified:
 - a. FR-S, UL 723.
 - b. Exterior: No increase in classification when subjected to the Standard Rain Test, ASTM D2898.
 - c. Provide UL mark on each piece of FRTM.
 - 6. Maximum flame spread rating: 25, ASTM E84.
 - 7. Wherever practicable, material to be treated shall be manufactured in its final form prior to treatment.
- D. Fasteners and Anchors:
- 1. Nails and screws:
 - a. Dry, non-corrosive exposure: Hot dipped galvanized meeting ASTM A153 or Type 304 stainless steel.
 - b. Wet, corrosive, marine, and/or below grade: Type 316 stainless steel.
 - 2. Adhesive anchors, expansion anchors, self-tapping concrete anchors, bolts, nuts, and washers: See Specification Section 03 15 19.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify measurements, dimensions, and shop drawing details before proceeding.
- B. Coordinate location of studs, nailers, blocking, grounds and similar supports for attached work.
- C. Eliminate sharp projections which would puncture roofing, flashing or underlayment material.

3.2 ERECTION AND INSTALLATION

- A. General:
 - 1. Provide preservative treated material for all wood used:
 - a. Outside building.
 - b. Below grade.
 - 2. Provide fire-retardant treated material for all wood used:
 - a. Inside building.
 - b. Exterior building walls.
 - c. Roof construction.
 - d. Parapet walls.
 - e. Roofing nailers.
- B. Attach work securely by anchoring and fastening as indicated or required to support applied loading.
 - 1. Anchor wood to concrete using adhesive or expansion anchors as specified in Specification Section 03 15 19.
 - a. Separate wood from direct contact to concrete with polyethylene foam gasket strip.
 - 1) Size: 1/4 inches by width of wood member.

- 2) Owens Corning "SillSealR".
 2. Anchor wood to metal using bolts and nuts as specified in Specification Section 03 15 19.
 3. Provide flat washers under all bolt heads and nuts.
 4. Fasten plywood in accordance with APA recommendations.
 5. Use fasteners of size that will not penetrate members where opposite side will be exposed to view or receive finish materials.
 6. Install fasteners without splitting of wood; predrill as required.
 7. Do not drive threaded friction type fasteners.
 8. Tighten bolts and lag screws at installation and retighten as required.
- C. Set work to required levels and lines, plumb, true.
1. Shim as required.
 2. Cut and fit accurately.
- D. Provide wood grounds, nailers, or blocking where required for attachment of other work and surface applied items.
1. Form to shapes indicated or required.
 - a. FRTM lumber:
 - 1) Do not rip or mill.
 - 2) Cross-cutting and drilling are allowable in accordance with manufacturer's recommendations and UL requirements.
 - 3) Resurfacing, planing or fabrication of special shapes or profiles shall be done prior to treatment.
 - b. FRTM plywood:
 - 1) Cross-cutting, ripping and drilling are allowable in accordance with manufacturer's recommendations and UL requirements.
 - c. Light sanding of FRTM as permitted by UL to remove raised grain or prepare for finishing is allowable.
 - d. Field treat cuts and holes in preservative treated material in accordance with AWWA M4 and manufacturer's published recommendations.
 2. Grounds:
 - a. Dressed, key beveled lumber minimum 1-1/2 inches wide of thickness required to bring face of ground even with finish material.
 - b. Remove temporary grounds when no longer required.
 3. Install roofing nailers as necessary for attachment of flashing, curbs, fascia, coping, and related accessories:
 - a. Match height of nailers to insulation.
 - b. Anchor nailers to resist force of 300 PLF unless required otherwise by FM Global or roofing manufacturer.
 - 1) Metal decking attachment:
 - a) Attach base nailer to metal roof deck using self-tapping stainless steel sheet metal screws (STSMS) with plate washers or with minimum 3/8 inches Type 304 stainless steel hex head bolts with nuts and washers.
 - b) Countersink heads of bolts flush with top of nailer.
 - 2) Concrete decking attachment:
 - a) Attach base nailer to concrete roof deck using minimum 3/8 inches stainless steel adhesive anchors with minimum 3 inches embedment.
 - b) Countersink heads of bolts flush with top of nailer.
 - 3) Provide size and spacing of anchorage as required to meet loading criteria specified.
 - a) Fasten blocking for perimeter flashing in accordance with ANSI/SPRI ES-1 and FM Global 1-49.
 - c. Provide 1/2 inches vent spaces between lengths of nailers.
 - d. Install nailers over vapor retarder.
- E. When wood has been exposed to moisture allow to completely dry out prior to covering with additional wood or another material.

- F. Correct or replace wood which shows bowing, warping or twisting to provide a straight, plumb and level substrate for applications of other materials.

END OF SECTION

SECTION 07 21 00
BUILDING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Rigid polystyrene board insulation.
 2. Sealant and mastic (for setting polystyrene and/or polyisocyanurate insulation board).
 3. Blanket or batt thermal insulation.
 4. Sound control insulation.
 5. Vapor retarder.
 6. Vapor retarder tape.

1.2 REFERENCES

- A. Reference Standards:
1. ASTM International (ASTM):
 - a. C272, Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions.
 - b. C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - c. C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - d. C578, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - e. C665, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - f. D1621, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - g. E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - h. E96, Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
 2. Underwriters Laboratories, Inc. (UL):
 - a. Building Materials Directory.

1.3 QUALITY ASSURANCE

- A. Field Mockups:
1. When mockup is acceptable to Contractor and Engineer, mockup shall serve as visual reference establishing standard for appearance and workmanship, for each type of building insulation Work required.
 2. Preserve and protect mockups until Engineer directs that associated mockup may be removed.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
1. Shop Drawings:
 - a. Schedule, in tabular or narrative format, indicating each Project-specific surface requiring building insulation Work, indicating for each type of insulation proposed, thickness and insulating value, proposed product and manufacturer, and other pertinent data.
 - b. Customized detail drawings (if any) for installing required building insulation materials.
 - c. Manufacturer's recommendations on sealants, tapes and mastics.
 2. Product Data:

- a. Submit insulation manufacturer's written information, including catalog excerpts, specifications, and indication of specific reference standards with which materials comply, for each item specified in this Section. Furnish such information for each thickness and type of item required.
 - b. Manufacturer's standard detail drawings for installing required building insulation materials.
 - c. Clearly mark on product data Submittals proposed items and features, and clearly indicate, via cross-outs or other method, items and features not proposed for the Work.
- B. Informational Submittals: Submit the following:
- 1. Supplier Instructions:
 - a. Instructions for handling, storing, and installing materials furnished under this Section.

1.5 FIELD CONDITIONS

- A. Ambient Conditions:
- 1. For the Work under this Section, design frost line is 2 feet below finished grade.

PART 2 - PRODUCTS

2.1 BUILDING INSULATION MATERIALS

- A. Building Insulation - General:
- 1. Description:
 - a. Provide all labor, materials, construction equipment and machinery, tools, services, and appurtenances necessary, required, or both, to furnish and install building insulation Work.
 - b. Locations of building insulation Work are shown and indicated in the Contract Documents.
 - 2. Foam plastic insulation installed in buildings and structures [that are subject to the applicable building code] shall comply with the Laws and Regulations, including applicable building code.
 - a. Surface burning characteristics: ASTM E84.
 - b. Flame spread index: Maximum 25.
 - c. Smoke developed: Maximum 450.
- B. Rigid Polystyrene Board Insulation:
- 1. Manufacturers: Subject to compliance with the Contract Documents: Provide required quantity of one of the following:
 - a. DiversiFoam Products.
 - b. DuPont.
 - c. Owens Corning.
 - d. Or equal.
 - 2. Material: Extruded, ASTM C578, Type IV.
 - a. Water vapor permeance: ASTM E96, 1.1 perm (1 perm = 1 grain of water vapor per hour per square foot per inch of mercury vapor pressure difference) maximum, per inch of insulation thickness.
 - b. Water absorption: ASTM C272, 0.3% maximum.
 - c. Thermal resistance: ASTM C518 at 75 degrees F mean temperature, five, per inch of insulation thickness.
 - 3. Provide insulation appropriate for intended use and service environment.
 - a. Perimeter Insulation:
 - 1) Similar to [Styrofoam Square Edge, by DuPont] [Styrofoam Highload 40 XPS, by DuPont].
 - 2) Compressive strength: ASTM D1621, 25 psi.
 - 3) Thickness:
 - a) Perimeter insulation: two inches.
 - 4) Edges: Square.

- b. Cavity insulation:
 - 1) Square Edge, by DuPont.
 - 2) Compressive strength: ASTM D1621, 15 psi.
 - 3) Thickness: two inches.
 - 4) Edges: Square.
 - C. Blanket or Batt Thermal Insulation:
 - 1. Manufacturers: Subject to compliance with the Contract Documents: Provide required quantity of one of the following:
 - a. Owens Corning.
 - b. USG Corporation.
 - c. CertainTeed.
 - d. Or equal.
 - 2. Materials: Glass or other inorganic fibers and resinous binders, formed into flexible blankets or semi-rigid sheets.
 - 3. Unfaced: ASTM C665, Type 1.
 - 4. Minimum thickness as shown or indicated on the Drawings.
 - D. Sound Control Insulation:
 - 1. Products and Manufacturers: Subject to compliance with the Contract Documents: Provide required quantity of one of the following:
 - a. Safe'n'Sound, by RockWool Group.
 - b. Thermafiber SAFB, by Owens Corning.
 - c. Or equal.
 - 2. Materials: Mineral wool batts:
 - a. ASTM C665, Type I.
 - b. Listed in UL Building Materials Directory, when used in fire rated construction.
 - 3. Density: Minimum 2.5 pounds per cubic foot.
 - 4. Sound reduction, in accordance with ASTM C423: Minimum noise reduction coefficient (NRC) for three-inch thick insulation material: 1.05.
 - 5. Thickness: As shown or indicated on the Drawings..
 - E. Vapor Retarder:
 - 1. Products and Manufacturers: Subject to compliance with the Contract Documents: Provide required quantity of one of the following:
 - a. Dura-Skrim Fire Retardant Series, by Raven Industries.
 - b. Griffolyn TX-1200FR, by Reef Industries.
 - c. Moistop Ultra 15, by Fortifiber Building Systems Group, by Henry Company.
 - d. Reinforced Foil Vapor Barrier, by Alumiseal.
 - e. Or equal.
 - 2. Materials: Fire rated, reinforced, three-ply, Class 1 material.
 - 3. Permeance rating: Not exceeding 0.035 perm (1 perm = 1 grain of water vapor per hour per square foot per inch of mercury vapor pressure difference) in accordance with ASTM E96.
 - F. Vapor Retarder Tape: As recommended by vapor retarder manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installing the Work constitutes Contractor's approval of underlying work, substrates, and field conditions prevailing at the time of the Work.

3.2 INSTALLATION

- A. Installation Requirements – General: Install products in accordance with manufacturer's instructions.
 - 1. Install building insulation Work in accordance with the Contract Documents, manufacturer's written instructions, applicable permits issued by authorities having

jurisdiction, and Laws and Regulations. Where such requirements conflict, obtain interpretation or clarification from Engineer prior to commencing the associated Work.

2. Provide insulation of full, required thickness over each surface requiring such insulation.
3. Install insulation to fit tightly around obstructions, filling voids.
4. Where other items, such as electrical junction boxes, switch boxes, electrical conduit, cabling, piping, or other items, are embedded in building or structure elements requiring insulation, cover the entirety of such items by providing insulation on side of building or structure element requiring insulation, and associated embedded items, as required. Providing insulation shall not impair or adversely affect functionality of such items, nor impair safety or appearance of associated building or structure.
5. Fit butted joints of batt or blanket insulation tightly together.
6. Provide single or double layer of insulation to provide required total thickness. When double layer of insulation is provided, stagger insulation joints by not less than one foot.
7. Do not install insulation that is broken, torn, or otherwise damaged.
8. Vapor-tightness:
 - a. Provide building insulation Work to provide vapor-tight system.
 - b. Seal or tape joints, penetrations, and other routes through which moisture or vapor may penetrate building insulation Work to provide complete vapor barrier.
 - c. Seal or tape to abutting materials to maintain vapor retarder integrity.
 - d. Vapor Retarder Tape:
 - 1) Provide manufacturer's recommended vapor retarder tape with faced batt insulation, as well as with separate vapor retarders.
 - 2) If vapor retarder tape fails to adhere to surface, provide sprayed adhesive, as recommended by tape manufacturer, to promote adhesion.
 - e. Sealant for Rigid Board Insulation:
 - 1) Provide manufacturer's recommended, solvent-free, sealant compatible with insulation board.
 - 2) Tape is unacceptable for rigid board insulation.

B. Rigid Board Polystyrene Insulation on Exterior Walls:

1. Install insulation on interior surfaces of exterior walls.
2. Install between wall furring strips. Cut to fit tightly to furring member.
3. Set solidly in mastic.
4. Prove tight joints.
5. Cut and fit insulation at corners, penetrations, connections, and similar types of construction and wall features.
6. Seal all joints with sealant applied continuously to edges of pieces before installation or apply sealant bead continuously to joint after installation.
7. Cover penetrations or connections, remaining exposed after insulation is in place. Seal penetrations or connections with expanding foam sealant for not less than six inches on each side.
8. If no covering is indicated on the Drawings, cover entire exposed surface with 0.5-inch thick gypsum board.
9. Support gypsum board at not less than two feet on centers.

C. Below-grade Perimeter Rigid Insulation:

1. Install insulation below grade on outside faces of foundation walls. Install in mastic with tight joints.
2. Where footers are below indicated, design frost line, extend insulation down to indicated design frost line. Where so indicated on the Drawings, extend beyond indicated design frost line.
3. Where footers are at indicated design frost line, extend insulation to top of footer or as otherwise shown or indicated on the Drawings.
4. Protect insulation from damage, displacement, or both, during backfilling and construction of floor slab.

D. Rigid Board Insulation in Cavity Walls:

1. When Work that will conceal insulation Work is required, installing such concealing Work prior to insulation is observed by Engineer [or Resident Project Representative] [or Owner's Site Representative] is unacceptable. Promptly remedy defective insulation Work before installing concealing Work.
 2. Set each piece of insulation flush with abutting insulation without ledges in surface of insulation.
 3. Install mastic on face of concrete or masonry back-up in accordance with mastic and insulation manufacturer's written instructions.
 4. Press courses of insulation between wall ties (horizontal reinforcing) with tightly-abutting edges in each direction.
 5. Place insulation firmly in mastic.
 6. Seal horizontal and vertical joints with sealant recommended by insulation manufacturer.
- E. Blanket or Batt Insulation using Separate Vapor Retarder Sheet in Exterior Stud Wall Systems:
1. Provide in-wall Work, including electrical junction boxes, electrical conduit, piping, and other in-wall Work prior to installing insulation and vapor retarder.
 2. Between studs, install insulation with friction-fit.
 3. Tightly butt together adjacent insulation.
 4. Install vapor retarder on "warm side" of exterior wall of building or structure. Completely seal each wall area to surrounding construction.
 5. Vapor Retarder:
 - a. In addition to requirements of this provision, vapor retarder requirements of this Article's "Installation Requirements – General" provision also apply
 - b. Install vapor retarder vertically.
 - c. Provide widest feasible vapor retarder sheet.
 - d. Provide in continuous sheets, from floor to structure above, without horizontal joints.
 - e. Fold flaps of vapor retarder over studs. Tape flaps together continuously.
 - f. Continuously tape bottom and top edges of vapor retarder to structure.
 - g. After installing electrical junction boxes, electrical conduit, piping, or other items within wall system, remedy tears or penetrations in vapor retarder with vapor retarder tape, prior to installing gypsum board.
- F. Blanket or Batt Insulation with Facing:
1. Location and Orientation:
 - a. Install insulation with its facing toward "winter warm side" of wall.
 - b. Install with facing flanges over edge of framing member.
 - c. Obstruct ventilation spaces is unacceptable.
 2. Fill miscellaneous voids, and locations shown or indicated on the Drawings.
 3. Tape joints and ruptures in vapor retarder.
 4. Provide vapor retarder tape for sealing insulation to adjacent Work thus providing continuous, vapor-tight installation.
 5. At Contractor's option, provide blanket or batt insulation without vapor retarder and provide separate vapor retarder as required.
- G. Sound Control Insulation:
1. Between studs, install insulation with friction-fit.
 2. Obstruct ventilation spaces is unacceptable.
 3. Fill miscellaneous voids, unless shown or indicated otherwise on the Drawings.
 4. After installing electrical junction boxes, electrical conduit, piping, or other items within wall system, reposition displaced insulation and fill voids as required.

3.3 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
1. Do not cover or conceal building insulation Work until such Work has been observed by Engineer or Owner's Site Representative, and deemed to comply with the Contract Documents, as well as Laws and Regulations. Such observation and indication of apparent compliance does not constitute Substantial Completion or acceptance of the Work.

B. Defective Work:

1. Replace, or repair in accordance with the Contract Documents, damaged insulation and vapor retarder. When Engineer is aware of such defective Work, Engineer will indicate to Contractor extent and nature of such defective Work. Remedy defective Work until compliance with the Contract Documents is achieved.

END OF SECTION

SECTION 07 26 00
UNDER SLAB VAPOR RETARDER

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Under slab vapor retarder.
- B. Related Specification Sections include but are not necessarily limited to:

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Concrete Institute (ACI):
 - a. 302.2R, Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
 - 2. ASTM International (ASTM):
 - a. E1643, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - b. E1745, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Product data sheet on vapor retarder sheet and vapor retarder tape.
 - c. All accessories proposed for use.
 - d. Manufacturer's installation instructions.
- B. Samples:
 - 1. Provide two, 6 inches x 6 inches samples of vapor retarder material taped together using the vapor retarder tape proposed.
 - 2. Provide two samples of all accessories proposed for use.
- C. Informational Submittals: Manufacturer's recommendation on vapor retarder tape.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Vapor retarder:
 - a. Fortifiber Building Systems Group, Inc. by Henry Company.
 - b. Layfield Group, Ltd.
 - c. ISI Building Products.
 - d. Raven Industries, Inc.
 - e. Reef Industries, Inc.
 - f. Stego Industries, LLC.
 - g. W.R. Meadows, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Vapor Retarder:
 - 1. ASTM E1745, Class A.

2. Thickness: Minimum 15 mil.
3. Water vapor permeance: 0.02 maximum.

2.3 ACCESSORIES

- A. Pipe Boots: Manufacturer's standard boot fabricated to maintain the integrity of the vapor retarder system.
- B. Vapor Retarder Tape: As recommended by vapor retarder manufacturers.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Base material over which vapor retarder is to be installed shall be level, compacted and free of debris, foreign objects or other deleterious materials.
- B. Surfaces at perimeter and penetrations of vapor barrier shall be clean, smooth and free of sharp objects, fins or projections.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions, ASTM E1643 and ACI 302.2R.
- B. Provide vapor retarder where indicated on the Drawings.
 1. Place continuous vapor retarder above granular fill subgrade material, unless noted otherwise.
- C. Lap minimum 6 inches and seal in accordance with ASTM E1643 and manufacturer's recommendations.
- D. Extend to extremities of area and seal to adjacent elements.
- E. Seal all penetrations: Provide pipe boot for all pipes or conduit penetrating the floor slab.

3.3 FIELD QUALITY CONTROL

- A. Ensure proper precautions are implemented to prevent damage to installed vapor retarder membrane prior to and during pouring of concrete floor slab.
- B. Inspect vapor retarder immediately prior to placement of concrete.
 1. Patch all punctures, tears, holes, etc.
 - a. Patch small punctures with vapor retarder tape as allowed by ASTM E1643 and manufacturer's recommendations.
 - b. Repair larger damage with additional layer of vapor retarder.
 - 1) Lap repairs minimum 6 inches beyond extent of damage in all directions.
 - 2) Seal perimeter of patch with vapor retarder tape or as recommended by manufacturer.

END OF SECTION

SECTION 08 11 00
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Metal doors and frames.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. ASTM International (ASTM):
 - a. A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 2. National Association of Architectural Metal Manufacturers (NAAMM):
 - a. Hollow Metal Manufacturers Association (HMMA).
 3. Steel Door Institute (SDI):
 - a. 117, Manufacturing Tolerances for Standard Steel Doors and Frames.
 - b. All SDI publications.
 4. Steel Door Institute/American National Standards Institute (SDI/ANSI):
 - a. A250.6, Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
 - b. A250.7, Nomenclature for Standard Steel Doors and Steel Frames.
 - c. A250.8, Specifications for Standard Steel Doors and Frames.
 - d. A250.10, Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
 - e. A250.11, Recommended Erection Instructions for Steel Frames.
- B. Qualifications: Manufacturer must be current member of SDI, and NAAMM (HMMA).
- C. Wipe coat galvanized steel is not acceptable as substitute for galvanizing finish specified.

1.3 DEFINITIONS

- A. As identified in SDI/ANSI A250.7.

1.4 SUBMITTALS

- A. Shop Drawings:
1. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 2. Schedule of doors and frames using same reference numbers as used on Drawings.
 3. SDI certification.
- B. Contract Closeout Information:
1. Operation and Maintenance Data:
 - a. See Specification Section 01 72 13 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store doors and frames in accordance with SDI/ANSI A250.11.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Metal doors and frames:
 - a. Ceco Door by ASSA ABLOY.
 - b. Steelcraft by Allegion PLC.
 - c. Curries by ASSA ABLOY.

2.2 MATERIALS

- A. Steel Sheet: Hot-dipped galvanized steel, ASTM A653, A60 coating.
- B. Frames: Hot-dipped galvanized steel, ASTM A653, A60 coating.
- C. Supports and Reinforcing: Hot-dipped galvanized steel, ASTM A653, A60 coating.
- D. Inserts, Bolts and Fasteners: Manufacturer's standard.
- E. Primer: Manufacturer's standard coating meeting SDI/ANSI A250.10.
- F. The Steel Door Institute does not recommend grouting of frames. Grouting of frames is NOT required for fire-rated frames. Frames in stud walls should not ever be grouted.
- G. Thermal Insulation: Polyurethane, CFC free.
- H. Sound Insulation: Fiberglass batt insulation or impregnated Kraft honeycomb.

2.3 ACCESSORIES

- A. Frame Anchors:
 - 1. Jamb anchors:
 - a. Masonry wire anchors: Minimum 0.1875 inches wire, galvanized.
 - b. Existing wall anchor: Minimum 18 GA, galvanized.
 - c. Stud partition and base anchors: Minimum 18 GA, galvanized.

2.4 FABRICATION

- A. General:
 - 1. SDI/ANSI A250.8.
 - 2. Fabricate rigid, neat in appearance and free from defects.
 - 3. Form to sizes and profiles indicated on Drawings.
 - a. Beveled edge.
 - 4. Fit and assemble in shop wherever practical.
 - 5. Mark work that cannot be fully assembled in shop to assure proper assembly at site.
 - 6. Continuously wire weld all joints, dress exposed joints smooth and flush.
 - 7. Fabricate doors and frames to tolerance requirements of SDI 117.
 - 8. Fit doors to SDI clearances.
 - 9. All doors shall be handed.
 - 10. Design and fabricate doors to requirements of the building code.
- B. Hollow Metal Doors:
 - 1. General:
 - a. 1-3/4 inches thick.
 - b. Fabricate with flush top caps.
 - 1) Thickness and material to match door face.
 - 2) Exterior doors: Seal weld top cap to door face and grind smooth and flush.
 - 3) Interior doors:
 - a) Attach top cap to door with concealed fasteners or by welding.
 - b) Factory seal if attached with fasteners.
 - c) No exposed fasteners will be accepted.

- c. Continuously wire weld all joints and dress, smooth and flush.
- 2. Exterior:
 - a. Doors 48 inches wide, or less: SDI/ANSI A250.8, Level 3, and physical performance level A, Model 2.
 - 1) Face sheet minimum thickness: 16 GA.
 - 2) Insulated: Minimum R10.
- 3. Interior:
 - a. Doors 48 inches wide, or less: SDI/ANSI A250.8, Level 2, and physical performance level "B", Model 2.
 - 1) Face sheet minimum thickness: 18 GA.
 - b. Sound insulated, minimum STC-35.
- C. Hollow Metal Frames:
 - 1. Door frames:
 - a. Provide 2 inches face at all heads, jambs and mullions for frames in stud walls.
 - b. Provide 4 inches face at head where noted on Drawings or required by wall construction.
 - c. 26 GA galvanized steel boxes welded to frame at back of all hardware cutouts.
 - d. Steel plate reinforcement welded to frame for hinge, strikes, closers and surface-mounted hardware reinforcing.
 - 1) All plate reinforcement shall meet size and thickness requirements of SDI/ANSI A250.8.
 - e. Split type frames not acceptable.
 - 1) All horizontal and vertical mullions and transom bars shall be welded to adjacent members.
 - f. Conceal all fasteners.
 - g. Frames shall be set up, all face joints continuously wire welded and dressed smooth.
 - h. Exterior (up to 4 feet wide): 16 GA.
 - i. Exterior (over 4 feet wide): 14 GA.
 - j. Interior: 16 GA.
 - k. Provide removable spreaders at bottom of frame.
- D. Prepare for finish hardware in accordance with hardware schedule, templates provided by hardware supplier, and SDI/ANSI A250.6.
 - 1. Locate finish hardware in accordance with SDI/ANSI A250.8.
 - 2. Prepare doors for swing direction indicated.
 - a. Preparing doors for non-handed hinges is not acceptable.
- E. After fabrication, clean off mill scale and foreign materials and prime with rust inhibiting primer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install doors and frames in accordance with SDI/ANSI A250.11, the building code and manufacturer's instructions.
- B. Plumb, align, and brace frames securely until permanently anchored.
 - 1. After completion of walls, remove temporary braces and spreaders.
 - 2. Anchor frames with minimum of three anchors per jamb.
 - a. Number and location of anchors shall be in accordance with SDI and frame manufacturer's recommendations.
- C. At new masonry or metal stud construction, place frames in conjunction with construction of walls or partitions.
 - 1. Masonry construction: Anchor frames using masonry wire anchors.
 - 2. Metal stud construction:

- a. Anchor frames using steel stud anchors.
 - b. Attach wall anchors with self-tapping screws.
- D. At concrete, precast concrete or existing masonry construction, place frames in rough opening using existing opening anchors.
- E. Use plastic plugs to keep silencer holes clear during construction.
- F. Immediately after erection, sand smooth rusted or damaged areas.
 - 1. Touch-up with rust-inhibiting primer.
- G. Install three silencers on strike jamb of single door frame and two on head of double door frame.
- H. Protect doors and frames during construction.

END OF SECTION

SECTION 32 92 00
SEEDING, SODDING AND LANDSCAPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Seeding, sodding and landscape planting:
 - a. Soil preparation.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Nursery and Landscape Association/American National Standards Institute (ANLA/ANSI):
 - a. Z60.1, American Standard for Nursery Stock.
 - 2. AOAC International (AOAC).
 - 3. ASTM International (ASTM):
 - a. D2397, Standard Specification for Cationic Emulsified Asphalt.
 - b. D2974 – Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils.
 - c. D5268, Standard Specification for Topsoil Used for Landscaping and Construction Purposes.
- B. Quality Control:
 - 1. Fertilizer:
 - a. If Engineer determines fertilizer requires sampling and testing to verify quality, testing will be done at Contractor's expense, in accordance with current methods of the AOAC.
 - b. Upon completion of Project, a final check of total quantities of fertilizer used will be made against total area seeded.
 - c. If minimum rates of application have not been met, Contractor will be required to distribute additional quantities to make up minimum application specified.

1.3 SUBMITTALS

- A. Shop Drawings:
 - 1. Layout drawings:
 - a. Scaled site plan (scale 1 inch = 20 feet or equal to scale of Project site plan Drawing) on reproducible Drawing to show:
 - 2. Product technical data including:
 - a. Acknowledgement that products submitted meet requirements of standards referenced.
 - b. Manufacturer's installation instructions.
 - c. Signed copies of vendor's statement for seed mixture required, stating botanical and common name, place of origin, strain, percentage of purity, percentage of germination, and amount of Pure Live Seed (PLS) per bag.
 - d. Type of herbicide to be used during first growing season to contain annual weeds and application rate.
 - 3. Certification that each container of seed delivered will be labeled in accordance with Federal and State Seed Laws and equals or exceeds Specification requirements.
- B. Informational Submittals:
 - 1. Copies of invoices for fertilizer used on Project showing grade furnished, along with certification of quality and warranty.

1.4 SEQUENCING AND SCHEDULING

- A. Installation Schedule:

1. Provide schedule showing when trees, shrubs, groundcovers and other plant materials are anticipated to be planted.
 2. Show schedule of when lawn type and other grass areas are anticipated to be planted.
 3. Indicate planting schedules in relation to schedule for irrigation system installation, finish grading and topsoiling.
 4. Indicate anticipated dates Engineer will be required to review installation for initial acceptance and final acceptance.
- B. Pre-installation Meeting:
1. Meet with Engineer and other parties as necessary to discuss schedule and methods, unless otherwise indicated by Engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND SUPPLIERS

- A. Subject to compliance with the Contract Documents, the manufacturers and suppliers listed in the applicable Articles below are acceptable.

2.2 MATERIALS

- A. Native Grass Seeding: Certified seed of locally adapted strains.
- B. Soil Amendments:
1. Unless otherwise required in this Section or elsewhere in the Contract Documents, soil amendments shall comply ASTM D5268.
- C. Asphalt Binder: Emulsified asphalt per State specifications.
- D. Water:
1. Water free from substances harmful to grass or sod growth.
 2. Provide water from source approved prior to use.

PART 3 - EXECUTION

3.1 SOIL PREPARATION

- A. General:
1. Limit preparation to areas which will be planted soon after.
 2. Provide facilities to protect and safeguard all persons on or about premises.
 3. Protect existing trees designated to remain.
 4. Verify location and existence of all underground utilities.
 - a. Take necessary precaution to protect existing utilities from damage due to construction activity.
 - b. Repair all damages to utility items at sole expense.
 5. Provide facilities such as protective fences and/or watchmen to protect work from vandalism.
 - a. Contractor to be responsible for vandalism until acceptance of work in whole or in part.
- B. Preparation for Lawn-Type Seeding, Sprigging, Plugging or Sodding:
1. Loosen surface to minimum depth of 4 inches.
 2. Remove stones over 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter.
 3. Prior to applying fertilizer, loosen areas to be seeded with a double disc or other suitable device if the soil has become hard or compacted.
 4. Correct any surface irregularities in order to prevent pocket or low areas which will allow water to stand.
 5. Distribute fertilizer uniformly over areas to be seeded:
 - a. For lawn-type seeding: 30 pounds per 1000 square feet.

- b. For pasture seeding: 200 pounds per acre.
- 6. Incorporate fertilizer into soil to a depth of at least 2 inches by disking, harrowing, or other approved methods.
- 7. Remove stones or other substances from surface which will interfere with turf development or subsequent mowing operations.
- 8. Grade lawn areas to a smooth, even surface with a loose, uniformly fine texture.
 - a. Roll and rake, remove ridges and fill depressions, as required to meet finish grades.
 - b. Limit fine grading to areas which can be planted soon after preparation.
- 9. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and before planting.

3.2 INSTALLATION

- A. Lawn-Type and Pasture Seeding:
 - 1. Do not use seed which is wet, moldy, or otherwise damaged.
 - 2. Perform seeding work from April 20 to May 15 for spring planting, and August 1 to September 15 for fall planting, unless otherwise approved by Engineer.
 - 3. Employ satisfactory methods of sowing using mechanical power-driven drills or seeders, or mechanical hand seeders, or other approved equipment.
 - 4. Distribute seed evenly over entire area at rate of application not less than 4 pounds (PLS) of seed per 1000 square feet, 50% sown in one direction, remainder at right angles to first sowing.
 - 5. Stop work when work extends beyond most favorable planting season for species designated, or when satisfactory results cannot be obtained because of drought, high winds excessive moisture, or other factors.
 - a. Resume work only when favorable conditions develop.
 - 6. Lightly rake seed into soil followed by light rolling or cultipacking.
 - 7. Immediately protect seeded areas against erosion by mulching.
 - a. Spread mulch in continuous blanket using 1-1/2 tons per acre to a depth of 4 or 5 straws.
 - 8. Protect seeded slopes against erosion with erosion netting or other methods approved by Engineer.
 - a. Protect seeded areas against traffic or other use by erecting barricades and placing warning signs.
 - 9. Immediately following spreading mulch, anchor mulch using a rolling coulter or a wheatland land packer having wheels with V-shaped edges to force mulch into soil surface, or apply evenly distributed emulsified asphalt at rate of 10-13 GAL/1000 square feet.
 - a. Type CSS-1 or Type CSS 1h asphalt emulsion in accordance with ASTM D2397 are acceptable.
 - b. If mulch and asphalt are applied in one treatment, use SS-1 emulsion with penetration test range between 150-200.
 - c. Use appropriate shields to protect adjacent site improvements.

3.3 PLANTING TREES, SHRUBS, AND GROUND COVERS

- A. Notification:
 - 1. Notify Engineer of source of plants and plant materials at least 30 days prior to planting to permit Engineer's inspection of source qualifications.
- B. Preparation:
 - 1. Handle plants so that roots or balls are adequately protected from breakage of balls, from sun or drying winds.
 - a. Ensure tops or roots of plants are not permitted to dry out.
 - 2. During transportation, protect materials from wind and sun to prevent tops and roots from drying out.
 - 3. Protect tops of plants from damage.
 - a. Plants with damaged tops will be rejected.

4. For purpose of inspection and planting identification, attach durable, legible labels to bundle or container of plant material delivered at the planting site.
 - a. State correct plant name and size of each plant in weather-resistant ink on labels.
 5. Do not prune trees and shrubs at nursery.
- C. Planting Season:
1. Plant deciduous shade trees and shrubs any time the ground is suitable between October 15 and June 1.
 2. Plant evergreen material between September 1 and June 1.
 3. Plant ground covers between March 15 to June 1.
- D. Planting Procedure:
1. Indicate locations of plants for approval by Engineer before excavating plant locations.
 2. In event underground construction, utilities, obstructions, or rock are encountered in excavation of plantings, secure alternate locations from Engineer.
 - a. Make said changes without additional compensation.
 - b. Where tree locations fall under existing overhead wires, or crowd existing trees, adjust locations as directed by Engineer.
 3. Excavate pits and beds as necessary and in accordance with ANLA/ANSI Z60.1.
 - a. Loosen bottom of pits prior to planting.
 - b. Excavation is unclassified, excavate all materials without additional cost.
 4. Tree and shrub pits to be circular in shape with vertical sides at least 1 foot greater in diameter than ball diameter.
 - a. Pit to be of sufficient depth to provide 6 inches of planting soil under ball when set to natural grade.
 5. Shrub and ground cover beds:
 - a. Plant shrubs used in mass plantings in individual holes of required size.
 - b. Strip all sod from among mass planting.
 - c. For ground cover beds, remove sod from within limits of bed.
 - d. Add soil amendments as specified and mix or rototill with existing topsoil to a depth of 6 inches.
 6. Set plants straight or plumb, in locations when indicated and at such level that after settlement they bear same relationship to finished grade as they did in their former setting.
 - a. Carefully tamp planting soil under and around base of balls to prevent voids.
 - b. Remove burlap, rope and wires from top of balls.
 - c. Do not remove burlap from sides and bottom of balls.
 7. Backfill plants with planting soil.
 - a. Tamp to 1/2 depth of pit and thoroughly water and puddle before bringing backfill to proper grade.
 - b. After planting has been completed, flood pit again so that backfill is thoroughly saturated and settled.
 8. After planting is complete, form a level saucer 3 inches high around each tree extending to limit of plant pit for watering purposes.
 9. Mulch plant pit after saucer has been shaped.
 - a. Mulch to limits of pit and uniformly over ground cover beds to a depth of 3 inches.
 - b. In mass plantings of shrubs, mulch entire area uniformly among shrubs to a depth of 3 inches.
 - c. If mulching is delayed and soil has dried out, water plants thoroughly before spreading mulch.
 10. Staking: Stake trees immediately after planting as detailed on Drawings or in accordance with Nursery Standards.
 11. Wrap deciduous trees 2 inches or more in caliper by neatly overlapping wrapping material between ground line and second branch.
 - a. Place ties at top and bottom of wrapping material and not more than 12 inches apart between top and bottom ties.
 12. Remove dead or damaged branches.

- a. Thin deciduous material to about two-thirds of initial branching.
 - b. Remove only dead or damaged branches from evergreens.
- 13. Water plants during planting operations.
 - a. Water each plant a minimum of once each week until final acceptance.
 - b. Apply sufficient water to moisten backfill about each plant so that moisture will extend into the surrounding soil.

3.4 MAINTENANCE AND REPLACEMENT

A. General:

- 1. Begin maintenance of planted areas immediately after each portion is planted and continue until final acceptance or for a specific time period as stated below, whichever is the longer.
- 2. Provide and maintain temporary piping, hoses, and watering equipment as required to convey water from water sources and to keep planted areas uniformly moist as required for proper growth.
- 3. Protection of new materials:
 - a. Provide barricades, coverings or other types of protection necessary to prevent damage to existing improvements indicated to remain.
 - b. Repair and pay for all damaged items.
- 4. Replace unacceptable materials with materials and methods identical to the original specifications unless otherwise approved by the Engineer.

B. Seeded or Sodded Lawns:

- 1. Maintain seeded lawns: 90 days, minimum, after installation and review of entire project area to be planted.
- 2. Maintenance period begins at completion of planting or installation of entire area to be seeded or sodded.
- 3. Engineer will review seeded or sodded lawn area after installation for initial acceptance.
- 4. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, and replanting as required to establish a smooth, uniform lawn, free of weeds and eroded or bare areas.
- 5. Lay out temporary lawn watering system and arrange watering schedule to avoid walking over muddy and newly seeded areas.
 - a. Use equipment and water to prevent puddling and water erosion and displacement of seed or mulch.
- 6. Mow lawns as soon as there is enough top growth to cut with mower set at recommended height for principal species planted.
 - a. Repeat mowing as required to maintain height.
 - b. Do not delay mowing until grass blades bend over and become matted.
 - c. Do not mow when grass is wet.
 - d. Time initial and subsequent mowings as required to maintain a height of 1-1/2 to 2 inches.
 - e. Do not mow lower than 1-1/2 inches.
- 7. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose.
 - a. Anchor as required to prevent displacement.
- 8. Unacceptable plantings are those areas that do not meet the quality of the specified material, produce the specified results, or were not installed to the specified methods.
- 9. Replant bare areas using same materials specified.
- 10. Engineer will review final acceptability of installed areas at end of maintenance period.
- 11. Maintain repaired areas until remainder of maintenance period or approved by Engineer, whichever is the longer period.

END OF SECTION

SECTION 33 05 31.16

PVC PRESSURE PIPE FOR WATER TRANSMISSION AND DISTRIBUTION (AWWA C900)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyvinyl chloride (PVC) pipe for water transmission and distribution, including potable water and water that will be treated to become potable, as well as other buried piping applications requiring AWWA C900 pipe, including:
 - a. AWWA C900 pipe.
 - b. Fittings.
 - c. Pipe joints, gaskets, proprietary restrained joints, installation of restrained joints, and appurtenances.
 - d. Couplings for buried AWWA C900 PVC piping.

B. Related Requirements include but are not necessarily limited to:

1. Section 33 14 11 - Water Utility Transmission and Distribution Piping.

1.2 REFERENCES

A. Abbreviations:

1. Indicated below are selected abbreviations used in this Section.
 - a. DIOD: Ductile iron outside diameter, which equals cast iron pipe outside diameter.
 - b. DR: Dimension ratio, which equals pipes outside diameter divided by pipes minimum wall thickness, where units are in inches.
 - c. HDB: Hydrostatic design basis in accordance with ASTM D2837.
 - d. IPS: Iron pipe size.
 - e. PC: Pressure class.
 - f. SDR: Standard dimension ratio. SDR differs from DR only in that SDR is used for a specific series of preferred numbers, known as Renard Numbers. DR is more general than SDR and refers to any ratio of outside diameter to wall thickness, not necessarily following Renard Numbers.

B. Reference Standards: Standards referenced in this section include, but are not necessarily limited to, the following:

1. American Society of Mechanical Engineers (ASME):
 - a. B1.1, Unified Inch Screw Threads (UN and UNR Thread Form).
2. ASTM International (ASTM):
 - a. A193, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
 - b. A194, Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both.
 - c. A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
 - d. B695, Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
 - e. D1505, Standard Test Method for Density of Plastics by the Density-Gradient Technique.
 - f. D1598, Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
 - g. D1599, Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings.

- h. D1784, Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
- i. D2290, Standard Test Method for Apparent Hoop Tensile Strength of Plastic or Reinforced Plastic Pipe.
- j. D2837, Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
- k. F477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- 3. American Water Works Association (AWWA).
 - a. C104 (ANSI A21.4) - Standard for Cement–Mortar Lining for Ductile-Iron Pipe and Fittings.
 - b. C105 (ANSI A21.5) - Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - c. C110 (ANSI A21.10) - Standard for Ductile-Iron and Gray-Iron Fittings.
 - d. C116 (ANSI A21.16) - Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
 - e. C153 (ANSI A21.53) - Standard for Ductile-Iron Compact Fittings.
 - f. C605 - Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
 - g. C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm).
 - h. C907, Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 In. Through 12 In. (100 mm Through 300 mm).
- 4. Plastic Pipe Institute (PPI):
 - a. TR-3, Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Hydrostatic Design Stresses (HDS), Pressure Design Basis (PDB), Strength Design Basis (SDB), Minimum Required Strength (MRS) Ratings, and Categorized Required Strength (CRS) for Thermoplastic Piping Materials or Pipe.
- 5. National Sanitation Foundation International (NSF):
 - a. 61, Drinking Water System Components – Health Effects.

1.3 QUALITY ASSURANCE

- A. Qualifications:
 - 1. PVC Pipe Manufacturer:
 - a. Obtain PVC pipe and PVC fittings (when PVC fittings are allowed by this Section) from a single manufacturer, unless otherwise acceptable to Engineer.
 - b. PVC pipe manufacturer shall be a business regularly engaged in manufacturing AWWA C900 PVC pipe of the sizes and pressure classes required for the Work.
 - c. Upon Engineer's request, submit documentation of manufacturer's prior experience furnishing PVC pipe of the sizes and pressure classes required, on not less than [five] other, completed projects, located in [the United States and Canada], within [five] years of the Effective Date of the Contract.
 - d. Manufacturer's Quality Assurance and Quality Control Programs:
 - 1) PVC pipe manufacturer shall have, and comply with, formal, written quality assurance (QA) and quality control (QC) programs as part of manufacturer's routine business.
 - 2) PVC pipe manufacturer shall obtain, record, and maintain, for not less than [five] years following manufacture, QA and QC records for the pipe and other items furnished for the Project. Promptly furnish copies of such records upon Engineer's or Owners request.

1.4 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Product Data:

- a. Manufacturer's published catalog information and specifications for each size and type of PVC piping required, including pipe, fittings, jointing materials, and appurtenances.
 - b. Clearly mark on product data Submittals proposed items and clearly indicate, via cross-outs or other method, items not proposed for the Work.
 - c. Clearly indicate in product data Submittal the reference standards with which pipe and appurtenances comply. Submittal shall include PVC materials certification required in this Section's "Source Quality Control" Article.
 - d. Where couplings are required, submit coupling manufacturer's catalog information and specifications for the specific couplings proposed.
- B. Informational Submittals; Submit the following:
- 1. Supplier Instructions:
 - a. Submit manufacturer's written instructions for handling, storing, and installing pipe, fittings, and other piping materials furnished.
 - 2. Source Quality Control Submittals:
 - a. Results of tests, inspections, and other quality control activities required by the Contract Documents and performed at the place of production or fabrication.
 - 3. Field Quality Control Submittals:
 - a. Results of tests, inspections, and other quality control activities required by the Contract Documents and performed at the Site.
 - 4. Qualifications Statements:
 - a. Piping materials manufacturer, when requested by Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Handling Requirements:
- 1. During handling and installation, avoid conditions where pipe bends excessively and avoid imparting kinks in the pipe.
 - 2. Handle piping materials in manner that does not scratch, score, or damage pipe, fittings, couplings, and appurtenances.
 - 3. During handling, do not drop pipe, fittings, or appurtenances.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

- A. Manufacturer's: Subject to compliance with the Contract Documents, products of the following manufacturers are acceptable:
- 1. PVC Pipe and Fittings:
 - a. Diamond Plastics.
 - b. JM Eagle.
 - c. Sanderson Pipe.
 - d. Westlake Pipe & Fittings.
 - e. Or equal.
 - 2. Ductile Iron Fittings:
 - a. American Ductile Iron Pipe.
 - b. McWane Ductile.
 - c. US Pipe.
 - d. Or equal.
 - 3. Polyethylene Encasement Tape:
 - a. Chasekote 750, by Chase.
 - b. Polyken 900, by Kendall.
 - c. Scotchrap 50, by 3M.
 - d. Polywrap, by V-Bio.
 - e. Or equal.
- B. Description:

1. Contractor shall provide all labor, materials, equipment, construction equipment and machinery, tools, services, and incidentals necessary, required, or both, for furnishing and installing AWWA C900 PVC piping, in accordance with the Contract Documents.
 2. Required locations of such piping are shown on the Drawings.
- C. Materials and Fabrication:
1. Materials - General
 2. Pipe:
 - a. Comply with AWWA C900.
 - b. PVC: Physical and chemical properties complying with ASTM D1784 cell class 12454.
 - c. Minimum HDB of 4,000 psig at 73.4 degrees F when tested in accordance with PPI TR-3.
 - d. Clearly mark pipe in accordance with AWWA C900.
 - e. Service Indication:
 - 1) Provide integral color or longitudinal color banding at 180 degrees apart.
 - a) Water: Blue.
 - b) Sewer: Green.
 - c) Reclaimed Water: Purple.
 - f. Pipe Joints:
 - 1) Push-on joints (gasketed bell and spigot) in accordance with ASTM D3139. Where AWWA C900 PVC pipe will connect to fittings with mechanical joints, provide adapters and restraints as necessary, required, or both for such connections.
 3. Gaskets:
 - a. Provide elastomeric gaskets complying with ASTM F477 for high-head applications.
 4. Ductile Iron Fittings:
 - a. Provide AWWA C110 fittings, unless otherwise approved by Engineer.
 - b. Unless expressly shown or required otherwise elsewhere in the Contract Documents, Contractor may provide AWWA C153 fittings, in lieu of AWWA C110 fittings. Contractor will be obligated to submit Change Proposal for appropriate reduction in the Contract Price when AWWA C153 fittings are approved in lieu of AWWA C110 fittings. AWWA C153 fittings are unacceptable for pump suction piping.
 - c. Joints of ductile iron fittings: Mechanical joints, complying with the reference standard, indicated above, for fittings.
 5. PVC Fittings:
 - a. PVC fittings are unacceptable.
 6. Nuts, Bolts, and Associated Hardware:
 - a. Buried:
 - 1) Tee-head bolts for mechanical joints: AWWA C111.
 - 2) Provide wax tape coatings in accordance with AWWA C217.
 - b. Heads and dimensions in accordance with ASME B1.1.
 - c. Threaded in accordance with ASME B1.1.
 - d. Ends shall extend 0.25-inch to 0.5-inch beyond nuts.

2.2 ACCESSORIES

- A. Products and Manufacturers: Subject to compliance with the Contract Documents, the following are acceptable:
1. Proprietary Joint Restraints (Push-on):
 - a. Series 1900 Split Serrated Restraint Harness by EBAA Iron, for 4-inch through 12-inch diameter.
 - b. Series 2800 Megalug Restraint Harness by EBAA Iron, for 14-inch through 54-inch diameter.
 - c. Series 1100C by Star Pipe Products, for 4-inch through 48-inch diameter.
 - d. Or equal.
 2. Proprietary Joint Restraints at Mechanical Joint Ductile Iron Fittings:

- a. Megalug, by EBAA Iron.
 - b. Stargrip, by Star Pipe Products.
 - c. Or equal
- 3. Compression Sleeve Couplings:
 - a. Style 253 (cast iron, 2"-16"), by Dresser Industries.
 - b. Or equal.
- 4. Reducing Couplings:
 - a. Style 62 (steel), by Dresser.
 - b. Or equal.
- 5. Restrained Compression Couplings:
 - a. Multi/Joint 3000 Plus (ductile iron), by GF Piping Systems (2-inch through 33-inch diameter). Acceptable as transition couplings.
 - b. Or equal.
- B. Materials:
 - 1. Lubricants for gaskets and jointing:
 - a. Provide lubricant that is non-toxic, does not support bacteria growth, does not degrade gasket or other adjacent materials, and imparts no taste or odor to contents of pipe [Gasket lubricant for piping that will convey potable water, or water that will be treated to become potable, shall be certified in accordance with NSF 61].
 - b. For mechanical joints, provide vegetable oil as lubricant for bolts.
 - 2. Polyethylene encasement for DI fittings: AWWA C105/A21.5.

2.3 SOURCE QUALITY CONTROL

- A. Factory Tests and Inspections:
 - 1. PVC materials delivered to pipe manufacturer:
 - a. Inspect for density in accordance with ASTM D1505, and carbon containment.
 - b. Submit certification from material Supplier that PVC materials comply with ASTM D1784 on a cell classification of 12454.
 - c. PVC pipe manufacturer shall verify certifications prior to incorporating PVC materials into pipe and fittings.
 - 2. Pipe manufacturing equipment:
 - a. Qualify each extrusion line and molding machine to produce pressure rated pipe and fittings by taking representative production samples and performing sustained pressure tests in accordance with ASTM D1598.
 - 3. PVC pipe and fittings:
 - a. Manufacturer shall inspect for diameter, wall thickness, length, straightness, out-of-roundness, concentricity, toe-in, inside and outside surface finish, markings, and end cut.
 - b. Tests to determine density, carbon content, and carbon dispersion.
 - c. Test representative samples, obtained in accordance with Section 5 of AWWA C900, of the pipe furnished to determine hoop tensile strength and ductility by either quick burst in accordance with ASTM D1599 or ring tensile in accordance with ASTM D2290.
 - 4. Factory inspection:
 - a. PVC pipe manufacturer's production and quality assurance facilities shall be open and available for inspection by Owner and Engineer.
 - 5. Submit results of required factory tests and inspections, and obtain Engineer's acceptance, prior to shipping PVC pipe and related items from the factory.
- B. Defective Work:
 - 1. Do not ship from the factory, or otherwise deliver to the Site, defective materials and items.
 - 2. Pipe, fittings, and other items delivered with scored, gouged, or otherwise marred surfaces are unacceptable.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installing the Work constitutes Contractor's approval of underlying work, subgrade, and field conditions prevailing at the time of the Work.

3.2 INSTALLATION

- A. Installation Requirements:
 - 1. Installation – General:
 - a. Provide PVC piping in accordance with the Contract Documents, Laws and Regulations, applicable permits issued by authorities having jurisdiction, and written instructions of material manufacturers. In the event of conflict between such requirements, obtain interpretation or clarification from Engineer before performing the Work.
 - b. Installation of AWWA C900 PVC piping shall be in accordance with AWWA C605, unless otherwise required by the Contract Documents.
 - c. Installation requirements applicable to piping required in this Section are set forth in Section 33 14 11 - Water Utility Transmission and Distribution Piping.
 - d. Wrap buried ductile iron fittings with polyethylene, in accordance with AWWA C105.
 - 2. Service Lateral Connections:
 - a. Provide service lateral connections to piping in accordance with Section 33 14 11 – Water Utility Transmission and Distribution Piping.

3.3 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 - 1. "Out-of-Roundness" Deflection Testing (Mandrel Testing):
 - a. Perform "out-of-roundness" testing for AWWA C900 PVC pipe.
 - 2. Hydrostatic Testing:
 - a. Hydrostatically test installed piping in accordance with Section 40 05 01 – Common Work Results for Process Piping, and AWWA C605.
 - b. Provide suitable end caps, plugs, or combination thereof on each end of piping segment being tested.
 - 3. Disinfection:
 - a. For piping and appurtenances that will convey potable water. Disinfect is required.
 - 4. Water Quality Sampling and Testing:
 - a. For piping and appurtenances that will convey potable water. Sampling and water quality testing shall be completed.
- B. Defective Work:
 - 1. Piping will be defective Work when piping is damaged or inconsistent with the Contract Documents, including failure to successfully pass required tests and inspections.
 - 2. Field repairs of AWWA C900 piping are unacceptable, except that portions of installed, damaged straight pipe may be cut, removed, and replaced with pipe complying with the Contract Documents.
 - 3. For mechanical joints, if joint leaks, loosen or remove fastening hardware, reset or replace gaskets, reinstall or retighten fastening hardware, and retest piping until acceptable results are achieved.

END OF SECTION

SECTION 33 11 13
POTABLE WATER SUPPLY WELLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Construction and development of two wells of a capacity of 25 GPM.
 2. Performing well plumbness and alignment tests.
 3. Test pumping of the well(s) including well recovery measurements.
 4. Well analysis and report.
 5. Disinfection of the water supply well.
 6. Temporary capping of the well.
 7. Abandonment of the well if so directed by the Owner and Engineer.
 8. Miscellaneous work specified or required.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. ASTM International (ASTM):
 - a. A53, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - b. C150, Standard Specification for Portland Cement.
 - c. C494, Standard Specification for Chemical Admixtures for Concrete.
 2. American Petroleum Institute (API):
 - a. 5L, Specification for Line Pipe
 3. American Welding Society (AWS):
 - a. Code for Arc and Gas Welding.
 4. American Water Works Association (AWWA):
 - a. A100, Standard for Water Wells.
 5. NSF International (NSF):
 - a. 61, Drinking Water System Components – Health Effects.
- B. Qualifications:
1. Have completed at least ten successful sand free municipal potable water supply wells with minimum depth and diameter of 300 feet and eight inches, respectively, within the last five years.
 2. Submit list of above wells with bid.
 - a. Include location, Owner, and brief description of wells.
 - b. Provide Owner contact name, telephone number, and email address for each referenced well.
 3. Submit identification and qualification of person(s) analyzing driller's log, whether on driller's staff, special consultant, or equipment manufacturer.
- C. Comply with all State of Missouri rules and regulations concerning municipal water supply wells.

1.3 SUBMITTALS

- A. Contract Closeout Information:
1. Operation and Maintenance Data:
 - a. See Specification Section 00 72 13 – General Conditions for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.
- B. Submit three copies of the following well data at appropriate times during construction.
1. Daily driller's report:

- a. During the drilling of the well, maintain a daily, detailed driller's report.
- b. Furnish a complete description of all formations encountered, number of feet drilled, number of HRS on the job, shutdown due to breakdown, quantity of material installed, and other pertinent data as may be requested by the Engineer.
- c. Values of tested drilling fluid properties.
2. Driller's log:
 - a. During the drilling of the well, prepare and keep and complete log setting forth the following:
 - 1) The reference point for all depth measurements.
 - 2) The depth at which each change of formation occurs.
 - 3) The depth at which the first water was encountered.
 - 4) The thickness of each stratum.
 - 5) The identification of the material of which each stratum is composed, such as:
 - a) Clay.
 - b) Sand or silt.
 - c) Sand and gravel: Indicate whether gravel is loose, tight, angular or smooth; color.
 - d) Cementation: Indicate whether grains (if present) have natural cementing materials between them, e.g., silica, calcite, etc.
 - e) Rock hardness.
 - 6) Samples of formations encountered (one set total).
 - 7) The depth interval from which each formation sample was taken.
 - 8) Sieve analysis of each significant water bearing formation.
 - 9) The depth to the static water level (SWL) and changes in SWL with well depth if measurable with drilling method used.
 - 10) Total depth of pilot borehole.
 - 11) Recommended gravel pack gradation and well screen type and opening size with calculations to support recommendations.
 - a) Submit name of gravel pack supplier.
 - 12) Any and all other pertinent information for a complete and accurate log.
 - 13) Depth or location of any lost drilling fluid, drilling materials or tools.
 - 14) The depth of the surface seal.
 - 15) The amount and type of cement (number of sacks) installed for the seal.
 - 16) The depth and description of the well casing.
 - 17) The description (to include type, length, diameter, slot sizes, material, and manufacturer) and location of well screens.
 - a) Include full manufacturer's recommendations for screen to casing attachment with specific connection or welding recommendations.
 - 18) Results of well alignment and plumbness test.
 - 19) The sealing off of water-bearing strata, if any, and the exact location thereof.
3. Geophysical Logs:
 - a. Product Data: Downhole geophysical logging equipment.
 - b. Geophysical logging data for each well.
 - 1) Provide three color field copies of each log shall to Engineer immediately after completion.
 - 2) Logs will become property of Engineer at time logging is completed.
 - c. In addition to the field copies, submit the following: Digital ASCII files of geophysical data on a CD or other method approved by Owner's Representative.
 - d. Should the geophysical logging subcontractor supply electronic log copies using that subcontractor's proprietary log viewer, that software shall also be provided in a format installable and useable by the Engineer and Owner..
 - e. Also require the geophysical logging subcontractor to conduct and submit post processing results of geophysical logging data, as required by the Specifications.
4. Well performance test results and recommendations:

- a. Keep accurate records of the pumping tests and furnish copies of all records upon completion of the tests.
- b. Include the date of the test, the clock time and elapsed pumping time of each measurement, the depth to water below the measuring point, the pumping rate at the time of measurement, and any pertinent comments on conditions that may affect the measurements.
- c. Provide description of methods and results of development of well.
- d. Provide copies of the results of the well performance tests as described in these specifications.
- e. Reduce data from the test pumping and recovery period by computation and plot to determine the degree of development, efficiency and coefficient of transmissibility of the well.
 - 1) Raw data and computed data are to be prepared in tabular form and provided in digital ASCII format.
 - 2) Graphical plots of time-drawdown and time-recovery shall be made on three-cycle semi-log charts.
 - 3) Describe methods used in computations and show example calculations.
- f. Provide results of the chemical water analysis.
- g. Include in this report recommendations for size and depth setting of pump, allowable daily pumping, long-term production capacity, and long-term drawdowns.
- h. Furnish report signed and sealed by a Professional Engineer registered in the State of Missouri.
 - 1) Submit copy to:
5. Drawings showing "As Constructed" conditions for completed well.
6. Completed State of Missouri Well Registration Form.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
1. Continuous slot wire wound screen:
 - a. Aqseptence Group (Johnson).
 - b. Weatherford (Houston Well Screen).
 - c. Alloy Machine Works.
 - d. Roscoe Moss Company.

2.2 MATERIALS

- A. Well Casing:
1. With the exception of the conductor casing, all casing material shall be new and unused.
 2. Plain ends of each joint shall be machine beveled perpendicular to the casing to ensure the straightness of each assembled section.
 3. Casing schedule:

Size (IN)	Material	OD (in)	ID (in)	Min. Thickness (in)	Min Weight (lbs/ft)
8	Steel	8.625	7.981	0.322	28.55

- B. Column Piping:
1. Column piping shall be HDPE PE4710 that meets the requirements of ASTM D3350 and be NSF-61 certified.
 2. HDPE column piping shall be DR 9 rated for working pressures up to 250 psi.
- C. Well Casing and Screen Centralizers:
1. Materials shall be physically and chemically compatible with the well casing or screen.

2. Centralizers shall be fitted on all casing using Halliburton or approved equal centralizers with “bow-string” straps.
3. Centralizers shall meet the requirements of API Specification 10D.
4. Centralizers shall be designed to provide adequate centering of well casing or screen of the diameter and to the depths required for this project.

2.3 CEMENT MIXES

A. Well Grout:

1. Concrete grout to be a mixture of cement, sand, and water in the proportion of 94 pounds of Portland cement (ASTM C150) and an equal volume of dry sand to not more than 6 GAL of potable quality water.
 - a. Where large volumes are required to fill annular openings, gravel not larger than 1/2 inches in size may be added in lieu of sand.
 - b. Do not use concrete grout below the water level in the well.

PART 3 - EXECUTION

3.1 PREPARATION

A. Pilot Borehole:

1. Drill two test holes at a location approved by the Owner.
 - a. Ingress and egress restrictions shall be established by the Owner.
2. Gather geological data by collecting samples, by performing geophysical logging, and by conducting sieve analysis on apparently productive aquifers for initial gravel pack gradations and screen size determinations.

B. Well Drilling Method:

1. Drill boreholes suitable for construction of a water supply well.
 - a. All boreholes shall be advanced so as to maintain the plumbness and alignment within allowable limits and provide a near gage pilot borehole to ensure the quality of the borehole geophysical logs.
2. Drilling fluid:
 - a. Take all necessary measures to protect water bearing formations from contamination and ensure that the drilling method used will not permanently plug the water bearing formations with drilling fluid.
 - b. The Contractor may utilize a drilling fluid comprised of either a polymer-based “mud” or a bentonite “gel”-based mud. Use of a bentonite viscosifier only, meeting the requirements of API Standard 13A, will not be permitted.
 - c. All drilling fluid components and additives shall be NSF-61 approved.
 - d. The use of salt or brine as a method of increasing the mud weight during drilling will not be permitted during the construction of the well. Any materials proposed for controlling artesian flow must be reviewed and approved by the Engineer prior to use.
 - e. Provide and operate portable laboratory equipment for monitoring basic drilling fluid properties to include density, viscosity, pH, and filtrate rate.
 - f. Use clean water, free of organic material, for drilling fluid unless otherwise approved by Engineer.
3. Sanitary protection of well:
 - a. At all times during the progress of the work, use reasonable precautions to prevent either tampering with the well or the entrance of foreign material into it.
 - 1) Keep well drilling equipment and tools clean.
 - 2) Cap conductor casing with a watertight welded or threaded cap or equipped with some other type of “vandal proof” cover when Contractor is off site.
 - b. Upon completion of well, install a suitable threaded, flanged, or welded cap or compression seal satisfying applicable state or local regulations or recommendations.

- c. Extend watertight casing of well to not less than 12 inches above the pump house floor or final ground level elevation, or to level shown on Drawings.
- d. Seal or screen any equipment which will permit direct access to the well.
 - 1) Meet the above height requirements to prevent entrance of foreign matter or contaminants.
- e. Slope ground immediately surrounding the top of the well casing away from well.

3.2 INSTALLATION

A. Well Casing:

- 1. Provide casing joints which are threaded and coupled watertight joints or welded conforming to the standards of the AWS.
- 2. The well casing assembly shall be suspended by the drilling rig and not permitted to rest on the bottom of the borehole.

B. Well Screen:

- 1. In no instance, drive or force into position.
- 2. The well screen assembly shall be suspended by the drilling rig and not permitted to rest on the bottom of the borehole.
- 3. Join screen sections for a single interval by threaded and coupled joints, or electric arc or acetylene welding.
 - a. Ensure joint(s) are straight, sandtight, and retain 100% of the screen strength.
- 4. Provide blank spacers for multiple interval screen of the same material as the screen.
 - a. Join to screen by threaded and coupled joints, or electric arc or acetylene welding.
 - b. The resulting joints must be straight, sandtight, and retain 100% of the screen strength.
- 5. To seal bottom of the deepest screen provide a plate or end cap of same material as screen.

C. Centralizers:

- 1. Extend out a minimum of 2 inches from casing or screen.
- 2. Place at 60 feet intervals starting 5 feet from the bottom of the string and extending to ground surface.
- 3. Place at least four equally spaced at each interval in such a manner that interference with gravel pack placement is minimized.
- 4. Fit on steel casing with straps at 0 degrees, 90 degrees, 180 degrees, and 270 degrees around casing at each position.

D. Gravel Pack:

- 1. Install gravel pack to depth shown on Drawings or as approved by the Engineer.
 - a. Protect gravel pack from contamination during delivery and storage.
 - b. Do not install any gravel pack contaminated with foreign substances.
- 2. Place gravel pack with tremie pipe positioned no more than 10 feet above the current gravel level. Gravel pack placement shall be in one continuous operation.
- 3. Closely control placement of gravel pack to protect against any segregation and bridging of gravel pack material.
- 4. Disinfect gravel pack as it is placed.
 - a. Use 1 pound of 70% calcium hypochlorite granules or powder per cubic yard of gravel pack.

E. Well Grout:

- 1. Grout annular space between well casing and drill hole to seal well against infiltration of contaminated water.
- 2. Ensure that annular space is free from obstructions before placing grout.
- 3. Place grout uniformly into annular space.
 - a. Use Positive Displacement Method (Interior or Exterior) in accordance with AWWA A100, Appendix C. Placement through a float shoe is also acceptable.
 - b. Ensure that no voids are formed in grout seal.
 - c. Place grout in a continuous operation to land surface.
- 4. Install grout in well from top of gravel pack to ground surface.

5. If directed, pressure test grout seal in presence of the Owner.
 - a. No work in the well will be permitted for 72 hours after grouting.
 - b. Ensure that all grout is placed before occurrence of the initial set.
- F. Protection of Quality of Water:
 1. Take necessary precautions to prevent contamination of the well and the aquifer from which the well is to draw its supply.
 2. In the event the well becomes contaminated due to the neglect of the Contractor, the Contractor, at his own expense, will perform such work as may be necessary to eliminate the contamination.

3.3 FIELD QUALITY CONTROL

- A. Plumbness and Alignment Testing:
 1. Furnish labor, tools and equipment and perform the test or tests.
 2. Use mechanical drift indicator to measure borehole deflection during drilling.
 - a. Provide Engineer results of calibration test of mechanical drift indicator tool showing tool is operating properly and accurately.
 - b. Calibration test shall be performed by tool manufacturer prior to use of tool on Project.
 - c. Deflection:
 - 1) The drift from vertical shall be not more than 0.5 degree between any two consecutive surveys, and not more than one degree over the entire well length.
 3. Correct the plumbness and alignment of the well at Contractor's expense.
 4. Make records of deflection readings and all other pertinent information a part of the permanent well log and record.
 5. Should the Contractor fail to correct the faulty alignment and plumbness, the Owner may refuse to accept the well.
- B. Well Development:
 1. Furnish necessary pumps, compressors, plungers, bailers, or other needed equipment and develop well by such approved methods as necessary to give the maximum yield of water per foot of drawdown and limit sand content as indicated herein.
- C. Well Performance Tests:
 1. Pumping test method:
 - a. Furnish, install and remove, when complete, the necessary measuring instruments and pumping equipment capable of pumping to the required point of discharge a minimum 25 GPM.
 - b. Furnish pumping unit complete with an ample power source, controls and appurtenances capable of being operated without interruption for a period of two hours.
 - c. Failure of pump operation for a period greater than 1% of the elapsed pumping time shall require suspension of the test until the water level in the pumped well has recovered to its original level.
 - 1) Recovery is considered "complete" after the well has been allowed to rest for a period at least equal to the elapsed pumping time of the aborted test except that if any three successive water level measurements spaced at least 20 minutes apart show no further rise in the water level in the pumped well, the test may be resumed immediately.
 - a) The Engineer or Owner's Representative shall be the sole judge as to whether this latter condition exists.
 - d. After completing the final test, remove by bailing, sand pumping or other methods, any sediment, stones or other foreign material that may have accumulated in the well.
 - 1) Time stated for the duration of the final test is a minimum only and the Engineer reserves the right to request the Contractor to extend such period of test, or to make additional tests.
- D. Well Disinfection:
 1. After well is completed, disinfect well and pump with chlorine solution.

- a. Thoroughly clean well of all foreign substances, oil, grease, joint dope, and scum, including tools, timbers, rope, debris, cement, prior to disinfection.
 - b. Utilize chemical cleaners if necessary.
 2. Disinfect well in accordance with AWWA A100 and State of Missouri requirements.
 3. Furnish chlorine solution for disinfecting the well of such volume and strength that a minimum residual concentration of 50 PPM of chlorine is obtained in all parts of the well for a minimum contact period of 2 hours.
- E. Water Quality Analysis:
1. Before disinfecting the well, obtain water samples for chemical analysis and submit to the State of Missouri for testing.
 2. After disinfecting and flushing well, obtain a water sample for bacterial testing and submit to the State of Missouri for testing.
 3. If samples do not meet requirements, or coliform organisms are present, redisinfect well until an acceptable test report is obtained.

END OF SECTION

SECTION 33 14 11
WATER UTILITY TRANSMISSION AND DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. General provisions applicable to all water transmission and distribution piping, valves and hydrants.
 2. Appurtenant Work required for buried piping used for water transmission and distribution, including:
 - a. Water service laterals, two-inch diameter and smaller, including connections to waterlines, corporation stops, piping, curb stops, and appurtenances.
 - b. Tapping sleeves and valves, three-inch diameter and larger.
 - c. Blow-off assemblies.
- B. Related Requirements: Include, but are not necessarily limited to:
1. Section 40 05 52 - Miscellaneous Valves.
 2. Section 40 05 61 - Gate Valves.

1.2 PRICE AND PAYMENT PROCEDURES

- A. Unit Prices
1. The following are Unit Price Work:
 - a. Water service laterals, two-inch diameter and smaller including connections to water transmission and distribution piping, corporation stops, water service lateral piping, curb stops and boxes, and appurtenances.
 - b. Tapping sleeves and valves, three-inch diameter and larger.
 - c. Blow-off assemblies.

1.3 REFERENCES

- A. Terminology:
1. Terminology indicated below are not defined terms and are not indicated with initial capital letters, but when used in this section have the meaning indicated below:
 - a. “Blow-off assembly” means assemblies, including valves, piping, and appurtenances used for flushing out waterlines and for draining and initial filling of waterlines. Blow-off assemblies may be required at low points, dead-ends, and other locations where shown or indicated in the Contract Documents. Blow-off assemblies are in addition to other types of hydrants.
 - b. “Service lateral” means piping and appurtenances conveying potable water between water distribution piping and a building or structure to which potable water will be supplied. In this Section, “service lateral” refers only to piping two-inch diameter and smaller. Service laterals include a connection to the water distribution piping, corporation stop, buried service lateral piping, a curb stop and box, and other appurtenances. In this Section, the terms “service lateral” and “water service lateral” have the same meaning.
 - c. “Water transmission and distribution piping” means the principal piping conveying potable water under pressure. Transmission piping generally refers to larger-diameter piping intended to convey greater quantities of water over distance, whereas distribution piping generally refers to piping delivering water to service laterals. However, service laterals and branch connections may also be connected to transmission piping. In this Section, the terms “water transmission and distribution piping”, “waterline”, “water main”, and, unless obviously intended otherwise, “pipe”, and derivative terms, have the same meaning.

- B. Reference Standards: Standards referenced in this section include, but are not necessarily limited to, the following:
1. American Association of State Highway and Transportation Officials (AASHTO):
 - a. Load and Resistance Factor Design (LRFD) Bridge Design Specifications.
 2. American Water Works Association (AWWA):
 - a. C105, Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - b. C223, Fabricated-Steel and Stainless-Steel Tapping Sleeves.
 - c. C600, Installation of Ductile-Iron Mains and Their Appurtenances.
 - d. C604, Installation of Buried Steel Water Pipe - 4 In. (100 mm) and Larger.
 - e. C605, Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
 - f. C800, Underground Service Line Valves and Fittings.
 - g. C810, Replacement and Flushing of Lead Service Lines.
 - h. Manual M9, Concrete Pressure Pipe.
 - i. Manual M55, PE Pipe, Design and Installation.
 3. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry:
 - a. SP-60, Connecting Flange Joints between Tapping Sleeves and Tapping Valves.
 - b. SP-111, Gray-Iron and Ductile-Iron Tapping Sleeves.
 4. National Sanitation Foundation International (NSF):
 - a. 61, Drinking Water System Components – Health Effects.
 5. Plastics Pipe Institute (PPI):
 - a. Polyethylene Piping Systems Field Manual for Municipal Water Applications.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Drinking water utility owner (when other than the Owner):
 - a. Coordinate with water utility owner affected by the Work and obtain from such entity requirements for connecting to existing waterlines, when such connections are part of the Work.
 - b. Obtain and pay for work permits, street opening permits, and other permits required by water utility owner and owners of affected streets, highways, and other rights of way.
 - c. Give written notices required by water utility owner and owners of streets, highways, and other rights of way.
 2. Notice to Emergency Services:
 - a. Give required advance, oral and written notices to fire departments, police departments having jurisdiction, ambulance services, and other emergency services as applicable, of proposed construction operations that may impact or affect emergency services' ability to perform their respective functions.
 - b. Give such notices as indicated immediately below for notice to affected water utility customers.
 3. Notice to affected water utility customers:
 - a. Give reasonable, advance written notice to owners and occupants of properties directly affected by water service lateral Work, regardless of size of water service piping.
 - b. Give such notice not less than five days prior to when such property will or may be affected by water service lateral Work (regardless of size of water service piping) and again not less than 24 hours prior to such property being affected by the Work.
 - c. Such notices to properties shall clearly indicate intended dates the properties water service will be affected and scheduled end-date of such activity, and a brief summary of the ways the property will be affected during the Project's construction. Provide notices on Contractor's letterhead and indicate the Project name, Owner, Owner's project or contract number (if any), and Contractor's contact person with telephone number and office hours.
 - d. Promptly furnish copies of such notices, as Submittal, upon request of Owner, Engineer, or other authority having jurisdiction.

- B. Sequencing and Scheduling:

1. Clearly indicate on the Progress Schedule planned dates for performing service lateral Work (regardless of size of piping). Indicate on the Progress Schedule separate activity for each street block where service laterals (regardless of size of piping) are required. When length of block exceeds 0.25-mile, provide separate activity in the Progress Schedule for each 0.25-mile segment of waterline where service lateral Work (regardless of size of piping) is required.
2. Sequencing requirements for testing, disinfecting, and connecting new service laterals (regardless of size of piping) to waterlines are in this Section's "Installation" Article.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer of Service Saddles, Corporation Stops, Service Lateral Piping, Curb Stops, and Tapping Sleeves and Valves:
 - a. Obtain service saddles from a single service saddle manufacturer unless otherwise acceptable to Engineer. Such manufacturer shall be a business regularly engaged in manufacturing service saddles of the size, material, and pressure capacity required. Upon request, furnish Submittal documenting manufacturer's record of furnishing required service saddles, in quantities similar to those required for the Work, for not less than five projects during the five year period immediately prior to the Effective Date of the Contract.
 - b. Obtain corporation stops from a single corporation stop manufacturer unless otherwise acceptable to Engineer. Such manufacturer shall be a business regularly engaged in manufacturing corporation stops of the size, material, and pressure capacity required. Upon request, furnish Submittal documenting manufacturer's record of furnishing required corporation stops, in quantities similar to those required for the Work, for not less than five projects during the five year period immediately prior to the Effective Date of the Contract.
 - c. Obtain service lateral piping of each type proposed from a single pipe manufacturer unless otherwise acceptable to Engineer. Such manufacturer shall be a business regularly engaged in manufacturing service lateral pipe of the size, material, and pressure capacity required. Upon request, furnish Submittal documenting manufacturer's record of furnishing required materials, in quantities similar to those required for the Work, for not less than [five] projects during the five year period immediately prior to the Effective Date of the Contract.
 - d. Obtain curb stops from a single curb stop manufacturer unless otherwise acceptable to Engineer. Such manufacturer shall be a business regularly engaged in manufacturing curb stops of the size, material, and pressure capacity required. Upon request, furnish Submittal documenting manufacturer's record of furnishing required curb stops, in quantities similar to those required for the Work, for not less than five projects during the five year period immediately prior to the Effective Date of the Contract.
 - e. Obtain tapping sleeves and valves (TS&V) from a single TS&V manufacturer unless otherwise acceptable to Engineer. Such manufacturer shall be a business regularly engaged in manufacturing TS&Vs of the size, material, and type required. Upon request, furnish Submittal documenting manufacturer's record of furnishing required TS&Vs, in quantities similar to those required for the Work, for not less than five projects during the five year period immediately prior to the Effective Date of the Contract. Tapping sleeves and associated valves may be obtained from separate manufacturers.
2. Installer of Water Transmission and Distribution Piping:
 - a. Installer of water transmission and distribution piping shall be entity possessing not less than five years of similar, relevant experience to the water transmission and distribution piping Work required under this Section and shall have completed not less than five projects installing substantively similar piping materials (including lining) of similar size to that required for the Work. Installer shall be able to document having installed

- not less than 5,000 linear feet combined total of such projects, excluding piping six-inch diameter and smaller.
- b. Foreman for installer of water transmission and distribution piping shall possess not less than five years of similar, relevant experience serving as foreman or superintendent for installing water transmission and distribution piping and shall have served as foreman for not less than five projects installing substantively similar piping materials (including lining) of similar size to that required for the Work. Foreman for installer shall be able to document having served as foreman or superintendent for installing not less than 5,000 linear feet combined total of such projects, excluding piping six-inch diameter and smaller.
- c. Submit documentation of compliance with qualifications requirements of this provision. For each project, indicate water utility owner (including organization name, current contact person knowledgeable concerning installers work, city and state, telephone number, and email address), project designation, and narrative summary of quantities of water transmission and distribution piping work performed, including indication of sizes, pipe materials, and pipe lining (if any), together with other pertinent information.
- 3. Installer of taps in existing water transmission and distribution piping:
 - a. Installer of taps in existing water transmission and distribution piping, provided by drilling or otherwise penetrating through wall of existing piping, shall be entity possessing not less than five years of similar, relevant experience to the tapping Work required under this Section, and shall have completed not less than 50 water service laterals tapped into existing water transmission or distribution piping similar in size, pipe material, pipe wall thickness, and lining material during the past five.
 - b. Submit documentation of compliance with qualifications requirements of this provision. For each project, indicate water utility owner (including organization name, current contact person knowledgeable concerning installers work, city and state, telephone number, and email address), project designation, and narrative summary of quantities of relevant tapping work performed, including indication of sizes, pipe materials, and pipe lining (if any), together with other pertinent information.

1.6 SUBMITTALS

- A. Action Submittals: Submit the following:
 - 1. Shop Drawings:
 - a. Submit schedule (in tabular or narrative format) of required service laterals (regardless of pipe size), indicating property locations, service lateral piping material and diameter, bid/pay item under which compensation will be requested, and other pertinent information.
 - 2. Product Data:
 - a. Submit manufacturer's published information, including catalogs, specifications, and indication of specific reference standards with which materials comply, for each item specified in this Section, unless such information is furnished as part of a Submittal under another Specifications section. Furnish such information for each size and type of item required.
 - b. Clearly mark on product data Submittals proposed items and clearly indicate, via cross-outs or other method, items not proposed for the Work.
- B. Informational Submittals: Submit the following:
 - 1. Manufacturer Instructions:
 - a. Instructions for handling, storing, installing, and startup of items furnished under this Section.
 - b. Instructions of pipe manufacturer for tapping water transmission and distribution piping.
 - c. Instructions of manufacturer of equipment, machinery, and tools used for tapping pipe.
 - 2. Field Quality Control Submittals:

- a. Written results of field tests and inspections required under this Section, including clear indication whether such results comply with criteria for acceptance indicated in the Contract Documents.
- 3. Qualifications:
 - a. Manufacturers, when requested by Engineer.
 - b. Installer of water transmission and distribution piping, including entity and foreman.
 - c. Installer of taps in existing water transmission and distribution piping, including entity and foreman.
- C. Closeout Submittals: Submit the following:
 - 1. Operation and Maintenance Data:
 - a. Submit, for operable items such as valves, where operation and maintenance data is not otherwise furnished under other Specifications sections.
 - 2. Record Documentation:
 - a. Clearly and accurately indicate location of each service lateral, blow-off assembly, and appurtenances, as applicable, on record drawings.
 - b. Furnish record drawing details of individual service laterals provided when service lateral installation involved unique conditions, such as adjacent Underground Facilities, and for service laterals two-inch diameter and larger.

PART 2 - PRODUCTS

2.1 WATER TRANSMISSION AND DISTRIBUTION SYSTEMS

- A. Description:
 - 1. Provide all materials, equipment, labor, construction equipment and machinery, tools, services, and incidentals necessary, required, or both, to furnish and install water transmission and distribution systems in accordance with the contract documents.
 - 2. Specifications for such Work are in this Section and other sections of the Contract Documents.
 - 3. Required water transmission and distribution Work is shown on the Drawings.
- B. Materials and Equipment:
 - 1. Materials and equipment furnished under this Section shall be certified in accordance with NSF 61.
 - 2. Wetted surfaces of piping, including fittings, valves, and similar items, shall contain not more than 0.25 percent lead by average weight.
 - 3. The following are indicated in other Specifications:
 - a. Water Transmission and Distribution Piping (other than service laterals): Specifications on waterline piping in Division 33 – Utilities.
 - b. Thrust Restraint for Water Transmission and Distribution Piping (other than service laterals): Specifications on waterline piping in Division 33 - Utilities (regarding restrained gaskets and proprietary joint restraint systems).
 - c. Inline Valves (unless otherwise specified in this Section): Specifications for valves in Division 40 - Process Interconnections.
 - 4. The types of Work expressly indicated in this Section are set forth in Paragraph 1.1.A of this Section.

2.2 SERVICE LATERALS

- A. Manufacturers
 - 1. Saddles: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. A.Y. McDonald Mfg
 - b. Ford Meter Box.
 - c. Mueller.
 - d. Robar.
 - e. Romac.

- f. Smith-Blair.
 - g. Or equal.
 - 2. Corporation Stops: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. A.Y. McDonald Mfg.
 - b. Ford Meter Box.
 - c. Mueller.
 - d. Cambridge Brass.
 - e. Or equal.
 - 3. Service Fittings: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. Ford Meter Box.
 - b. Mueller.
 - c. Cambridge Brass.
 - d. Or equal.
 - 4. Curb Stops and Boxes: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. A.Y. McDonald Mfg
 - b. Ford Meter Box.
 - c. Mueller.
 - d. Cambridge Brass.
 - e. Or equal.
- B. Description:
- 1. Provide materials, equipment, services, and all other Work necessary, required, or both, to furnish and install water service laterals.
 - 2. Unless otherwise shown or indicated, or directed by Engineer, each water service lateral provided under this Article shall include [service saddle,] corporation stop, service fittings, service lateral piping, and curb stop and box.
 - 3. For each water service connection three-inch diameter and larger, provide tapping sleeve and valve rather than water service lateral as required in this Article.
 - 4. Quantity of Required Service Laterals:
 - a. In general, locations of required service laterals to individual residences, businesses, buildings, and structures, are not shown. Provide water service lateral to each residence, business, building, structure, and property, regardless whether such property is occupied by existing residence, business, building, or structure.
 - b. Unless shown or indicated otherwise in the Contract Documents, service laterals shall be nominal 0.75-inch diameter.
 - c. For multi-residence buildings where service laterals will be connected directly to public waterline, provide one service lateral for each residence therein when such building has four or fewer residential units, unless otherwise shown on the Drawings. When required size and location of service lateral for multi-residence building is greater in number than indicated in this paragraph, is not shown or indicated on the Drawings, provide one 2-inch diameter service lateral for such building, at location directed at the Site by Engineer, in consultation with owner of such property.
 - d. For buildings with multiple business or institutional occupants, where service laterals will be connected directly to public waterline, provide one service lateral for each business or institutional occupant therein when such building has 10 or fewer business or institutional occupants, unless otherwise shown on the Drawings. When required size and location of service lateral for building with business or institutional occupants greater in number than indicated in this paragraph, is not shown or indicated on the Drawings, provide one 3-inch diameter service lateral for such building, at location directed at the Site by Engineer, in consultation with owner of such property.
 - e. When size and location of service laterals for industrial, office, and other types of buildings, structures, or properties is not shown or indicated on the Drawings, obtain

interpretation or clarification from Engineer before proceeding with associated service laterals Work.

- f. When service lateral is provided for vacant property, size of service lateral will be based on property's existing zoning. Provide service laterals at locations directed at the Site by Engineer, in consultation with owner of such property (when reasonably available).

C. Performance Criteria:

1. Pressure Classification:

- a. Water service lateral components shall be appropriate for working pressure of 150 psig at 100 degrees F, unless shown or indicated otherwise in the Contract Documents.

D. Materials and Fabrication:

1. Materials and Fabrication – General:

- a. Provide service laterals two-inch diameter and smaller, in accordance with AWWA C800.
- b. Materials of service lateral components shall minimize corrosion resulting from galvanic action.
- c. Threaded connections, where provided: NPT.

2. Service Saddles:

- 1) Provide service saddles with bodies with threaded outlets, seals, and suitable means for attachment to water distribution pipe.
- 2) Bodies shall conform to outside configuration of water distribution pipe.
- 3) Provide drip-tight connection when used as service connection to water distribution pipe.
- b. Flow passage through service saddle outlet shall be of sufficient size to accommodate drilling or tapping equipment used to provide water service lateral of nominal diameter required.
- c. Service saddle dimensions and size restrictions shall be in accordance with AWWA C800.
- d. Appropriate for material and size of water distribution pipe on which service saddle will be installed and in accordance with service saddle manufacturer's written instructions for associated water distribution pipe.
- e. Saddle Attachment to Host Pipe:
 - 1) Type:
 - a) Single strap extending around entire circumference of host pipe.
 - 2) Materials:
 - a) Strap: Bronze with manufacturer's standard fastening hardware.
 - b) U-bolt: Bronze with manufacturer's standard fastening hardware.
- f. Tapping Boss:
 - 1) Materials:
 - a) Brass.
 - b) Ductile iron.
 - 2) O-ring gasket, service saddle manufacturers standard material.
 - 3) Service saddle manufacturers standard fastening hardware and appurtenant materials.

3. Corporation Stops:

- a. Watertight under operating pressure equal to required pressure classification when fully closed.
- b. Size: Sufficient to accommodate drilling or tapping water distribution piping to provide service lateral nominal diameter not less than that required by the Contract Documents.
- c. Corporation stops up to and including two-inch diameter shall be ball corporation valves.
- d. Material: Brass alloy, unless otherwise approved by Engineer. Fluorocarbon coated ball.
- e. Provide corporation stops 1.5-inch diameter and larger with O-ring or other gasket type.

- f. Connections: Inlet connection shall be threaded. Provide compression-type outlet connections unless otherwise approved by Engineer.
- 4. Service Fittings:
 - a. Provide service fittings as necessary for the Work, including requirements (if any) on the Drawings. Service fittings include compression, pack joint, copper flare, straight couplings, threaded, service tees, U-branch, Y-branch, pipe plugs, bushings, insert stiffeners, other adapters, and similar items necessary, required, or both, for a complete, functional water service lateral system.
 - b. Provide insert stiffeners for polyethylene service lateral piping.
 - c. Material: Copper alloy appropriate for service conditions and environment, unless other material is approved by Engineer.
 - d. Size: Sufficient for required nominal diameter of water service lateral.
 - e. End connections: Threaded, [brazed,] compression, or flared, as appropriate.
 - f. Compression connections, copper tube flare connections, and swivel connections, when provided, shall seal to retain service lateral piping without slippage at pressure classification required for the associated service lateral.
- 5. Service Lateral Piping:
 - a. Unless shown or indicated otherwise in the Contract Documents, provide water service lateral piping as indicated in this provision.
- 6. Curb Stops and Boxes:
 - a. Curb stops shall be straight-through design and provide drip-tight shutoff in closed position.
 - b. Curb stop head: Tee design.
 - c. Curb Stop Materials: Brass alloy with stainless steel seats. Fluorocarbon coated ball or plug, as applicable.
 - d. Provide curb stop appropriate for associated curb box.
 - e. Provide curb box for each curb stop furnished.
 - f. Curb Box Materials: Steel pipe body, with cast iron lids and bases. Coat curb box components with epoxy coating inside and outside.
 - g. Provide curb boxes extending from top of curb stop to finished grade. Curb box lid shall be not less than 0.25-inch above or below finished grade.
 - h. Provide stationary rod for curb stops installed six feet or greater below finished grade.
 - i. Curb Valve Operating Heads: Shutoff rod opening shall be compatible with end of stationary rod or valve head provided. Dimensional requirements for head of valves shall be compatible with shutoff rods or stationary rod attachment. Comply with AWWA C800.
- 7. Installation Markers:
 - a. Provide watertight plug, end coupling, or similar item, compatible with material to which plug or end coupling is connected, removeable when private water service lateral piping is extended to associated building or structure.
 - b. When curb stop is located within right-of-way, provide water service lateral piping to right-of-way boundary.
 - c. Where water service lateral end is within lawn or landscaped area, provide hardwood stake, with head not less than two square inches, to mark surface location of end of water service lateral provided. Such stake shall be not less than [12] inches long and, after installation, shall protrude above finished grade by not more than [0.75]-inch.
 - d. Where water service lateral end is within area other than lawn or landscaped area, provide no. 4 reinforcing steel rod to mark surface location of end of water service lateral provided. Such rod shall be not less than one foot long and, after installation, shall protrude above finished grade by not more than [3/8]-inch. Do not provide in areas paved with Portland cement concrete, asphalt concrete, or other hard surfacing; for such areas, obtain interpretation or clarification from Engineer before marking end of water service lateral.

2.3 TAPPING SLEEVES AND VALVES

A. Products and Manufacturers:

1. Tapping Sleeves: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. Ford Meter Box.
 - b. Mueller.
 - c. Robar.
 - d. Tyler Union.
 - e. Or equal.
2. Tapping Valves: Subject to compliance with the Contract Documents, provide required quantity of one of the following:
 - a. Mueller (wedge type gate valves).
 - b. American Flow Control (resilient wedge gate valve).
 - c. M&H Valve (resilient wedge gate valve, four-inch through 12-inch diameter).
 - d. Matco-Norca (resilient wedge gate valve, four-inch through 12-inch diameter).
 - e. Or equal.

B. Description:

1. Provide tapping sleeve and valve at each location where new waterline or water service lateral larger than two-inch diameter is required, when connected to waterline, three-inch diameter through [24]-inch diameter, existing prior to the Effective Date of the Contract.
2. Provide watertight tapping sleeves and valves suitable for operating pressures and hydrostatic test pressures required.
3. Where connecting piping will be smaller than three-inch diameter, provide service lateral in accordance with service lateral requirements of this Section.

C. Performance Criteria:

1. Pressure Classification:
 - a. Tapping sleeves working pressure rating: 150 psig at 100 degrees F, unless shown or indicated otherwise in the Contract Documents.
 - b. Tapping valves working pressure:
 - 1) Valves 3-inch through 12-inch diameter: 350 psig at 100 degrees F, unless shown or indicated otherwise in the Contract Documents.
 - 2) Valves larger than 12-inch diameter: 250 psig at 100 degrees F, unless shown or indicated otherwise in the Contract Documents.

D. Materials and Fabrication:

1. Tapping Sleeves and Valves Materials and Fabrication - General:
 - a. Tapping sleeves and their associated tapping valves shall be suitable for use as a system, providing watertight connections and free of galvanic corrosion potential.
 - b. Tapping sleeves and valves shall be suitable for the tapping equipment used and shall support providing required nominal outlet diameter in existing pipe.
2. Tapping Sleeves:
 - a. Type: Tee-type with one outlet per tapping sleeve.
 - b. Size:
 - 1) Suitable for existing pipe size and material that will be tapped, nominal diameter as shown or indicated on the Drawings. If information is available regarding existing pipe material and outside diameter, Owner will furnish such information to Contractor via Engineer, upon Contractor's written request. Contractor is responsible for field-verifying dimensions prior to purchasing tapping sleeves.
 - 2) Outlet nominal diameter as shown or indicated on the Drawings.
 - c. Outlet Connection Type: Flanged, in accordance with MSS SP-60.
 - d. Provide 0.75-inch diameter, threaded plug on outlet suitable for testing.
 - e. Gasket Type: 360 degrees around entire, interior surface of tapping sleeve with integral gap bridge. Provide tapping sleeve with bridging plate, coordinated with gasket

providing watertight interface between tapping sleeve halves at rated pressure classification. Provide gasket at outlet connection.

- f. Gasket Material: EPDM rubber.
- g. Fastening Hardware: Manufacturer's standard for tapping sleeve furnished. Fastening hardware material shall not result in galvanic corrosion with tapping sleeve or other, connected material. [When epoxy-coated tapping sleeve is required, provide similar, compatible protective coating on fastening hardware].

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
 - 1. Comply with requirements of the General Conditions, as may be modified by the Supplementary Conditions, relative to locating and protecting existing Underground Facilities.
 - 2. Field-verify material, outside diameter, and condition of existing water transmission and distribution piping where service laterals, tapping sleeves and valves, and similar Work will connect to, or otherwise affect, existing Underground Facilities. When necessary to obtain such information, excavate test pits, in accordance with.
 - 3. When connecting new transmission or distribution piping to existing transmission or distribution piping, expose existing piping joints where such connection is required to verify joint types and whether joints are restrained, prior to performing the required connection.
- B. Installing the Work constitutes Contractor's approval of underlying work, subgrades, substrates, and field conditions prevailing at the time of the Work.

3.2 PREPARATION

- A. Demolition and Removal:
 - 1. Perform removals of site improvements, such as pavement, sidewalks, curbs, gutters, and similar areas, as well as removal of existing Underground Facilities (when required).

3.3 INSTALLATION

- A. Installation Requirements – General:
 - 1. Install the Work in accordance with the Contract Documents, Laws and Regulations, permits and approvals issued by authorities having jurisdiction, and manufacturer's written instructions. In event of conflict among such requirements, obtain Engineer's interpretation or clarification before proceeding with the associated Work.
 - 2. When portion of existing water transmission or distribution piping is required to be cut and disconnected from adjacent, existing water transmission or distribution piping, prior to cutting such piping, expose pipe joints and determine extent, if any, of restrained joints on existing piping that will remain in service following such Work. Engineer may direct providing additional restraints on existing pipe joints, via appropriate Contract modification or allowance authorization (when applicable). Provide temporary bracing of existing piping to remain in service until permanent joint restraints are provided.
 - 3. Proximity of Waterlines and Sewers or Other Sources of Potential Contamination:
 - a. Unless otherwise shown or indicated in the Contract Documents, install water transmission and distribution piping, including service laterals not less than 10 feet horizontally from existing and proposed gravity or pressurized sanitary sewers, combined sewers, storm sewers, septic tanks, absorption fields, surface water treatment systems (whether for wastewater or stormwater), and other, similar, facilities, as measured from exterior surfaces of such facilities and piping. Similarly, provide not less than 1.5 feet vertical separation between water transmission and distribution piping and such sources of potential contamination, with waterline preferably above, unless otherwise shown or indicated.

- b. At crossings of waterlines and sewers or similar sources of potential contamination, center a full (18-foot or 20-foot, as applicable) section of waterline pipe on the sewer or other potential contamination source, with waterline joints equidistant from the other, crossing piping. For such crossings, backfill entire width of trench at crossing of piping with granular structural fill above required top of pipe bedding material.
 - c. Waterline may be installed a horizontal distance less than 10 feet from sewer or other potential source of contamination when crown of sewer piping or top of other sources of potential contamination is not less than 1.5 feet below invert of waterline.
 - d. When 1.5 feet of vertical separation cannot be provided at crossings of waterline and sewer or other source of potential contamination, the sewer piping or other, similar piping shall be rated for pressurized service, and manholes in proximity to waterline shall be watertight or otherwise sealed. Such sewers or other, similar piping and manholes within less than 10-foot horizontal separation and 1.5 feet vertical separation shall be pressure-tested (either hydrostatically or by other, applicable means established in the Contract Documents) and demonstrated to be free of leakage.
 - e. Waterlines shall not pass through or physically touch manholes, chambers, or vaults, whether at ground surface, buried, or partially buried, serving existing or proposed sanitary sewer, combined sewer, storm sewer, or other source of potential contamination.
 - f. When Contractor is unable to comply with this provision's requirements concerning separation of waterlines and sewers or other sources of potential contamination, promptly give written notice of differing subsurface or physical conditions as required elsewhere in the Contract Documents.
4. Cleanliness of Piping Interior and Temporary Capping of Piping:
- a. Continuously maintain interior of all water transmission and distribution piping, service laterals, and related piping and appurtenances free of dirt, foreign material, and other deleterious matter.
 - b. If, in Engineer's opinion, piping, appurtenances, or any combination thereof, contains dirt, foreign material, or other deleterious matter that cannot be removed by flushing, remove such matter by other means and swab pipe interior with bactericidal solution.
 - c. At end of each workday, and when Contractor's workers are absent from Site, plug, cap or otherwise provide watertight covering over open ends of pipe to prevent ingress of foreign material, liquid, humans, animals, and insects.
5. Clean surfaces of joints and accessory items, such as gaskets, couplings, fastening hardware, and similar items, prior to performing jointing of pipe sections.
6. Inspect each pipe segment and fitting, including pipe interior and exterior, for damage and defects immediately prior to installation. Piping with such defects is unacceptable.
7. Start laying pipe at lowest point and proceed towards higher elevations, unless otherwise approved by Engineer.
8. Completed joints shall be watertight and free of visible or apparent leakage.
9. Deflections at joints shall not exceed 50 percent of deflection allowed by manufacturer's written instructions, unless otherwise approved by Engineer.
10. Only jointing methods expressly indicated in the Contract Documents for water transmission and distribution piping are acceptable.
11. Jointing Method – Bell and Spigot (push-on) Joints:
- a. Install bell and spigot pipe so that bells face the direction of laying, unless otherwise approved by Engineer.
 - b. Bevel and lubricate spigot end of pipe to facilitate without damaging gasket. Do not lubricate bell and O-ring or gasket.
 - c. Thoroughly clean gasket groove.
 - d. Flex rubber gaskets inward and install into gasket recess of bell socket. For cold weather installation, warm gasket prior to placing in bell.
 - e. Field cut pipe, where necessary, with machine specially designed for cutting the type of pipe being installed. Make cuts carefully, without damaging pipe, and with smooth end at right angles to axis of pipe. File or grind cut ends to resemble factory-prepared

spigot end as recommended by manufacturer, in accordance with manufacturer's written instructions. When not expressly addressed in pipe manufacturer's written instructions, bevel the cut end at angle of 30 degrees from pipe centerline, extending 0.25-inch along pipe.

- f. When pipe is not furnished with manufacturer's mark at spigot ends to indicate extent of full insertion, prior to making joints, provide appropriate marking near spigot ends to indicate required length of insertion into bell socket.
 - g. Appropriately insert spigot end of pipe into bell socket used to keep joint from contacting the ground. Fully install spigot end into bell socket.
 - h. Immediately after installing spigot into bell, use feeler gauge to verify proper positioning and condition of gasket.
12. Mechanical Joints:
- a. Prior to performing jointing, clean fastening hardware by wire brushing.
 - b. Install fastening hardware, hand-tighten, and progressively tighten diametrically opposite bolts uniformly around flange to provide proper tension.
 - c. When tightening joints, do not exert undue strain on adjoining pipe.
 - d. Twenty-four hours following jointing, check bolt torque to verify stress relief has not occurred.
13. Restrained Joints:
- a. Provide restrained joints where shown or indicated on the Drawings.
 - b. Provide restrained joints in accordance with restrained joint manufacturer's written instructions.
14. Couplings:
- a. Prior to installing and assembling couplings required in this Section, thoroughly clean joint ends with wire brush to remove foreign matter.
 - b. For couplings that incorporate gaskets, after cleaning apply lubricant to rubber gasket or inside of coupling housing and to joint ends.
 - c. After lubricating, install gasket around joint end of previously installed piece and mate joint end of subsequent pipe section to installed pipe section.
 - d. Position gasket and place coupling sleeve around gasket.
 - e. Installation of Hardware:
 - 1) Insert bolts and install nuts, initially tightening by hand.
 - 2) Tighten bolts uniformly to produce equal pressure on all parts of sleeve.
 - 3) When sleeve clamps meet metal-to-metal, joint is complete and further tightening is not required.
15. Allow pipe to stabilize to temperature of bedding material, or casing pipe, as applicable, before connecting new piping to existing piping and before backfilling.
16. Adapters and Connecting to Existing Piping:
- a. Provide necessary adapters, specials, and connection items necessary when connecting different types and sizes of pipe or connecting pipe by different manufacturers.
17. Provide closure pieces shown or necessary to complete the Work.
- a. .

B. Installation Requirements – Service Laterals:

1. Service Lateral Installation – General:
- a. Requirements in this "Installation Requirements – Service Laterals" provision are generally intended for service laterals two-inch diameter and smaller. Provide service laterals three-inch diameter and larger, when required, by providing tee and valve on outlet, or tapping sleeves and valves on associated water transmission or distribution piping, rather than service saddles, corporation stops, and curb stops and boxes.
 - b. Provide service laterals perpendicular to street or right-of-way boundary.
 - c. Perform service lateral connections to water transmission and distribution piping in the presence of water utility owner.
 - d. Sequence of Testing and Disinfecting of Service Laterals:

- 1) Service laterals provided as part of the Work shall be tested and disinfected as required for water transmission and distribution piping, in accordance with the Contract Documents.
 - 2) Service laterals provided as part of new waterline (where such waterline was provided as part of the Work) may be tested and disinfected as part of the waterline testing and disinfecting, up to the associated curb stop. Such testing and disinfecting, when performed, shall be completed prior to connecting service lateral piping (downstream of the curb stop) to a building or structure.
 - 3) Alternatively, new waterline (provided as part of the Work) may be tested and disinfected, certified as substantially complete, and placed into operation prior to connecting service laterals to new waterline. In such case, install required service laterals, and test and disinfect service laterals in accordance with the Contract Documents, prior to connection of service laterals to associated building or structure. Completion of all service laterals, including required testing and disinfecting, is condition precedent to eligibility for Substantial Completion of the Work in its entirety.
2. Tapping of Pipes and Corporation Stop Installations:
- a. Locations:
 - 1) Refer to "Description" provision of this Section's "Service Laterals" Article.
 - 2) Unless otherwise directed, provide service lateral connections at 2 o'clock and 10 o'clock locations on circumference of water transmission or distribution piping.
 - 3) When not shown on the Drawings, provide service lateral connection at locations as directed by Engineer at the Site, in consultation with owner of property that will be served by associated service lateral (when such property owner is reasonably available for such consultation). Physically mark such locations on water transmission and distribution piping prior to commencing tapping.
 - 4) When multiple taps are required in proximity to each other, provide taps not less than two feet apart along length of associated water transmission or distribution piping and staggered (on pipe circumference) so that spacing of taps at same orientation on pipe circumference are not closer than four feet.
 - 5) Do not tap pipe within three feet of pipe joint.
 - 6) Do not tap pipe on fittings.
 - b. Equipment:
 - 1) Provide and use for tapping water transmission and distribution piping only construction equipment and machinery specifically manufactured for use in tapping piping, suitable for the pipe material and lining.
 - 2) Cutting heads shall be sharp and appropriate for the intended purpose.
 - c. Tapping – General:
 - 1) Properly disinfect tapping equipment, machinery, tools, corporation stops, and service fittings before each comes into contact with potable water or water that will be treated to become potable.
 - 2) Comply with written operating instructions of manufacturer of tapping equipment, machinery, and tools.
 - 3) Provide and use smooth-jawed adjustable wrenches that fully and evenly engage corporation stop wrenching flats. Loose-fitting wrenches and pipe wrenches are unacceptable. Place wrenches only on corporation stop body wrench flats. Do not use rounded areas of corporation stop body for tightening into pipe or saddle. Wrenching on other areas of corporation stop is unacceptable.
 - 4) During tapping, cover pipe adjacent to tap with protective blanket.
 - 5) Tapping Using Service Saddles:
 - a) Center service saddle tapping boss over intended location of tapped connection.
 - b) Attach service saddle to pipe, seat at intended location, and tighten fastening hardware in accordance with manufacturer's written instructions.
 - c) Install corporation stop using pipe thread sealant.

- d) Install tapping equipment through installed corporation stop and cut hole in pipe.
 - e) Remove tapping equipment and close corporation stop.
- 6) Direct Tapping:
 - a) Center tapping equipment over intended location of tapped connection.
 - b) Install tapping equipment through corporation stop and cut hole in pipe.
 - c) Fully install corporation stop threads through pipe wall using pipe thread sealant.
 - d) Remove tapping equipment and close corporation stop.
- 7) To maximum extent practicable:
 - a) Avoid discharging cuttings into water transmission or distribution pipe.
 - b) Remove “coupon” cut from pipe wall.
 - c) Avoid damaging pipe lining, except as necessary to provide clean, square-edged hole in pipe wall.
- 8) Visually confirm absence of leakage at tapped connection and corporation stop.
- d. Tapping of PVC Pipe:
 - 1) Tap PVC pipe for service laterals in accordance with AWWA C605, unless otherwise indicated in this Section.
 - 2) PVC pipe [six-inch diameter and less and 18-inch diameter and greater] shall not be direct-tapped. [Do not direct-tap PVC pipe with wall thickness less than DR 18].
- e. Tapping of Ductile Iron and Cast Iron Pipe:
 - 1) Tap ductile iron pipe and cast iron pipe for service laterals in accordance with AWWA C600, unless otherwise indicated in this Section.
- f. Tapping of Steel Pipe:
 - 1) Tap steel pipe for service laterals in accordance with AWWA C600 and applicable provisions of AWWA C604, unless otherwise indicated in this Section.
 - 2) After completing tapping, replace and repair damage to protective coating of steel pipe, in accordance with AWWA reference standard applicable to the type of existing coating. Comply with coating manufacturer's written instructions for repair and replacement methods.
- g. Tapping of Polyethylene Pipe:
 - 1) Tap polyethylene pipe for service laterals, including service saddles, in accordance with AWWA Manual M55 and PPI Polyethylene Piping Systems Field Manual for Municipal Water Applications, unless otherwise indicated in this Section.
 - 2) Tapping equipment or machinery shall be manufactured specifically for tapping polyethylene pressure pipe.
 - 3) During service saddle installation, do not deform polyethylene pipe, whether by excessively tightening fastening hardware or other means.
- 3. Service Lateral Piping Installation:
 - a. Installed depth of crown of service lateral piping shall be in accordance with Laws and Regulations and, in no event, shall be less than one foot below elevation sufficient to prevent freezing and damage from cold temperatures.
 - b. Install service lateral piping in accordance with AWWA C800, this Section and other relevant requirements of the Contract Documents.
 - c. Provide service lateral fittings installation in accordance with fitting manufacturer’s written instructions.
 - d. When connecting service lateral piping to corporation stop, use two wrenches in making the connection. Use one wrench to support corporation stop or curb stop (as applicable) and use second wrench to tighten service connection.
 - e. For polyethylene tubing and copper tubing, snake piping in trench to compensate for thermal expansion and contraction.
 - f. For polyethylene service lateral piping, provide underground detectable warning tape.
 - g. Perform service lateral piping hydrostatic testing before backfilling, to facilitate leak detection and remedial actions.

4. Curb Stop and Box Installation:
 - a. Install curb stops and boxes in accordance with AWWA C800 and curb stop and box manufacturer's written instructions, unless otherwise required by the Contract Documents.
 - b. Provide top of curb box within tolerance of 0.5-inch of finished grade adjacent to curb box.
 - c. Unless meter box or similar item is required, as part of the Work, downstream of curb stop, provide removeable, watertight cap on discharge end of curb stop, for future connection of meter box or additional service lateral piping to building or structure served.
 5. Surface Markings:
 - a. For each service lateral provided, provide surface marking, visible at finished grade, indicating location of end of service lateral provided by Contractor.
 - b. Provide surface markings in accordance with "Service Laterals" Article in this Section.
- C. Installation Requirements – Tapping Sleeves and Valves:
1. This provision applies to providing new piping connection to existing water transmission or distribution piping, where new, connected piping will be three-inch diameter or larger, regardless of whether such new, connected piping will serve a single property or multiple properties.
 2. Locations:
 - a. Provide tapping sleeves and valves at locations shown or indicated on the Drawings.
 - b. Provide tapping sleeves not less than three feet from bell end, spigot end, or other, applicable type of pipe joint. When insufficient space is available for tapping sleeve installation, obtain interpretation or clarification from Engineer before proceeding. When applicable, comply with the Contract's requirements concerning giving notice of different subsurface or physical conditions.
 - c. Unless otherwise shown or indicated, provide tapping sleeve outlet oriented in same horizontal plane as horizontal centerline of associated water transmission or distribution piping.
 3. Tapping Sleeves and Valves - General:
 - a. Connections to cast iron pipe, ductile iron pipe, PVC pipe, polyethylene pipe, and asbestos cement pipe:
 - 1) Such connections shall be performed while existing piping remains in service and pressurized.
 - 2) Clean exterior surfaces of pipe at connection point to provide smooth surface for tapping sleeve installation.
 - 3) Properly secure tapping sleeve to pipe to prevent movement during tapping.
 - 4) Prior to tapping, test tapping sleeve as follows:
 - a) Hydrostatically test tapping sleeve at the greater of 1.5 times local static pressure of existing piping or 150 psig.
 - b. When the Contract Documents do not otherwise expressly address such shutdowns, submit request for such shutdown.
 - c. Operate tapping equipment, machinery, and tools in accordance with manufacturer's written operating instructions. During setup, tapping, and removal of tapping equipment and machinery, support tapping equipment and machinery independent of piping, tapping sleeve, and valve.
 - d. Comply with MSS SP-60.
 - e. During tapping, cover pipe adjacent to tap with protective blanket.
 4. Installation Requirements by Type of Pipe:
 - a. Tapping of PVC Pipe:
 - 1) Tap PVC pipe in accordance with AWWA C605, unless otherwise indicated in this Section.
 - b. Tapping of Ductile Iron and Cast Iron Pipe:
 - 1) Tap ductile iron pipe and cast iron pipe in accordance with AWWA C600, unless otherwise indicated in this Section.

- 2) When tapping sleeve is installed on piping with polyethylene encasement, remove polyethylene encasement from area where tapping sleeve is required. Following installation of tapping sleeve and valve, replace polyethylene encasement over new tapping sleeve and valve and area of existing piping exposed, in accordance with AWWA C105.
 - c. Tapping of Steel Pipe:
 - 1) Tap steel pipe in accordance with AWWA C604, unless otherwise indicated in this Section.
 - d. Tapping of Polyethylene Pipe:
 - 1) Tap polyethylene pipe, including tapping sleeves and valves, in accordance with AWWA Manual M55 and PPI Polyethylene Piping Systems Field Manual for Municipal Water Applications, unless otherwise indicated in this Section.
 - 2) Tapping equipment or machinery shall be manufactured specifically for tapping polyethylene pressure pipe.
 - 3) During tapping sleeve installation, do not deform polyethylene pipe.
 - e. Tapping of Concrete Pressure Pipe:
- D. Installation Requirements – Blow-off Assemblies:
1. This provision applies to providing new blow-off assemblies that are not hydrants.
 2. Locations:
 - a. Provide blow-off assemblies at locations shown or indicated on the Drawings.
 - b. Unless expressly shown or indicated otherwise, do not install valve boxes that are part of blow-off assemblies in sidewalks, gutters, or areas subject to vehicular traffic.
 - c. Provide blow-off assembly connections to water transmission or distribution piping not less than three feet from bell end, spigot end, or other, applicable type of pipe joint. When insufficient space is available for connection, obtain interpretation or clarification from Engineer before proceeding. When applicable, comply with the Contract's requirements concerning giving notice of different subsurface or physical conditions.
 3. Blow-off Assemblies - General:
 - a. For blow-off assemblies with two-inch diameter (and less) connection to water transmission or distribution piping, provide connection to water transmission or distribution piping in accordance with this Article's "Installation Requirements – Service Laterals" provision.
 - b. For blow-off assemblies with three-inch diameter and larger connection to water transmission or distribution piping, provide connection to water transmission or distribution piping in accordance with this Article's "Installation Requirements – Tapping Sleeves and Valves" provision.
 - c. Provide pipe bedding material surrounding vertical run of piping leading into valve box housing hose connection, for radius of six inches from pipe. Surface of such material shall extend up into valve box housing hose connection.
 - d. Install each valve on concrete slab not less than 1.5 feet by 1.5 feet in plan and three inches thick. Downstream of valve, where piping elbows 90 degrees upward, provide concrete thrust block in accordance with the Contract Documents. Provide concrete in accordance with the Specifications of Division 03 - Concrete.
 - e. Install buried piping associated with blow-off assemblies in accordance with the Specifications on waterline piping in Division 33 - Utilities, Division 40 - Process Interconnections, and this Section. Provide restrained pipe joints.
 - f. Installed depth of crown of blow-off assembly piping shall be in accordance with Laws and Regulations and, in no event, shall be less than one foot below elevation sufficient to prevent freezing and damage from cold temperatures.
 - g. Comply with this Section's "Blow-off Assemblies" Article in "Part 2 – Products", which describes entire blow-off assembly, including certain requirements which may be considered as installation requirements, such as limitation on overall length of blow-off assemblies, requirements concerning drain hole required in piping below hose connection, and other requirements.

- h. Install hose connection in accordance with manufacturer's written instructions.
- 4. Installation Requirements for Alternative Blow-off Assembly Valve:
 - a. This provision applies when Contractor provides alternative blow-off assembly valve indicated in this Section's "Blow-off Assemblies" Article in "Part 2 – Products". Unless otherwise modified in this provision on alternative blow-off assembly valves, comply with all requirements for blow-off assemblies in this Section.
 - b. When alternative blow-off assembly valve is provided, second valve box and cover (for hose connection) is not required. In such case, hose connection may be provided in same valve box as the valve.
 - c. Provide valve discharge with upturned 90-degree elbow, oriented toward top of valve box. Provide piping of required size between upturned elbow and hose connection, so that hose connection is four inches below bottom of valve box cover.
 - d. Provide concrete thrust block on opposite side of valve box from entry piping.
 - e. Install valve in accordance with valve manufacturer's written instructions.
- E. Installation Tolerances:
 - 1. Provide water transmission and distribution piping Work within three inches of planar location required by the Contract Documents, unless more-stringent tolerance is necessary for installing piping as required by the Contract Documents, such as for maintaining required separation from other Underground Facilities, or for connecting to existing piping.
 - 2. Provide water transmission and distribution piping Work within [one] inch of elevation required by the Contract Documents, unless more-stringent tolerance is necessary for installing piping as required by the Contract Documents, such as for maintaining required separation from other Underground Facilities, or for connecting to existing piping.

3.4 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 - 1. Water Transmission and Distribution Piping:
 - a. Perform field tests and inspections of water transmission and distribution piping in accordance with the Specifications for the associated type of pipe in Division 33 - Utilities and Division 40 - Process Interconnections, together with applicable piping schedules included in the Contract Documents.
 - b. Apparent leakage at joints of piping, fittings, couplings, specials, adapters, and taps is unacceptable.
 - c. Apparent leakage through body or bearings of valves, curb stops, and corporation stops is unacceptable.
 - d. In presence of Engineer demonstrate full range of operation of valves, curb stops, and corporation stops following installation. In presence of same entity, upon completion of finish grading of adjacent areas, verify that valve box covers and curb stop covers are within specified tolerances, relative to adjacent, finished grade.
 - 2. Service Laterals:
 - a. Requirements for scheduling and sequencing field tests and inspections of service laterals are in this Section's "Scheduling and Sequencing" provision in the "Administrative Requirements" Article, and in this Section's "Installation Requirements – Service Laterals" provision in "Part 3 – Execution".
 - b. Perform hydrostatic testing of service lateral piping prior to covering service lateral piping with backfill. Provide backfill in accordance with the Contract Documents following Engineer's acceptance of hydrostatic test results for associated service lateral.
 - c. During testing of ground key curb stops, outlet may be capped to eliminate leakage through curb stop's closed port opening.
 - d. When hydrostatically testing water transmission or distribution piping, when capping corporation stop is impractical, hydrostatically test to curb stop with corporation stop in open position.
 - e. Prior to performing hydrostatic testing, obtain from Engineer clarification or interpretation concerning required hydrostatic test pressures when required hydrostatic

- test pressures on service saddles for attachment to PVC or polyethylene pipe exceed 100 percent of manufacturer's pressure rating of lowest-rated component.
3. Tapping Sleeves and Valves:
 - a. Comply with this Section's "Installation Requirements – Tapping Sleeves and Valves" provision in "Part 3 – Execution" relative to testing installed tapping sleeve for leakage prior to tapping the associated pipe.
 - b. In addition, hydrostatically test tapping sleeves and valves as part of the associated water transmission and distribution piping.
 4. Blow-off Assemblies:
 - a. Perform field tests and inspections of connections of blow-off assemblies to water transmission and distribution piping as required elsewhere in this Section for service laterals and tapping sleeves and valves as applicable.
 - b. Hydrostatically test piping associated with blow-off assemblies, and perform field tests and inspections of valves, as required elsewhere in this Section.
- B. Defective Work:
1. The following are reasons for Engineer to reject water transmission and distribution Work as defective:
 - a. Providing Work of size, material, type, or any combination thereof, inconsistent with the Contract Documents.
 - b. Providing the Work not in accordance with required tolerances.
 - c. Failure of the Work to comply with required tests, inspections, or any combination thereof.
 - d. Apparent evidence of leakage when the Work is pressurized.
 - e. Unacceptable deformation of the Work under typical operating conditions.
 - f. Damage to the Work while Contractor is responsible for protecting the Work, including damage resulting from freezing, damage to exterior surfaces of piping and appurtenances, damage to piping linings beyond that normally associated with appropriate tapping equipment and methods, and others.
 - g. Other non-compliance with the Contract Documents.
 2. Remedy Defective Work in accordance with the Contract Documents, Laws and Regulations, written instructions of manufacturers of items incorporated into the Work and written instruction of manufacturers of construction equipment and machinery used.

END OF SECTION

SECTION 33 16 23
HYDROPNEUMATIC WATER STORAGE TANKS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Requirements for hydropneumatic water storage tanks, including:
 - a. Requirements for delegated design services and qualifications of delegated design professional retained by Contractor, Subcontractor, or Supplier.
 - b. Design criteria with which delegated designs must comply.
 - c. Foundations for tanks.
 - d. Steel tanks.
 - e. Feed piping, overflow piping, and discharge piping.
 - f. Appurtenances for water storage tanks, including: electrical; ladders, platforms, guardrails; and other items.
- B. Related Requirements: Include, but are not necessarily limited to:
 - 1. Section 03 15 19 - Anchorage to Concrete.

1.2 REFERENCES

- A. Reference Standards: Standards referenced in this section include, but are not necessarily limited to, the following:
 - 1. American Concrete Institute (ACI):
 - a. 318 - Building Code Requirements for Structural Concrete.
 - 2. American National Standards Institute (ANSI):
 - a. Z535.1 - Standard for Safety Colors.
 - 3. American Petroleum Institute (API):
 - a. 650 - Welded Tanks for Oil Storage.
 - 4. American Society of Civil Engineers (ASCE):
 - a. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
 - 5. American Water Works Association (AWWA):
 - a. D100 - Welded Carbon Steel Tanks for Water Storage.
 - b. D102 - Coating Steel Water-Storage Tanks.
 - 6. Association for Materials Protection and Performance (formerly National Association of Corrosion Engineers (NACE))
 - a. NACE SP0178 - Design, Fabrication, and Surface Finish Practices for Tanks and Vessels to Be Lined for Immersion Service.
 - 7. ASTM International (ASTM).
 - a. A36 - Standard Specification for Carbon Structural Steel.
 - b. A516 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Design Conference:
 - 1. Pre-design conference is not required for water storage tanks for this Project.

1.4 QUALITY ASSURANCE:

- A. Qualifications:
 - 1. Manufacturer of Water Storage Tanks:
 - a. Shall have not less than five years' experience in furnishing water storage tanks and related appurtenances of similar size and type to those required for the Project.

- b. Manufacturer of water storage tanks and accessories required by this Section shall have its own production facility and be a business regularly engaged in manufacturing and furnishing water storage tanks and accessories of the type required.
 - c. Manufacturer shall be able to document having furnished not less than five water storage tanks of type and size equal to or larger than those required for the Work, during the past ten years.
 - d. When requested by Engineer, submit qualifications statement indicating manufacturer's record of manufacturing and furnishing water storage tanks and accessories of the type required, and documentation of compliance with qualifications requirements of this Article.
2. Welders:
- a. Welders engaged in the Work shall be qualified and certified in accordance with welding reference standards indicated in AWWA D100 Section 8.2.
 - b. Upon Engineer's request, submit documentation, for each individual welder engaged in the water storage tank Work in accordance with this Article.

1.5 SUBMITTALS

- A. Action Submittals: Submit the following:
- 1. Delegated Design Professional's Instruments of Service Submittals:
 - a. Certificate of compliance, including indication of all performance and design criteria values used for performance and design criteria indicated in the Contract Documents for water storage tanks (and other associated delegated design Work).
 - b. Design Drawings:
 - 1) Show and indicate layout of water storage tanks, including arrangement, dimensions, sizes of tank and support elements; tanks, concrete foundations, grated platforms, and other information necessary and required to demonstrate to Engineer compliance with performance and design criteria shown and indicated in the Contract Documents. Elevations shall be based on Project's datum indicated on the Drawings.
 - 2) Plans and elevation drawings minimum scale: 1/8-inch = 1 foot.
 - 3) Details, and sections minimum scale: 1.5 inches = 1 foot.
 - c. Design specifications.
- B. Informational Submittals: Submit the following:
- 1. Shop Drawings Approved by Delegated Design Professional: Where the Shop Drawings bear the seal and signature of delegated design professional, such Shop Drawings are considered to be delegated design professional's instruments of service Submittals (Action Submittals) as indicated above.
 - a. Plans and elevation drawings minimum scale: 1/8-inch = 1 foot.
 - b. Details, and sections minimum scale: 1.5 inches = 1 foot.
 - c. Design loads and combination of loads transmitted to supporting structural elements, including foundation.
 - d. Size and location of each component of water storage tanks.
 - 1) Where applicable, show and indicate clearance under structural framing members, both horizontal and vertical.
 - 2) Layout, sizes, and reinforcing for concrete foundations.
 - 3) Show cross-section of components.
 - e. Size, location, and details of anchor bolts, base plates, and other components fastened to tank's foundation.
 - f. Details of Work fully designed by delegated design professional where such Work connects to Work fully designed by Engineer.
 - g. Details of appurtenances.
 - h. Layout and details of ladder systems, platforms, guardrail systems, hatches allowing access into tank, and similar elements.
 - 2. Product Data Approved by Delegated Design Professional:

- a. Acknowledgement that items submitted comply with requirements of standards referenced in this Section.
 - b. Coatings for Shop-Applied Primer: Indicate coating system manufacturer, products, and proposed dry film thickness for shop-applied prime coats. Also furnish coating system manufacturer's product data for proposed materials. Submittals for field-applied coatings are to be furnished.
- 3. Certifications:
 - a. Submit manufacturer's certification of compliance that steel was fabricated in accordance with the Contract Documents and delegated design professional's requirements.
- 4. Supplier's Instructions:
 - a. Supplier's written instructions for handling, storing, and installing water storage tanks and related components at the Site.
- 5. Source Quality Control Submittals:
 - a. Submit required source quality control Submittals when requested by Engineer.
- 6. Field Quality Control Submittals:
 - a. Submit written results of field quality control tests and inspections required by this Section and elsewhere in the Contract Documents.
- 7. Qualifications Statements:
 - a. Water storage tank manufacturer/installer, when requested by Engineer.
 - b. Delegated design professional.
 - c. Welders' qualifications and certifications in accordance with requirements of "Qualifications" provision of this Section's "Quality Assurance" Article, when requested by Engineer.
- C. Closeout Submittals: Submit the following:
 - 1. Operation and Maintenance Data:
 - a. Include in operation and maintenance data clear indication of each tank's storage volume for each one foot increment of water surface level in tank.
 - 2. Record Documents:
 - a. Submit complete record drawings and record specifications for water storage tanks, showing and indicating as-constructed conditions.
 - b. Indicate total weight of metal furnished by tank Supplier.
 - 3. Keys: Upon Substantial Completion, furnish to Owner (or facility manager) not less than three complete sets of keys for operable security barriers controlling access to water storage tank and tank access hatches.

PART 2 - PRODUCTS

2.1 TANKS

- A. Design Criteria:
 - 1. Hydropneumatic tanks shall be certified for drinking water use under the latest version of ANSI/NSF Standard 61.
 - 2. Large hydropneumatics tanks with a gross volume larger than 120 gallons shall be designed and constructed in accordance with the latest ASME boiler and pressure vessel code as published by the American Society of Mechanical Engineers.
 - 3. Proper protection shall be given to metal surfaces of hydropneumatics tanks.
 - a. Interior coatings shall be certified for drinking water use under the latest ANSI/NSF Standard 61.
 - b. Tanks constructed of steel or other metal subject to corrosion shall have both interior and exterior surfaces painted.
 - c. Tanks constructed of corrosion resistant metals shall not be required to be painted. Tanks constructed of corrosion resistant metals shall be certified for drinking water use under the latest ANSI/NSF Standard 61.

- d. Hydropneumatic tanks 500 gallons or greater in size shall have interiors that are either epoxy or glass coated.
 - 4. Hydropneumatic tanks 500 gallons or greater in size and all tanks used for disinfection contact time shall have separate inlet and outlet lines to provide positive flow through the tank.
 - 5. Hydropneumatic tanks with gross volume less than 500 gallons per tank shall be constructed with the following appurtenances and features:
 - a. Each tank shall be equipped with a Schrader type valve to allow air to be added to the tank and to check air pressure.
 - b. Tanks shall be equipped with automatic controls to control pressure/water level in the tanks.
 - c. A means to manage the volume and pressure of air in the air cushion of pressure tanks shall be provided but this may be done manually with portable equipment.
 - d. There shall be at least one pressure gage in the tank manifold.
 - e. Sufficient space shall be provided around the tanks to be accessible to maintenance.
 - 6. Conventional pressure tanks shall have a water sight glass, a pressure gage, a mechanical means of adding air, a means to adjust the air to water ration, and a pressure blow-off for excess pressure.
 - 7. Conventional tanks with gross volume of 500 gallons or more shall also be constructed with the following appurtenances and features:
 - a. Each tank shall have at least one manway with minimum diameter of 24-inch clear opening for circular manways.
 - b. Each tank shall have a drain that shall discharge above normal ground surface with no direct connection to a sewer or storm drain.
 - c. Each tank shall be protected from freezing.
- B. Materials:
- 1. Tank Inlet and Discharge Piping:
 - a. Tank inlet and discharge piping below concrete foundation shall be in accordance with piping Specifications, including schedules, in Division 40 - Process Interconnections, suitably restrained to prevent movement.
 - 2. Process Piping:
 - a. Process Piping – General:
 - 1) Provide process piping connections to tank at locations shown on the Drawings and in accordance with this Section and requirements of Division 40 - Process Interconnections. Piping connections shall be watertight during hydrostatic testing of tank and associated piping and during tank operation.
 - 2) Size of process piping and related connections to tank are shown or indicated on the Drawings.
 - 3) Where connecting piping to tank bottom requires welding, prevent damage to piping and associated pipe lining (if any) during welding. Remedy damage, if any, in manner acceptable to Engineer.
 - 4) After making piping connection to tank bottom, where connection is required to be flush with tank floor, grind “lip” of pipe at connection to tank floor to be flush with tank floor.
 - b. Inlet Pipe:
 - 1) Provide inlet connection to tank, flush with tank floor. Inlet shall be baffled.
 - c. Discharge Pipe:
 - 1) Provide discharge connection to tank, flush with tank floor. Discharge shall be baffled.

2.2 ACCESSORIES

- A. Concrete:
 - 1. Concrete – General:
 - a. Concrete mix designs shall be by tank manufacturer.

- b. 28-day compressive strength shall be not less than 4,000 psi, unless otherwise required elsewhere in this Section.
 - c. Exposed concrete shall have air-entrainment admixture.
- B. Hatches:
 - 1. Hatches – General:
 - a. Hatches shall be gasketed, watertight, dustproof, and prevent entry of insects and animals.
 - b. Type 316 stainless steel hardware, including hinges and operable mechanisms.
 - c. Lockable. Keyed to Owner’s keying system.
- C. Electrical Systems:
 - 1. Electrical Work, including service equipment, cabling, conduit, junction boxes, switches, convenience receptacles, luminaires and other lighting system components, lightning protection and other electrical equipment shall be in accordance with the Drawings.

2.3 SOURCE QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Perform shop testing and inspections in accordance with AWWA D100.
 - 2. Perform and document results of Supplier’s standard shop tests and inspections. Upon Engineer’s request, submit documentation of successful completion of such tests and inspections.
 - 3. Contractor and Supplier are responsible for properly remedying defects in materials and systems furnished prior to shipment of items from the factory or fabrication location.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Installing the Work constitutes Contractor’s approval of underlying work, subgrades, substrates, and field conditions prevailing at the time of the Work.

3.2 INSTALLATION

- A. Installation Tolerances:
 - 1. Installation tolerances shall be in accordance with AWWA D100 unless more-stringent tolerance is required in this Section, except that requirement of AWWA D100 Section 10.6.5 indicating that tolerances may be waived if structural adequacy of shell is substantiated by a rational analysis, shall not apply. The Work shall comply with tolerances indicated in AWWA D100 Section 10.6.5, Section 10.6.6, and others as applicable.
- B. Air Compressor:
 - 1. Install air compressor to maintain an adjustable air pressure within the tank. Air compressor shall be set to maintain pressure 5 psi higher than pressure required to activate well pump.
 - 2. Air compressor shall be capable of providing pressure up to 100 psi in the tank.
 - 3. Complete air compressor package shall be submitted and supplied with hydropneumatic tank package.

3.3 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 - 1. Visually inspect installed water tanks and advise Engineer of apparent defects.
 - 2. Perform field quality control, including field tests and inspections for concrete in accordance with the Specifications of Division 03 - Concrete.
 - 3. Demonstrate, in presence of Engineer, complete operability and functionality of security doors, hatches, valves, lighting, and other systems associated with water tanks.
- B. Defective Work:
 - 1. Remedy defective work in accordance with the Contract Documents and AWWA D100.

2. Do not perform remedial work on a joint or weld unless water surface elevation is not less than two feet below area being remedied.
3. If quantity or severity of leaks are, in Engineer's opinion, too extensive to remedy while tank is filled with water, Engineer may direct that tank be emptied and entire disinfection and re-filling procedure be repeated until all leaks are remedied and tank is properly hydrostatically tested, disinfected, and acceptable results are obtained from required water quality testing.
4. Interior and exterior coatings shall be completely remedied (including repeat of surface preparation of steel before re-coating) in accordance with the Contract Documents.

END OF SECTION

SECTION 40 05 31

PIPE - PLASTIC

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Plastic pipe.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
1. ASTM International (ASTM):
 - a. PVC (polyvinyl chloride) materials:
 - 1) D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 - 2) D1785, Standard Specification for Poly(Vinyl Chloride) PVC Plastic Pipe, Schedules 40, 80 and 120.
 - 3) D2467, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - 4) D3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
 - 5) D3139, Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
 - 6) D3212, Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
 - 7) F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - 8) F679, Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
 - 9) F794, Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
 - 10) F949, Standard Specification for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings.
 - b. Installation:
 - 1) D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 2. American Water Works Association (AWWA):
 - a. PVC (polyvinyl chloride) materials:
 - 1) C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In.
 - b. Polyethylene (PE) materials:
 - 1) C901, Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inches through 3 IN, for Water Service.
 3. NSF International (NSF).

PART 2 - PRODUCTS

2.1 PVC PRESSURE PIPING (EXPOSED)

- A. General:
1. Provide Schedule 80 pipe with Schedule 80 fittings and appurtenances to locations shown on Drawings.
 2. Furnish materials in full compliance to following material specifications:

- a. Manufacture pipe, fittings and appurtenances from polyvinyl chloride (PVC) compound which meets the requirements of Type 1, Grade 1 (12454-B) Polyvinyl Chloride as outlined in ASTM D1784.
 - b. Manufacture pipe, fittings and valves from materials that have been tested and approved for conveying potable water by the NSF.
- B. Pipe:
 - 1. Furnish pipe meeting requirements of ASTM D1785.
 - 2. Pipe 2 inches and less to be solvent welded.
 - 3. Pipe larger than 2 inches may be either flanged or solvent welded unless shown otherwise on Drawings.
- C. Fittings: Provide ASTM D2467 PVC socket type fittings having the same pressure and temperature rating as the pipe.
- D. Flanges/Unions:
 - 1. Furnish flanges and unions at locations shown on Drawings.
 - 2. Provide either flanges or unions at valves, penetrations through structures and equipment connections.
 - 3. For pipe larger than 2 inches, provide 150 pound socket type PVC flange.
 - 4. For pipe 2 inches and less, provide socket type PVC union with Buna O-rings.
 - 5. Use flat, full faced natural rubber gaskets at flanged connections.
 - a. Furnish heavy hex head bolts, each with one heavy hex nut, ASTM F593 Type 316 stainless steel.
 - 6. Use spacers supplied by pipe manufacturer when mating raised-faced flanges to other flanges.
- E. Installation:
 - 1. Field threading PVC will not be permitted.
 - a. Perform required threaded connections or attachments by the use of factory molded socket by threaded adapters.
 - b. Female adapters are not acceptable.
 - 2. Employ installation and pipe support practices and solvent welding all in compliance to the manufacturer's printed recommendation.
 - a. Continuously support PVC piping at liquid operating temperatures in excess of 100 DEGF.
 - b. For vertical piping, band the pipe at intervals to rigidly support load of twice vertical load.
 - c. Support riser clamps on spring hangers.
 - d. Do not clamp PVC tightly or restrict movement for expansion and contraction.

2.2 PRESSURE PIPING (UNDERGROUND)

- A. Materials: Furnish materials in full compliance with following requirements:
 - 1. Sizes 1/2- through 3-inch diameter: AWWA C901 PE with Pressure Class of 200 PSI.
 - 2. Sizes 4- through 60-inch diameter: AWWA C900 PVC with Pressure Class of 200 PSI.
 - 3. Joints for polyethylene pipe shall be fusion type in accordance with AWWA C901.
 - 4. Joints for PVC pipe shall be the elastomeric-gasket type with a pressure rating not less than pipe pressure rating meeting performance requirements of ASTM D3139.
- B. Installation:
 - 1. Field threading of PVC pipe will not be permitted.
 - 2. Perform installation procedures, handling, thrust blocking, connections, and other appurtenant operations in full compliance to the manufacturer's printed recommendations and in full observance to plan details when more stringent.

PART 3 - EXECUTION

3.1 IDENTIFICATION

- A. Identify each length of pipe clearly at intervals of 5 feet or less.
 - 1. Include manufacturer's name and trademark.
 - 2. Nominal size of pipe, appurtenant information regarding polymer cell classification and critical identifications regarding performance specifications and NSF approvals when applicable.

3.2 PRESSURE PIPING (UNDERGROUND)

- A. Installation:
 - 1. Field threading of PVC pipe will not be permitted.
 - 2. Perform installation procedures, handling, thrust blocking, connections, and other appurtenant operations in full compliance to the manufacturer's printed recommendations and in full observance to plan details when more stringent.

3.3 PVC DRAINAGE, SEWER PIPING

- A. Installation: Install pipe and fittings in accordance with ASTM D2321 and as recommended by the manufacturer.
 - 1. Provide for a maximum deflection of not more than 5%.
- B. Infiltration and Exfiltration:
 - 1. The maximum allowable infiltration measured by test shall not exceed 100 GAL per inch of pipe diameter per mile per 24 hours.
 - 2. Observe full instructions of the Engineer for carrying of testing procedures.
 - a. Perform tests only during presence of the Engineer or his authorized representative.
 - 3. Should any test on any section of pipe line disclose either infiltration rates greater than allowed or disclose air loss rate greater than that permitted, locate and repair the defective joints or pipes at no cost to Owner and retest until requirements stated are met.
- C. Deflection:
 - 1. After backfilling, each section of pipe shall be checked for deflection by pulling a mandrel through the pipe.
 - 2. Pipe with deflection exceeding 5% of the inside diameter shall have backfill removed and replaced to provide a deflection of less than 5%.
 - 3. Any repaired pipe shall be retested.

3.4 PVC TUBING

- A. Fittings:
 - 1. Install tubing with nylon fittings and connectors.
 - 2. Use barbed type adapters with stainless steel clamps.
 - 3. Provide fittings capable of withstanding temperatures from a -70 to 250 degrees F.
 - 4. Ensure fittings have the same pressure and temperature rating as the tubing.
- B. Trays:
 - 1. Flat smoothed bottom tray for supporting flexible hoses when there is a chance that the hoses may pulse or move.

END OF SECTION

SECTION 40 05 52

MISCELLANEOUS VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Air release and vacuum relief valves.
 - 2. Automatic control valves:
 - a. Pressure relief and pressure-sustaining valves.
 - b. Pressure-reducing valves.
 - c. Surge arrester valves.
 - d. Altitude valves.
 - e. Electric check valves.
 - f. Float-controlled valves.
 - 3. Pinch valves.
 - 4. Mud valves.
 - 5. Float-operated valves (2 inches and smaller).
 - 6. Pressure-reducing valves (2 inches and smaller).
 - 7. Pressure relief valves (1 inches and smaller).
 - 8. Solenoid valves.
 - 9. Telescoping valves.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - 2. American Water Works Association (AWWA):
 - a. C512, Standard for Air-Release, Air-Vacuum, and Combination Air Valves for Waterworks Service.
 - b. C550, Standard for Protective Interior Coatings for Valves and Hydrants.
 - 3. Canadian Standards Association (CSA).
 - 4. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).

1.3 SUBMITTALS

- A. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 00 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

PART 2 - PRODUCTS

2.1 AIR RELEASE AND VACUUM RELIEF VALVES

- A. Air Valves - General:
 - 1. Comply with AWWA C512.
- B. Type 1 – Cast Iron Air Valves With Stainless Steel Floats:
 - 1. Water:
 - a. Air Release Valves:
 - 1) Products and Manufacturers: Subject to compliance with the Contract Documents, furnish required quantity of one of the following:
 - a) DeZurik APCO 200A.

- b) VAG GA Industries, Figure 920.
 - c) Or equal.
 - 2) Materials:
 - a) Body and cover: Cast iron or semi-steel.
 - b) Float: Stainless steel.
 - c) Linkage and trim: Bronze or stainless steel.
 - 3) Design requirements:
 - a) Size: 1 inch (connection to process piping or other item to which valve is attached).
 - b) Working pressure: 100 psig.
 - c) Release 10 scfm at 10 psig differential at 100 psig operating pressure in the associated piping system.
- b. Air and Vacuum Valve:
 - 1) Products and Manufacturers: Subject to compliance with the Contract Documents, furnish required quantity of one of the following:
 - a) VAG GA Industries, Figure 992.
 - b) Or equal.
 - 2) Materials:
 - a) Body and cover: Cast iron.
 - b) Float: Stainless steel.
 - c) Seat: Buna-N.
 - 3) Design requirements:
 - a) Size: As shown on the Drawings.
 - b) Working pressure: 100 psig.
 - c) Air vacuum capacity: 10 scfm at 5 psig differential from atmospheric.
 - d) Isolation Valves: For each air release valve, air-vacuum valve, and combination air valve, provide isolation valve where the air valve connects to the process pipe. Provide appropriate connection to the process pipe, such as tee fitting, appropriate tapping saddle, or other connection approved by Engineer. Isolation valves' type(s) shall be as shown or indicated in the Contract Documents. Where type is not shown or indicated, provide isolation valve type recommended by air valve manufacturer. Unless indicated otherwise in the Contract Documents, isolation valve shall be same materials required for associated air valve and appropriate for the valve's service, environment, and use. Where isolation valve size is not expressly shown or indicated, unless otherwise recommended in writing by air valve manufacturer and approved by Engineer, isolation valve diameter shall be the same as nominal size of associated air valve. Isolation valves shall have rigid-type connections to process pipe and air valve, that support disassembly for maintenance and troubleshooting.
- c. Combination Air Release and Vacuum Valve:
 - 1) Products and Manufacturers: Subject to compliance with the Contract Documents, furnish required quantity of one of the following:
 - a) VAG GA Industries, Figure 945 or 960.
 - b) Or equal.
 - 2) Materials:
 - a) Body and cover: Cast iron.
 - b) Float, linkage and hardware: Stainless steel.
 - c) Seat: Buna-N.
 - 3) Design requirements:
 - a) Size: As shown on the Drawings.
 - b) Provide isolation valve, type as shown on the Drawings.
- d. Air and Vacuum Valve:
 - 1) Products and Manufacturers: Subject to compliance with the Contract Documents, furnish required quantity of one of the following:

- a) DeZurik APCO ASV-401.
 - b) VAG GA Industries, Figure 993.
 - c) Or equal.
- 2) Materials:
 - a) Body and cover: Cast iron.
 - b) Float: Stainless steel.
 - c) Seat: Buna-N.
- 3) Design requirements:
 - a) Size: As shown on the Drawings.
 - b) Flush accessories:
 - (1) Blow-off valve.
 - (2) Clean water inlet valve.
 - (3) Hose and quick connect coupling.
- e. Combination Air Release and Vacuum Valve:
 - 1) Products and Manufacturers: Subject to compliance with the Contract Documents, furnish required quantity of one of the following:
 - 2) DeZurik APCO S-440.
 - 3) VAG GA Industries, Figure 942.
 - 4) Crispin USL20B.
 - 5) Or equal.
- f. Materials:
 - 1) Body and cover: Cast iron.
 - 2) Float: Stainless steel.
 - 3) Seat: Buna-N.
- g. Design requirements:
 - 1) Size: As shown on the Drawings.
 - 2) Provide isolation valve, type as shown on the Drawings.
 - 3) Flush accessories:
 - a) Blow off valve.
 - b) Clear water inlet valve.
 - c) Hose and quick connect coupling.

2.2 ACCESSORIES

- A. Furnish any accessories required to provide a completely operable valve.

2.3 FABRICATION

- A. Completely shop assemble unit including any interconnecting piping, speed control valves, control isolation valves and electrical components.
- B. Provide internal epoxy coating suitable for potable water for all iron body valves in accordance with AWWA C550.

2.4 SOURCE QUALITY CONTROL

- A. Shop hydrostatically test to piping system test pressure.

2.5 MAINTENANCE MATERIALS

- A. Provide one set of any special tools or wrenches required for operation or maintenance for each type valve.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Air Release, Vacuum Relief, and Pressure Relief Valves:
 - 1. Pipe exhaust to a suitable disposal point.

2. Where exhausted to a trapped floor drain, terminate exhaust line 6 inches minimum above floor.

B. Float-Operated Valves: Install baffle around float to minimize turbulence adjacent to float.

3.2 FIELD QUALITY CONTROL

A. Clean, inspect, and operate valve to ensure all parts are operable and valve seats properly.

B. Check and adjust valves and accessories in accordance with manufacturer's instructions and place into operation.

END OF SECTION

SECTION 40 05 61

GATE VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Gate valves.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. ASTM International (ASTM):
 - a. A126, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - 2. American Water Works Association (AWWA):
 - a. C500, Standard for Metal-Seated Gate Valves for Water Supply Service.
 - b. C504, Standard for Rubber-Seated Butterfly Valves.
 - c. C550, Standard for Protective Epoxy Interior Coatings for Valves and Hydrants.
 - 3. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
 - a. SP-9, Spot Facing for Bronze, Iron and Steel Flanges.
 - b. SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
 - c. SP-80, Bronze Gate, Globe, Angle and Check Valves.

1.3 DEFINITIONS

- A. OS&Y: Outside Screw and Yoke.
- B. NRS: Non-rising Stem.
- C. RS: Rising Stem.

1.4 SUBMITTALS

- A. Contract Closeout Information:
 - 1. Operation and Maintenance Data:
 - a. See Specification Section 01 33 00 for requirements for the mechanics, administration, and the content of Operation and Maintenance Manual submittals.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the manufacturers listed in the applicable Articles below are acceptable.

2.2 VALVES: WATER, STEAM CONDENSATE, STEAM TO 125 PSI, AIR; 2-1/2 INCHES AND SMALLER

- A. Class 125 bronze gate valve.
- B. Comply with MSS SP-80.
- C. Materials:
 - 1. Body, bonnet, wedge: Bronze.
 - 2. Stem: Silicon bronze.
 - 3. Packing: Aramid fibers with graphite (Kevlar®).
- D. Design Requirements:
 - 1. 125 psi steam, 200 psi non-shock WOG.

- 2. Screw in bonnet, non-rising stem, solid wedge.
- E. Manufacturers:
 - 1. Nibco.
 - 2. Stockham.

2.3 VALVES: STEAM CONDENSATE, STEAM TO 125 PSI, AIR; 3 INCHES AND LARGER

- A. Class 125 iron body gate valve.
- B. Comply with MSS SP-70.
- C. Materials:
 - 1. Body, bonnet, wedge: Cast iron, ASTM A126, Class B.
 - 2. Stem: Brass, bronze, or copper silicon alloy.
- D. Design Requirements:
 - 1. 125 psi steam to 400 degrees F, 200 psi WOG.
 - 2. Bolted bonnet, OS&Y, solid wedge, bronze mounted.
- E. Manufacturers:
 - 1. Nibco.
 - 2. Stockham.

2.4 VALVES: WATER (HOT, COLD, HEATING, COOLING, SERVICE, PROCESS, POTABLE, NON-POTABLE, AND WASTEWATER)

- A. Double Disc Gate Valve, 3 to 12 inches (Water Application):
 - 1. Comply with AWWA C500.
 - 2. Materials:
 - a. Seating surfaces, stems, stem nut: Bronze.
 - b. Body, disc: Cast iron.
 - 3. Design requirements:
 - a. 200 psi working pressure.
 - b. Buried: NRS, O-ring stem seal, 2 inches operation nut.
 - c. Exposed: NRS, O-ring stem seal, handwheel.
 - 4. Manufacturers:
 - a. American Flow Control.
 - b. Clow.
 - c. M&H.
 - d. Mueller.
- B. Resilient Wedge Gate Valves, 2 to 48 inches (Water, Wastewater Application):
 - 1. Comply with AWWA C509.
 - 2. Materials:
 - a. Stem and stem nut: Bronze.
 - 1) Wetted bronze parts in low zinc bronze.
 - 2) Aluminum bronze components: Heat treated per AWWA C504.
 - b. Body, gate: [Cast iron.] [Ductile iron.]
 - c. Resilient wedge: Fully encapsulated rubber wedge.
 - 3. Design requirements:
 - a. Minimum 200 PSIG working pressure.
 - b. Buried: NRS, O-ring stem seal, 2 inches square operating nut.
 - c. Exposed: OS&Y, stuffing box stem seal, handwheel.
 - d. Counter clockwise open rotation.
 - e. Fusion bonded epoxy coating interior and exterior except stainless steel and bearing surfaces.
 - 1) Comply with AWWA C550.
 - 2) Wetted bronze parts in low zinc bronze.
 - 3) Aluminum bronze components: Heat treated per AWWA C504.

4. Manufacturers:
 - a. Clow.
 - b. Mueller.
 - c. American Flow Control.
 - d. M & H.
- C. Double Disc Gate Valves, 14 to 48 inches (Water, Wastewater Application):
 1. Comply with AWWA C500.
 2. Materials:
 - a. Seating surfaces, stem, stem nut: Bronze.
 - b. Body, discs: Cast iron.
 3. Design requirements:
 - a. 150 psi working pressure.
 - b. NRS O-ring stem seal.
 - c. Provide gear actuator, 20 inches and larger valves.
 - d. Provide roller tracks and scrapers for horizontal valves size 16 inches and larger.
 - e. Provide bypass valve sized per AWWA C500.
 4. Manufacturers:
 - a. Clow.
 - b. Mueller.
 - c. American Flow Control.
 - d. M & H.

2.5 ACCESSORIES

- A. Refer to Drawings and valve schedule for type of actuators.
 1. Furnish actuator integral with valve.

2.6 FABRICATION

- A. General:
 1. Provide valves with clear waterways the full diameter of the valve.
- B. Spot valves in accordance with MSS SP-9.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Where larger buried valves utilize smaller bypass valves, provide a second valve box installed over the bypass valve operating nut.
- B. Do not install gate valves inverted or with the stems sloped more than 45 degrees from the upright unless the valve was ordered and manufactured specifically for this orientation.

END OF SECTION

SECTION 40 05 66

CHECK VALVES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Check valves 2.5-inch diameter and smaller.
 - 2. Swing check valves, three-inch to 24-inch diameter.
 - 3. Cushioned swing check valves, three-inch to 24-inch diameter.
 - 4. Double door check valves.
 - 5. Silent check valves.
 - 6. Rubber flapper swing check valves, two-inch to 24-inch diameter.
 - 7. Ball check valves, 0.5-inch to four-inch diameter.
 - 8. Duckbill check valves.

1.2 REFERENCES

- A. Referenced Standards:
 - 1. American Society of Mechanical Engineers (ASME):
 - a. B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
 - 2. American Water Works Association (AWWA):
 - a. C508, Standard for Swing-Check Valves for Waterworks Service, 2 in. through 24 in. NPS.
 - 3. Manufacturers Standardization Society of the Valve and Fittings Industry Inc. (MSS):
 - a. SP-71, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 - b. SP-80, Bronze Gate, Globe, Angle and Check Valves.

1.3 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Valve Manufacturers:
 - a. Manufacturer shall be a business regularly engaged in manufacturing and furnishing check valves of the type required and similar equipment.
 - b. Manufacturer shall be able to document having furnished not less than 50 check valves, of the type required, of size equal to or larger than those required for the Work, during the past five years.
 - c. When requested by Engineer, submit qualifications statement indicating manufacturer's record of manufacturing and furnishing check valves of the types and sizes required and furnish documentation of compliance with qualifications requirements of this Article.

1.4 SUBMITTALS

- A. Informational Submittals: Submit the following:
 - 1. Manufacturer's Instructions:
 - a. Manufacturer's written instructions for delivery, handling, storage, installation, and startup.

PART 2 - PRODUCTS

2.1 CHECK VALVES: 2.5 INCHES AND SMALLER

- A. Class 125 Bronze Swing Check Valves (Fuel Oil, Compressed Air, Water, Wastewater):

1. Manufacturers:
 - a. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1) Nibco T413-V.
 - 2) Stockham B-319Y.
 2. Materials:
 - a. Body, bonnet, disc: Bronze.
 3. Design requirements:
 - a. 125 psi steam to 406 degrees F, 200 psi WOG.
 - b. Horizontal swing, renewable disc.
- B. Class 150 Bronze Lift Check Valves (Fuel Oil, Compressed Air):
1. Comply with MSS SP-80.
 2. Manufacturers:
 - a. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1) Stockham b-322B.
 - 2) Powell 158B.
 3. Materials:
 - a. Body, cap, disc holder: Bronze.
 - b. Disc: Buna-N.
 4. Design requirements:
 - a. 150 psi to 150 degrees F, 300 psi WOG.
 - b. Lift check, union cap.
- C. Class 200 Bronze Swing Check Valves (Steam 125 to 200 psi):
1. Comply with MSS SP-80.
 2. Manufacturers:
 - a. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1) Nibco T473B.
 - 2) Stockham B345.
 3. Materials:
 - a. Body, bonnet, disc: Bronze.
 4. Design requirements:
 - a. 200 psi steam to 550 degrees F, 400 psi WOG.
 - b. Horizontal swing, Y-pattern.
 - c. Renewable disc.

2.2 SWING CHECK VALVES: 3 INCHES TO 24 INCHES

- A. Swing Check Valves (Water, Wastewater, Sludge):
1. Comply with AWWA C508.
 2. Manufacturers:
 - a. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1) Clow.
 - 2) America Darling.
 - 3) GA Industries.
 3. Materials:
 - a. Body and cover: Cast iron.
 - b. Seat ring, hinge: Bronze.
 - c. Disc:
 - 1) 3 to 4 inches: Bronze.
 - 2) 6 to 24 inches: [Cast iron with bronze face] [Cast iron with rubber face].
 - d. Hinge shaft: Stainless steel.

- e. Bearings, connecting hardware: Bronze.
- 4. Design requirements:
 - a. 175 psi working pressure (3 to 12 inches).
 - b. 150 psi working pressure (14 to 24 inches).
 - c. Furnish with outside weight and lever or lever and spring.
- B. Class 125 Iron Check Valves (Steam to 125 psi, Fuel Oil):
 - 1. Comply with MSS SP-71.
 - 2. Manufacturers:
 - a. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1) Nibco F-918B.
 - 2) Stockham 373 1/2.
 - 3. Materials:
 - a. Iron body, bronze mounted.
 - b. Seat ring, disc face: Bronze.
 - c. Hinge pin: Bronze or stainless steel.
 - d. Connecting hardware: Bronze or plated steel.
 - 4. Design requirements:
 - a. 125 psi steam to 450 degrees F, 200 psi WOG.
 - b. Bolted cap.
- C. Class 250 Iron Check Valves (Steam 125 to 250 psi):
 - 1. Comply with MSS SP-71, Type 1.
 - 2. Manufacturers:
 - a. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1) Nibco F-968-B.
 - 2) Stockham F-947.
 - 3. Materials:
 - a. Iron body, bronze mounted.
 - b. Seat ring, disc face: Bronze.
 - c. Hinge pin: Brass.
 - d. Connecting hardware: Bronze.
 - 4. Design requirements:
 - a. 250 psi steam to 450 degrees F, 500 psi WOG.
 - b. Bolted cap.

2.3 CUSHIONED SWING CHECK VALVES: 2 INCHES TO 24 INCHES

- A. Class 250.
 - 1. Comply with AWWA C508.
- B. Manufacturers:
 - 1. Air:
 - a. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1) GA Industries, Figure 250D Class 250.
 - 2) APCO Series 6000.
 - 2. Oil:
 - a. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1) GA Industries Figure 25-DXH.
 - 2) APCO Series 6000B.
- C. Materials:
 - 1. Body, cover, disc, levers: Cast iron or cast steel.
 - 2. Seat: Bronze or stainless steel.

3. Seat ring: Bronze or rubber (Buna-N).
4. Hinge: Stainless steel.
5. Cushion cylinder: Metallic corrosion resistant material.

D. Design Requirements:

1. Seat ring: Replaceable.
2. Hinge: Extend out both sides with lever and weight.
3. Cushion: [Air] [Oil] type with adjustable speed control.

2.4 DOUBLE DOOR CHECK VALVES

A. Class 250.

B. Manufacturers:

1. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - a. APCO Series 9000 (2 to 48 inches).
 - b. Nibco W920-W (2 to 24 inches).
 - c. Technocheck by Techno Corporation.

C. Materials:

1. Body: Cast iron [wafer] [threaded lug] style.
2. Doors:
 - a. 2 to 12 inches: Aluminum bronze.
 - b. 14 to 54 inches: Ductile iron, bronze faced.
3. Hinge and stop pins: Stainless steel, 316.
4. Spring: Stainless steel, T316.
5. Seat: Buna-N.

2.5 SILENT CHECK VALVES

A. ASME B16.1, Class 250.

B. Manufacturers:

1. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - a. APCO Series 300 or 600.
 - b. GA Industries, Figures 280 or 290.
2. Materials:
 - a. Body: Cast iron.
 - b. Plug and seat: Bronze.
 - c. Spring: Stainless steel.

C. Design Requirements:

1. Body type:
 - a. 1 to 10 inches: Wafer.
 - b. 3 to 30 inches: Flanged center guided, globe style.

2.6 RUBBER FLAPPER SWING CHECK VALVES: 2 INCHES TO 24 INCHES

A. ASME B16.1, Class 125 (175 psi).

B. Acceptable Manufacturer:

1. APCO Series 100.

C. Materials:

1. Body and cover: Cast iron.
2. Flapper: Buna-N, steel reinforced.

2.7 BALL CHECK VALVES: 1/2 INCHES TO 4 INCHES

A. Manufacturers:

1. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - a. R&G Sloane.
 - b. Corr Tech.
- B. Performance Criteria:
 1. Pressure Rating: 150 psi at 73 degrees F.
- C. Materials:
 1. Body: PVC.
 2. Ball: Glass filled or polypropylene.
 3. Seals: Viton or EPDM.
- D. Design Requirements:
 1. Connectors: Double union.

2.8 SOURCE QUALITY CONTROL

- A. Factory Tests and Inspections:
 1. Perform manufacturer's standard factory tests and inspections on materials and equipment furnished. Correct defects prior to shipment to the Site.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation – General:
 1. Provide check valves at locations shown and indicated in the Contract Documents.
 2. Install in accordance with the Contract Documents and manufacturer's written instructions. In event of conflict between the Contract Documents and manufacturer's written instructions, obtain written interpretation or clarification from Engineer.
 3. Before installing, ensure each check valve is clean and free of dirt and debris.

3.2 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
 1. Promptly after installing, before installing connecting pipe, verify proper and free operation of check valve.
 2. Hydrostatically test check valves together with associated piping.
 3. To extent practical, prior to Substantial Completion, verify proper operation of each installed check valve.

END OF SECTION

SECTION 46 33 11
CHEMICAL FEED - LIQUID SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Chemical metering pumps for: chlorination system.
 - 2. System accessories.
 - 3. Liquid chemical tanks:
 - a. Storage tanks.
 - b. Holding tanks.

1.2 QUALITY ASSURANCE

- A. Referenced Standards:
 - 1. National Electrical Manufacturers Association (NEMA):
 - a. 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. Secure and coordinate entire system including but not necessarily limited to metering pumps, electric equipment, controls, hardware, valving, and piping through the metering pump manufacturer.

1.3 SYSTEM DESCRIPTION

- A. System shall be supplied through a single source and include all components specified herein.

1.4 SUBMITTALS

- A. Shop Drawings:
 - 1. Drawings and product data:
 - a. Pump:
 - 1) Chemical resistance data for materials used.
 - 2) Complete performance information:
 - a) Capacity, operating range.
 - b) Pressure rating.
 - c) NPSH required.
 - d) Stroke speed, length.
 - e) Horsepower required.
 - f) Plunger diameter.
 - b. Valves.
 - c. Piping.
 - d. Control modes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
 - 1. Metering pumps and accessories:
 - a. Chem Con.
 - b. Milton Roy.

- c. Pulsafeeder.
 - d. Wallace and Tiernan.
- 2. Polymer blenders:
 - a. Stranco.
 - b. Wallace and Tiernan.
- 3. Tanks:
 - a. Storage tanks:
 - 1) Owens-Corning.
 - 2) Polycorr, Inc.
 - 3) Raven Industries.
 - 4) Red Ewald, Inc.
 - b. Holding tank:
 - 1) Nalgene Industrial Products.

2.2 METERING PUMPS

A. Pump Performance and Design Requirements:

- 1. Units shall have the following characteristics:
 - a. Heads/unit: 1.
 - b. Flow Switch Activated.
 - c. 1/4" Tubing.
 - d. Flow Capacity: 4 GPD.
 - e. Pressure Rating: 80 psi.
 - f. Conform to ANSI/NSF 61 & 372.
 - g. Basis of Design: Chemtech Series XP Peristaltic Metering Pump Model XP004
 - 1) Power Input: 115 VAC/60HZ, 1/6 HP.
 - 2) Shipping Weight: 8 lbs.

B. Pump Fabrication:

- 1. Pump:
 - a. Ball-check inlet and outlet valves.
 - b. Moving parts totally enclosed and self-lubricating.
 - c. Complete external control with 10:1 minimum manual stroke adjustment, adjustable while operating.
 - d. Capable of operating dry without damage to any component.
 - e. Repeatable accuracy: 1% of maximum output or better.
 - f. Nameplate with chemical, capacity (GPH) and pressure (PSI) ratings.
- 2. Drive:
 - a. Motors:
 - 1) TENV.
 - b. Speed reducers permanently lubricated.
 - c. Hydraulic drives to automatically vent gases and relieve excess pressures.
- 3. Support:
 - a. Mount pump and drive on common support plates.
 - b. Fabricate to withstand all operating loads.
 - c. Provide anchorage of support.
- 4. Controls:
 - a. Solenoid pumps:

- 1) ON-OFF switch with local speed control (0-100%).

C. Miscellaneous Accessories:

1. Dimensions (approximate):
 - 1) Height: 25 inches.
 - 2) Width: 16 inches.
 - 3) Length: 16 inches.
- b. Materials: 304 stainless or fiberglass reinforced plastic.
2. Main connection:
 - a. Corporation cock type.
 - b. Pipe NPT size: 1/4 inches DIA.
 - c. Provide corporation cock with compression fitting for solution tube.

2.3 TANKS

A. Fabrication (Fiberglass Reinforced Plastic):

1. Conform to referenced standards or specified requirements if more stringent.
2. Helical filament-wound side walls and contact molded top and base construction.
3. Minimum design safety factors and wall thickness per governing standard but not less than the following:
 - a. Internal pressure: 10:1.
 - b. External pressure: 5:1.
 - c. Seismic loads: 3:1.
4. Sufficient resin on all surfaces to prevent fiber exposure.
5. Ends fabricated integrally with shell, or separately and laminated to shell.
6. Joints made with heavy reinforced lay-ups for structural stability and to prevent leakage.
7. Inner surface layer: 10-20 mils thick.
 - a. Inner layer followed by laminate 80-90 mils thick, reinforced with noncontinuous chopped strand fiberglass.
 - b. Laminate layer resin content:
 - 1) 70-80%.
 - 2) Total thickness of two layers at least 100 mils.
8. Structurally reinforce walls with helical filament winding of continuous strands, tops, and bases with fiberglass mat and/or woven roving.
 - a. Thickness and glass content per tensile and flexural requirements.
9. Reinforcing ribs per manufacturer's recommendations.
10. Lifting lugs provided on tank.
11. Coated with protective gel coat, color as selected by Engineer.
12. Minimum wall thickness: 1/4 inches.

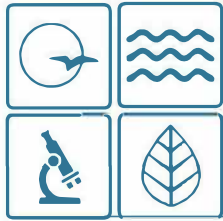
B. Tank Accessories:

1. General:
 - a. Location and size of piping connections as shown on Drawings.
 - b. Penetrations to be factory installed in accordance with referenced standards.
2. Storage tanks:
 - a. The following minimum trim features to be included:
 - 1) Fill port.
 - 2) Overflow port.
 - 3) Drain port, side bottom type.
 - 4) Suction port.

- 5) 24 inches diameter top manhole, quick-access type.
- 6) Mushroom type vent.
- 7) Side ladder attached to tank.
- 8) Fill pipe and conduit support attachment lugs.
- 9) All tank ports to be flange type.

END OF SECTION

APPENDIX 1



MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Michael L. Parson
Governor

Dru Buntin
Director

August 1, 2022

Leanne Mattern
Office of Administration, Facilities Management Design & Construction
Harry S. Truman SOB,
301 West High Street, Room 730
Jefferson City, MO 65102

Dear Permittee:

Pursuant to the Federal Water Pollution Control Act, under the authority granted to the State of Missouri and in compliance with the Missouri Clean Water Law, we have issued and are enclosing your Missouri State Operating Permit for Office of Administration, MOR-100038.

Please read and review your permit and attached Standard Conditions. They contain important information on site management and reporting requirements. Quarterly reports required by this report must be submitted through our eDMR system.

This permit may include requirements with which you may not be familiar. If you would like The Department of Natural Resources to meet with you to discuss how to satisfy the permit requirements, an appointment can be set up by contacting the permit writer at 573-526-1139. These visits are called Compliance Assistance Visits and focus on explaining the requirements to the permit holder.

This permit is both your Federal NPDES Permit and your new Missouri State Operating Permit and replaces all previous State Operating Permits issued for this facility under this permit number. In all future correspondence regarding this facility, please refer to your State Operating Permit number and facility name as shown on page one of the permit.

If you were adversely affected by this decision, you may be entitled to an appeal before the Administrative Hearing Commission (AHC) pursuant to 10 CSR 20-1.020 and 10 CSR 20-6.020; RSMo Section 621.250, 640.013, and 644.051.6. To appeal, you must file a petition with the AHC within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC. Contact information for the AHC is: Administrative Hearing Commission, Truman State Office Building, Room 640, 301 W. High Street, P.O. Box 1557, Jefferson City, Missouri 65102, phone: (573) 751-2422, fax: (573) 751-5018; website: <http://ahc.mo.gov/>.

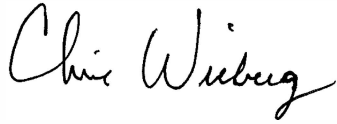


Office of Administration
Page Two

Please be aware that this facility may also be subject to any applicable county or other local ordinances or restrictions. If you have any questions concerning this permit, please do not hesitate to contact the Water Protection Program at P.O. Box 176, Jefferson City, MO 65102, 573-522-4502.

Sincerely,

WATER PROTECTION PROGRAM

A handwritten signature in cursive script that reads "Chris Wieberg". The signature is written in black ink and is positioned above the printed name and title.

Chris Wieberg
Director

CW/qs

Enclosure

STATE OF MISSOURI
DEPARTMENT OF NATURAL RESOURCES
MISSOURI CLEAN WATER COMMISSION



MISSOURI STATE OPERATING PERMIT

General Operating Permit

In compliance with the Missouri Clean Water Law, (Chapter 644 R.S. Mo as amended, hereinafter, the Law), and the Federal Water Pollution Control Act (Public Law 92-500, 92nd Congress) as amended,

Permit No MOR100038

Owner: OA-Facilities Mgmt, Design, and Construc
Address: 301 West High Street, Hst Rm 370
Jefferson City, MO 65101

Continuing Authority: OA Facilities Mgmt Design Construction
301 West High St.
HST SOB Rm 730
Jefferson City, MO 65102

Facility Name: Office of Administration
Facility Address: OA-FMDC, PO Box 809 301 W High street
JEFFERSON CITY, MO 65102

Legal Description: Land Grant 02681, Cole County
UTM Coordinates: 571840.000/4270368.000
Receiving Stream: Tributary to Wears Creek (U)
First Classified Stream - ID#: 100K Extent-Remaining Streams (C) 3960.00
USGS# and Sub Watershed#: 10300102 - 1304

is authorized to discharge from the facility described herein, in accordance with the effluent limitations and monitoring requirements as set forth herein.

FACILITY DESCRIPTION All Outfalls SIC #1629

All Outfalls - Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, filling and other activity that results in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution of waters of the state)

Issued to a city, county, state or federal agency, other governmental jurisdiction, or other private area-wide projects as determined by the Department on a case-by-case basis

This permit authorizes only wastewater, including storm water, discharges under the Missouri Clean Water Law and the National Pollutant Discharge Elimination System, it does not apply to other regulated areas. This permit may be appealed in accordance with RSMo Section 644.051.6 and 621.250, 10 CSR 20-6.020, and 10 CSR 20-1.020.

August 01, 2022

Issue Date

Chris Wieberg, Director
Water Protection Program

July 04, 2027

Expiration Date

I. APPLICABILITY

A. Permit Coverage and Authorized Discharges

1. This Missouri State Operating Permit (permit) authorizes the discharge of stormwater and certain non-stormwater discharges from land disturbance sites that disturb one or more acres, or disturb less than one acre when part of a larger common plan of development or sale that will disturb a cumulative total of one or more acres over the life of the project.

A Missouri State Operating Permit must be issued before any site vegetation is removed or the site disturbed. Any site owner/operator subject to these requirements for stormwater discharges and who disturbs land prior to permit issuance from the Missouri Department of Natural Resources (Department) is in violation of both State regulations per 10 CSR 20-6.200(1)(A) and Federal regulations per 40 CFR 122.26. The owner/operator of this permit is responsible for compliance with this permit [10 CSR 20-6.200 (3)(B)].

2. This general permit is issued to a city, county, state or federal agency, other governmental jurisdiction, or other private area-wide projects as determined by the Department on a case-by-case basis, for land disturbance projects performed by or under contract to the permittee.
3. This permit authorizes stormwater discharges from land disturbance support activities (e.g., equipment staging yards, material storage areas, excavated material disposal areas, borrow areas, concrete, or asphalt batch plants) provided appropriate stormwater controls are designed, installed, and maintained and the following conditions are met and addressed in the Stormwater Pollution Prevention Plan (SWPPP). The permittee is responsible for compliance with this permit for any stormwater discharges from construction support activity.
 - (a) The support activity is directly related to the construction site required to have permit coverage for stormwater discharges;
 - (b) The support activity is not a commercial operation or serve multiple unrelated construction sites;
 - (c) The support activity does not continue to operate beyond the completion of the construction activity at the project it supports;
 - (d) Sediment and erosion controls are implemented in accordance with the conditions of this permit; and
 - (e) The support activity is strictly stormwater discharges or non-stormwater discharges listed in PART I, APPLICABILITY, Condition A.4. Support activities which discharge process water shall apply for separate coverage (e.g., a concrete batch plant discharging process water shall be covered under a MOG49).
4. This permit authorizes non-stormwater discharges associated with your construction activity from the following activities provided that these discharges are treated by appropriate Best Management Practices (BMPs) where applicable and addressed in the permittee's site specific SWPPP required by this general permit:
 - (a) Discharges from emergency fire-fighting activities;
 - (b) Hydrant flushing and water line flushing, provided the discharged water is managed to avoid instream water quality impacts;
 - (c) Landscape watering, including to establish vegetation;
 - (d) Water used to control dust;
 - (e) Waters used to rinse vehicles and equipment, provided there is no discharge of soaps, solvents, or detergents used for such purposes;
 - (f) External building washdown, provided soaps, solvents, and detergents are not used, and external surfaces do not contain hazardous substances (e.g., paint or caulk containing polychlorinated biphenyls (PCBs))
 - (g) Pavement wash waters, provided spills or leaks of toxic or hazardous substances have not occurred (unless all spill material has been removed) and where soaps, solvents, and detergents are not used. Directing pavement wash waters directly into any water of the state, storm drain inlet, or stormwater conveyance (constructed or natural site drainage features), unless the conveyance is connected to an effective control, is prohibited;
 - (h) Uncontaminated air conditioning or compressor condensate;
 - (i) Uncontaminated, non-turbid discharges of ground water or spring water;
 - (j) Foundation or footing drains where flows are not contaminated with process materials; and
 - (k) Uncontaminated construction dewatering water discharged in accordance with requirements found in this permit for specific dewatering activities.

B. Permit Restrictions and Limitations

1. This permit does not authorize the discharge of process wastewaters, treated or otherwise.
2. For sites operating within the watershed of any Outstanding National Resource Water (which includes the Ozark National Riverways and the National Wild and Scenic Rivers System), sites that discharge to an Outstanding State Resource Water, or facilities located within the watershed of an impaired water as designated in the Clean Water Act (CWA) Section 303(d) list with an impairment for sedimentation/siltation:
 - (a) This permit authorizes stormwater discharge provided no degradation of water quality occurs due to discharges from the permitted facility per 10 CSR 20-7.031(3)(C).
 - (b) A site with a discharge found to be causing degradation or contributing to an impairment by discharging a pollutant of concern, during an inspection or through complaint investigations, may be required to become a no discharge facility or obtain a site-specific permit with more stringent monitoring and SWPPP requirements.
3. This permit does not allow placement of fill material into any stream or wetland, alteration of a stream channel, or obstruction of stream flow unless the appropriate CWA Section 404 permitting authority provides approval for such actions or determines such actions are exempt from Section 404 jurisdiction. Additionally, this permit does not authorize placement of fill in floodplains unless approved or determined exempt by appropriate federal and/or state floodplain development authorities.
4. This operating permit does not affect, remove, or replace any requirement of the National Environmental Policy Act; the Endangered Species Act; the National Historic Preservation Act; the Comprehensive Environmental Response, Compensation and Liability Act; the Resource Conservation and Recovery Act; or any other relevant acts. Determination of applicability to the above mentioned acts is the responsibility of the permittee. Additionally, this permit does not establish terms and conditions for runoff resulting from silvicultural activities listed in Section 402(l)(3)(a) of the Clean Water Act.
5. Compliance with all requirements in this permit does not supersede any requirement for obtaining project approval from an established local authority nor remove liability for compliance with county and other local ordinances.
6. The Department may require any facility or site authorized by a general permit to apply for a site-specific permit [10 CSR 20-6.010(13)(C)].
7. If a facility or site covered under a current general permit desires to apply for a site-specific permit, the facility or site may do so by contacting the Department for application requirements and procedures.
8. Any discharges not expressly authorized in this permit and not clearly disclosed in the permit application cannot become authorized or shielded from liability under CWA section 402(k) or Section 644.051.16, RSMo, by disclosure to EPA, state, or local authorities after issuance of this permit via any means, including any other permit applications, funding applications, the SWPPP, discharge monitoring reporting, or during an inspection. Discharges at the facility not expressly authorized by this permit must be covered by another permit, be exempt from permitting, or be authorized through some other method.

II. EXEMPTIONS FROM PERMIT REQUIREMENTS

1. Sites that discharge all stormwater runoff directly to a combined sewer system (as defined in 40 CFR 122.26 and 40 CFR 35.2005) connecting to a publicly owned treatment works which has consented to receive such a discharge are exempt from Department stormwater permit requirements.
2. Land disturbance activities that disturb less than one (1) acre of total land area which are not part of a common plan or sale where water quality standards are not exceeded are exempt from Department stormwater permit requirements.

3. Oil and gas related activities as listed in 40 CFR 122.26(a)(2)(ii) where water quality standards are not exceeded are exempt from Department stormwater permit requirements.
4. Linear, strip, or ribbon construction or maintenance operations meeting one (1) of the following criteria are exempt from Department stormwater permit requirements:
 - (a) Grading of existing dirt or gravel roads which does not increase the runoff coefficient and the addition of an impermeable surface over an existing dirt or gravel road;
 - (b) Cleaning or routine maintenance of roadside ditches, sewers, waterlines, pipelines, utility lines, or similar facilities;
 - (c) Trenches two (2) feet in width or less; or
 - (d) Emergency repair or replacement of existing facilities as long as BMPs are employed during the emergency repair.

III. REQUIREMENTS

1. The permittee shall post a public notification sign at the main entrance to the site, or a publically visible location, with the specific MOR100 permit number. The public notification sign must be visible from the public road that provides access to the site's main entrance. An alternate location is acceptable provided the public can see it and it is noted in the SWPPP. The public notification sign must remain posted at the site until the site is finalized.
2. The permittee shall be responsible for notifying the land owner and each contractor or entity (including utility crews and city employees or their agents) who will perform work at the site of the existence of the SWPPP and what actions or precautions shall be taken while on site to minimize the potential for erosion and the potential for damaging any BMP. The permittee is responsible for any damage a subcontractor may do to established BMPs and any subsequent water quality violation resulting from the damage.
3. Ensure the design, installation, and maintenance of effective erosion and sediment controls to minimize the discharge of pollutants. At a minimum, such controls must be designed, installed, and maintained to:
 - (a) Control stormwater volume, velocity, and peak flow rates to minimize soil erosion;
 - (b) Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion and scour;
 - (c) Minimize the amount of exposed soil during construction activity;
 - (d) Minimize the disturbance of steep slopes;
 - (e) Minimize sediment discharges from the site. Address factors such as:
 - 1) The amount, frequency, intensity, and duration of precipitation;
 - 2) The nature of resulting stormwater runoff;
 - 3) Expected flow from impervious surfaces, slopes, and drainage features; and
 - 4) Soil characteristics, including the range of soil particle size expected to be present on the site.
 - (f) Provide and maintain natural buffers around surface waters as detailed in Part V. BMP REQUIREMENTS Condition 7, direct stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration and filtering, unless infeasible; and
 - (g) Minimize soil compaction and preserve topsoil where practicable.

A 2-year, 24-hour storm event can be determined for the project location using the National Oceanic and Atmospheric Administration's National Weather Service Atlas 14 which can be located at https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html, or the permittee can determine local rainfall distribution for a 2-year, 24 hours storm event using multi-decade local high density rain gauge data, as approved by the Department.

4. BMPs for land disturbance [10 CSR 20-6.200(1)(D)2] are a schedule of activities, practices, or procedures that reduces the amount of soil available for transport or a device that reduces the amount of suspended solids in runoff before discharge to waters of the state. The term BMPs are also used to describe the sediment and erosion controls and other activities used to prevent stormwater pollution. BMPs are divided into two main categories: structural or non-structural; and they are also classified as temporary or permanent. Temporary BMPs may be added and removed as necessary with updates to the SWPPP as specified in the requirements below.

5. Installation of BMPs necessary to prevent soil erosion and sedimentation at the downgradient project boundary (e.g. buffers, perimeter controls, exit point controls, storm drain inlet protection) must be complete prior to the start of all phases of construction. By the time construction activity in any given portion of the site begins, downgradient BMPs must be installed and operational to control discharges from the initial site clearing, grading, excavating, and other earth-disturbing activities. Additional BMPs shall be installed as necessary throughout the life of the project.
6. All BMPs shall be maintained and remain in effective operating condition during the entire duration of the project, with repairs made within the timeframes specified elsewhere in this permit, until final stabilization has been achieved.
 - (a) Ensure BMPs are protected from activities that would reduce their effectiveness.
 - (b) Remove any sediment per the BMP manufacturer's instructions or before it has accumulated to one-half of the above-ground height of any BMP that collects sediment (i.e., silt fences, sediment traps, etc.)
 - (c) The project is considered to achieve final stabilization when Part V. BMP REQUIREMENTS, Condition 13 is met.
7. Minimize sediment trackout from the site and sediment transport onto roadways.
 - (a) Restrict vehicle traffic to designated exit points.
 - (b) Use appropriate stabilization techniques or BMPs at all points that exit onto paved roads or areas outside of the site.
 - (c) Use additional controls or BMPs to remove sediment from vehicle and equipment tires prior to exit from facility where necessary.
 - (d) Any sediment or debris that is tracked out past the exit pad or is deposited on a roadway after a precipitation event shall be removed by the shorter of either the same business day (for business days only), or by the end of the next business day if track-out occurs on a non-business day, and before predicted rain events. Remove the track-out sediment by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. Sediment or debris tracked out on pavement or other impervious surfaces shall not be disposed of into any stormwater conveyance, storm drain inlet, or water of the state.
 - (e) Stormwater inlets susceptible to receiving sediment or other pollutants from the permitted land disturbance site shall have curb inlet protection. This may include inlets off the active area where track out from vehicles and equipment could impact the stormwater runoff to those inlets.
8. Concrete washout facilities shall be used to contain concrete waste from the activities onsite, unless the washout of trucks and equipment is managed properly at an off-site location.

The washout facility shall be managed to prevent solid and/or liquid waste from entering waters of the state by the following:

 - (a) Direct the wash water into leak-proof containers or pits designed so that no overflows can occur due to inadequate sizing or precipitation;
 - (b) Locate washout activities away from waters of the state, stormwater inlets, and/or stormwater conveyances where practicable. If not practicable, use BMPs to reduce risk of waste leaving the washout facility;
 - (c) Washout facilities shall be cleaned, or new facilities must be constructed and ready for use, once the washout is 75% full;
 - (d) Designate the washout area(s) and conduct such activities only in these areas.
 - (e) Ensure contractors are aware of the location, such as by marking the area(s) on the map or signage visible to the truck and/or equipment operators.
9. Good housekeeping practices shall be maintained at all times to keep waste from entering waters of the state.
 - (a) Provide solid and hazardous waste management practices, including providing trash containers, regular site cleanup for proper disposal of solid waste such as scrap building material, product/material shipping waste, food/beverage containers, spent structural BMPs;
 - (b) Provide containers and methods for proper disposal of waste paints, solvents, and cleaning compounds.
 - (c) Manage sanitary waste. Portable toilets shall be positioned so that they are secure and will not be tipped or knocked over and so that they are located away from waters of the state and stormwater inlets and stormwater conveyances.
 - (d) Ensure the storage of construction materials be kept away from drainage courses, stormwater conveyances, storm drain inlets, and low areas.

10. All fueling facilities present shall at all times adhere to applicable federal and state regulations concerning underground storage, above ground storage, and dispensers.
11. Any hazardous wastes that are generated onsite shall be managed, stored, and transported according to the provisions of the Missouri Hazardous Waste Laws and Regulations.
12. Store all paints, solvents, petroleum products, petroleum waste products, and storage containers (such as drums, cans, or cartons) so they are not exposed to stormwater or provide other prescribed BMPs (such as plastic lids and/or portable spill pans) to prevent the commingling of stormwater with container contents. Commingled water may not be discharged under this permit. Provide spill prevention, control, and countermeasures to contain the spill. Any containment system used to implement this requirement shall be constructed of materials compatible with the substances contained and shall prevent the contamination of groundwater.
13. Implement measures intended to prevent the spillage or loss of fluids, oil, grease, fuel, etc. from vehicles and equipment to thereby prevent the contamination of stormwater from these substances. This may include prevention measures such as, but not limited to, utilizing drip pans under vehicles and equipment stored outdoors, covering fueling areas, using dry clean-up methods, use of absorbents, and cleaning pavement surfaces to remove oil and grease.
14. Spills, Overflows, and Other Unauthorized Discharges.
 - (a) Any spill, overflow, or other discharge not specifically authorized in the permit above are unauthorized.
 - (b) Should an unauthorized discharge cause or permit any contaminants, other than sediment, or hazardous substance to discharge or enter waters of the state, the unauthorized discharge must be reported to the regional office as soon as practicable but no more than 24 hours after the discovery of the discharge. If the spill or overflow needs to be reported after normal business hours or on the weekend, the facility must call the Department's Environmental Emergency Response hotline at (573) 634-2436. Leaving a message on a Department staff member voice-mail does not satisfy this reporting requirement.
 - (c) A record of all spills shall be retained with the SWPPP and made available to the Department upon request.
 - (d) Other spills not reaching waters of the state must be cleaned up as soon as possible to prevent entrainment in stormwater but are not required to be reported to the Department.
15. The full implementation of this operating permit shall constitute compliance with all applicable federal and state statutes and regulations in accordance with RSMo 644.051.16 and the CWA §402(k); however, this permit may be reopened and modified or alternatively revoked and reissued to comply with any applicable effluent standard or limitation issued or approved under Clean Water Act §§ 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) if the effluent standard or limitation so issued or approved contains different conditions or is otherwise more stringent than any effluent limitation in the permit or controls any pollutant not limited in the permit. This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, termination, notice of planned changes, or anticipated non-compliance does not stay any permit condition.

IV. STORMWATER POLLUTION PREVENTION PLAN (SWPPP) MANAGEMENT REQUIREMENTS

1. The primary requirement of this permit is the development and implementation of a SWPPP which incorporates site specific practices to best minimize the soil exposure, soil erosion, and the discharge of pollutants, including solids for each site covered under this permit.

The purpose of the SWPPP is to ensure the design, implementation, management, and maintenance of BMPs in order to prevent sediment and other pollutants in stormwater discharges associated with the land disturbance activities [40 CFR 122.44 (k)(4)] from entering waters of the state above established general and narrative criteria; compliance with Missouri Water Quality Standards; and compliance with the terms and conditions of this general permit.

- (a) **The SWPPP must be developed and implemented prior to conducting any land disturbance activities and must be specific to the land disturbance activities at the site.**
- (b) The permittee shall fully implement the provisions of the SWPPP required under this permit as a condition of this general permit throughout the term of the land disturbance project. Failure to develop, implement, and maintain a SWPPP may lead to immediate enforcement action.

- (c) The SWPPP shall be updated any time site conditions warrant adjustments to the project or BMPs.
 - (d) Either an electronic copy or a paper copy of the SWPPP, and any required reports, must be accessible to anyone on site at all times when land disturbance operations are in process or other operational activities that may affect the maintenance or integrity of the BMP structures and made available as specified under Part VIII. STANDARD PERMIT CONDITIONS, Condition 1 of this permit. The SWPPP shall be readily available upon request and should not be sent to the Department unless specifically requested
2. Failure to implement and maintain the BMPs chosen, which can be revised and updated, is a permit violation. The chosen BMPs will be the most reasonable and cost effective while also ensuring the highest quality water discharged attainable for the facility. Facilities with established SWPPPs and BMPs shall evaluate BMPs on a regular basis and change the BMPs as needed if there are BMP deficiencies.
3. The SWPPP must:
- (a) List and describe the location of all outfalls;
 - (b) List any allowable non-stormwater discharges occurring on site and where these discharges occur;
 - (c) Incorporate required practices identified below;
 - (d) Incorporate sediment and erosion control practices specific to site conditions;
 - (e) Discuss whether or not a 404 Permit is required for the project; and
 - (f) Name the person(s) responsible for inspection, operation, and maintenance of BMPs. The SWPPP shall list the names and describe the role of all owners/primary operators (such as general contractor, project manager) responsible for environmental or sediment and erosion control at the land disturbance site.
4. The SWPPP briefly must describe the nature of the land disturbance activity, including:
- (a) The function of the project (e.g., low density residential, shopping mall, highway, etc.);
 - (b) The intended sequence and timing of activities that disturb the soils at the site; and
 - (c) Estimates of the total area expected to be disturbed by excavation, grading, or other land disturbance support activities including off-site borrow and fill areas;
5. In order to identify the site, the SWPPP shall include site information including size in acres. The SWPPP shall have sufficient information to be of practical use to contractors and site construction workers to guide the installation and maintenance of BMPs.
6. The function of the SWPPP and the BMPs listed therein is to prevent or minimize pollution to waters of the state. A deficiency of a BMP means it was not effective in preventing or minimizing pollution of waters of the state.

The permittee shall select, install, use, operate and maintain appropriate BMPs for the permitted site. The following manuals are acceptable resources for the selection of appropriate BMPs.

Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites, (Document number EPA 833-R-06-004) published by the United States Environmental Protection Agency (USEPA) in May 2007. This manual as well as other information, including examples of construction SWPPPs, is available at the USEPA internet site at https://www.epa.gov/sites/production/files/2015-10/documents/sw_swppp_guide.pdf; and <https://www.epa.gov/npdes/developing-stormwater-pollution-prevention-plan-swppp>.

The latest version of *Protecting Water Quality: A field guide to erosion, sediment and stormwater best management practices for development sites in Missouri*, published by the Department. This manual is available at: <https://dnr.mo.gov/document-search/protecting-water-quality-field-guide>.

The permittee is not limited to the use of these guidance manuals. Other guidance publications may be used to select appropriate BMPs. However, all BMPs must be described and justified in the SWPPP. Although the use of these manuals or other resources is recommended and may be used for BMP selection, they do not supersede the conditions of this permit. They may be used to inform in the decision making process for BMP selection but they are not themselves part of the permit conditions.

The permittee may retain the SWPPP, inspection reports, and all other associated documents (including a copy of this permit) electronically pursuant to RSMo 432.255. The documents must be made available to all interested persons in either paper or electronic format as required by this permit and the permittee must remit a copy (electronic or otherwise) of the SWPPP and inspection reports to the Department upon request.

7. The SWPPP must contain a legible site map, multiple maps if necessary, identifying:
 - (a) Site boundaries of the property;
 - (b) Locations of all waters of the state (including wetlands) within the site and half a mile downstream of the site's outfalls;
 - (c) Location of all outfalls;
 - (d) Direction(s) of stormwater flow (use arrows) and approximate slopes before and after grading activities;
 - (e) Areas of soil disturbance and areas that will not be disturbed (or a statement that all areas of the site will be disturbed unless otherwise noted);
 - (f) Location of structural and non-structural BMPs, including natural buffer areas, identified in the SWPPP;
 - (g) Locations where stabilization practices are expected to occur;
 - (h) Locations of on-site and off-site material, waste, borrow, or equipment storage areas and stockpiles;
 - (i) Designated points where vehicles will exit the site;
 - (j) Location of stormwater inlets and conveyances including ditches, pipes, man-made conduits, and swales; and
 - (k) Areas where final stabilization has been achieved.
8. An individual shall be designated by the permittee as the environmental lead. This environmental lead shall have knowledge in erosion, sediment, and stormwater control principles, knowledge of the permit, and the site's SWPPP. The environmental lead shall ensure all personnel and contractors understand any requirements of this permit may be affected by the work they are doing. The environmental lead or designated inspector(s) knowledgeable in erosion, sediment, and stormwater control principles shall inspect all structures that function to prevent or minimize pollution of waters of the state.
9. Throughout coverage under this permit, the permittee shall amend and update the SWPPP as appropriate during the term of the land disturbance activity. All SWPPP modifications shall be signed and dated. The permittee shall amend the SWPPP to incorporate any significant site condition changes which impact the nature and condition of stormwater discharges. At a minimum, these changes include whenever the:
 - (a) Location, design, operation, or maintenance of BMPs is changed;
 - (b) Design of the construction project is changed that could significantly affect the quality of the stormwater discharges;
 - (c) The permittee's inspections indicate deficiencies in the SWPPP or any BMP;
 - (d) Department notifies the permittee in writing of deficiencies in the SWPPP;
 - (e) SWPPP is determined to be ineffective in minimizing or controlling erosion and sedimentation (e.g., there is visual evidence of excessive site erosion or sediment deposits in streams, lakes, or downstream waterways, sediment or other wastes off site); and/or
 - (f) Department determines violations of water quality standards may occur or have occurred.
10. Site Inspections: The environmental lead, or a designated inspector, shall conduct regularly scheduled inspections. These inspections shall be conducted by a qualified person, one who is responsible for environmental matters at the site, or a person trained by and directly supervised by the person responsible for environmental matters at the site. Site inspections shall include, at a minimum, the following:
 - (a) For disturbed areas that have not achieved final stabilization, all installed BMPs and other pollution control measures shall be inspected to ensure they are properly installed, appear to be operational, and are working as intended to minimize the discharge of pollutants.
 - (b) For areas on site that have achieved either temporary or final stabilization, while at the same time active construction continues on other areas, ensure that all stabilization measures are properly installed, appear to be operational, and are working as intended to minimize the discharge of pollutants.
 - (c) Inspect all material, waste, borrow, and equipment storage and maintenance areas that are covered by this permit. Inspect for conditions that could lead to spills, leaks, or other accumulations of pollutants on the site.
 - (d) Inspect all areas where stormwater typically flows within the site, including drainage ways designed to divert, convey, and/or treat stormwater.

- (e) All stormwater outfalls shall be inspected for evidence of erosion, sediment deposition, or impacts to the receiving stream. If a discharge is occurring during an inspection, the inspector must observe and document the visual quality of the discharge and take note of the characteristics of the stormwater discharge, including turbidity, color; odor; floating, settled, or suspended solids; foam; oil sheen; and other indicators of stormwater pollutants.
 - (f) When practicable the receiving stream shall also be inspected for a minimum of 50 feet downstream of the outfall.
 - (g) The perimeter of the site shall be inspected for evidence of BMP failure to ensure concentrated flow does not develop a new outfall.
 - (h) The SWPPP must explain how the environmental lead will be notified when stormwater runoff occurs.
11. Inspection Frequency: All BMPs must be inspected in accordance to one of the schedules listed below. The inspection frequency shall be documented in the SWPPP, and any changes to the frequency of inspections, including switching between the options listed below, must be documented on the inspection form:
- (a) At least once every seven (7) calendar days and within 48 hours after any storm event equal to or greater than a 2-year, 24-hour storm has ceased during a normal work day or within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday; or
 - (b) Once every 14 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches of precipitation or greater, or the occurrence of runoff from snowmelt. To determine if a storm event of 0.25 inches or greater has occurred on the site, the permittee shall either keep a properly maintained rain gauge on site, or obtain the storm event information from a weather station near the site location.
 - 1) Inspections are only required during the project's normal working hours.
 - 2) An inspection must be conducted within 24 hours of a storm event which has produced 0.25 inches. The inspection shall be conducted within 24 hours of the event end, or within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday.
 - 3) If it is elected to inspect every 14 calendar days and there is a storm event at the site that continues for multiple days, and each day of the storm produces 0.25 inches or more of rain, the permittee shall conduct an inspection within 24 hours of the end of the storm or within 72 hours if the rain event ceases during a non-work day such as a weekend or holiday.
 - (c) Areas on site that have achieved stabilization, while at the same time active construction continues on other areas, may reduce inspection frequency to monthly, for those stabilized areas, if the following conditions exist:
 - 1) For areas where disturbed portions have undergone temporary stabilization, inspections shall occur at least once a month while stabilized and when re-disturbed shall follow either frequency outlined in (a),(b), or (c) above.
 - 2) Areas on site that have achieved final stabilization must be inspected at least once per month until the permit is terminated.
 - (d) If construction activities are suspended due to frozen conditions, the permittee may temporarily reduce site inspections to monthly until thawing conditions begin to occur if all of the following are met:
 - 1) Land disturbances have been suspended; and
 - 2) All disturbed areas of the site have been stabilized in accordance with Part V. BMP REQUIREMENTS, Condition 13.
 - 3) The change shall be noted in the SWPPP.
 - (e) Any basin dewatering shall be inspected daily when discharge is occurring. The discharge shall be observed and dewatering activities shall be ceased immediately if the receiving stream is being impacted. These inspections shall be noted on a log or on the inspection report.

If weather conditions or other issues prevent correction of BMPs within seven calendar days, the reasons for the delay must be documented (including pictures), and there must be a narrative explaining why the work cannot be accomplished within the seven day time period. The documentation must be filed with the regular inspection reports. The corrections shall be made as soon as weather conditions or other issues allow.

12. Site Inspection Reports: A log of each inspection and/or copy of the inspection report shall be kept readily accessible and must be made available upon request by the Department. Electronic logs are acceptable as long as reports can be provided within 24 hours. If inspection reports are kept off site, the SWPPP must indicate where they are stored. The inspection report shall be signed by the environmental lead or designated inspector (electronically or otherwise).
- (a) The inspection report is to include the following minimum information:
 - 1) Inspector's name and title.
 - 2) Date and time of inspection.
 - 3) Observations relative to the effectiveness of the BMPs and stabilization measures. The following must be

documented:

- a. Whether BMPs are installed, operational, and working as intended;
 - b. Whether any new or modified stormwater controls are needed;
 - c. Facilities examined for conditions that could lead to spill or leak;
 - d. Outfalls examined for visual signs of erosion or sedimentation at outfalls. Excessive erosion or sedimentation may be due to BMP failure or insufficiency. Response to observations should be addressed in the inspection report.
- 4) Corrective actions taken or necessary to correct the observed problem.
 - 5) Listing of areas where land disturbance operations have permanently or temporarily stopped.
13. Any structural or maintenance deficiencies for BMPs or stabilization measures shall be documented and corrected as soon as possible but no more than seven (7) calendar days after the inspection.
- (a) Corrective action documentation shall be stored with the associated site inspection report.
 - (b) Immediately take all reasonable steps to address the condition, including cleaning up any contaminated surfaces so the material will not discharge in subsequent storm events.
 - (c) If weather conditions or other issues prevent correction of BMPs within seven calendar days, the reasons for the delay must be documented (this may include pictures) and there must be a narrative explaining why the work cannot be accomplished within the seven day time period. The permittee shall correct the problem as soon as weather conditions or issues allow.
 - (d) Corrective actions may be required by the Department. The permittee must comply with any corrective actions required by the Department as a result of permit violations found during an inspection.

V. BMP REQUIREMENTS

1. The information, practices, and BMP requirements in this section shall be implemented on site and, where noted, provided for in the SWPPP.
2. Existing vegetation and trees shall be preserved where practicable. The permittee is encouraged to preserve topsoil where practicable.
3. The permittee shall select appropriate BMPs for use at the site and list them in the SWPPP. When selecting effective BMPs, the permittee shall consider stormwater volume and velocity. A BMP that has demonstrated ineffectiveness in preventing or minimizing sediment or other pollutants from leaving a given site shall be replaced with a more effective BMP, or additional and sequential BMPs and treatment devices may be incorporated as site conditions allow. The permittee should consider a schedule for performing erosion control measures when selecting BMPs.
4. The SWPPP shall include a description of both structural and non-structural BMPs that will be used at the site.
 - (a) The SWPPP shall provide the following general information for each BMP which will be used one or more times at the site:
 - 1) Physical description of the BMP;
 - 2) Site conditions that must be met for effective use of the BMP;
 - 3) BMP installation/construction procedures, including typical drawings; and
 - 4) Operation and maintenance procedures and schedules for the BMP.
 - (b) The SWPPP shall provide the following information for each specific instance where a BMP is to be installed:
 - 1) Whether the BMP is temporary or permanent;
 - 2) When the BMP will be installed in relation to each phase of the land disturbance procedures to complete the project; and
 - 3) Site conditions that must be met before removal of the BMP if the BMP is not a permanent BMP.
5. Structural BMP Installation: The permittee shall ensure all BMPs are properly installed and operational at the locations and relative times specified in the SWPPP.
 - (a) Perimeter control BMPs for runoff from disturbed areas shall be installed before general site clearing is started. Note this requirement does not apply to earth disturbances related to initial site clearing and establishing entry, exit, or access of the site, which may require that stormwater controls be installed immediately after the earth

disturbance.

- (b) For phased projects, BMPs shall be properly installed as necessary prior to construction activities.
 - (c) Stormwater discharges which leave the site from disturbed areas shall pass through an appropriate impediment to sediment movement such as a sedimentation basin, sediment traps (including vegetative buffers), or silt fences prior to leaving the land disturbance site.
 - (d) A drainage course change shall be clearly marked on a site map and described in the SWPPP.
 - (e) If vegetative stabilization measures are being implemented, stabilization efforts are considered “installed” when all activities necessary to seed or plant the area are completed. Vegetative stabilization is not considered “operational” until the vegetation is established.
6. Install sediment controls along any perimeter areas of the site that are downgradient from any exposed soil or other disturbed areas. Prevent stormwater from circumventing the edge of the perimeter control. For sites where perimeter controls are infeasible, other practices shall be implemented to minimize discharges to perimeter areas of the site.
7. For surface waters of the state, defined in Section 644.016.1(27) RSMo, located on or adjacent to the site, the permittee must maintain a riparian buffer or structural equivalent in accordance with at least one of the following options. The selection and location must be described in the SWPPP.
- (a) Provide and maintain a 50-foot undisturbed natural buffer; or
 - (b) Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer; or
 - (c) If infeasible to provide and maintain an undisturbed natural buffer of any size, implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.
 - (d) The permittee is not required to comply with (a), (b), or (c) above if one or more of the following exceptions apply and documentation is provided in the SWPPP:
 - 1) As authorized per CWA Section 404 Department of the Army permit and its associated Section 401 Water Quality Certification from the Department.
 - 2) If there is no discharge of stormwater to waters of the state through the area between the disturbed portions of the site and waters of the state located within 50 feet of the site. This includes situations where the permittee has implemented permanent control measures that will prevent such discharges, such as a berm or other barrier.
 - 3) Where no natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for the current development of the site.
 - a. Where some natural buffer exists but portions of the area within 50 feet of the waters of the state are occupied by preexisting development disturbances the permittee is required to comply with (a), (b), or (c) above.
 - 4) For linear projects where site constraints make it infeasible to implement a buffer or equivalent provided the permittee limit disturbances within 50 feet of any waters of the state and/or the permittee provides supplemental erosion and sediment controls to treat stormwater discharges from earth disturbances within 50 feet of the water of the state. The permittee must also document in the SWPPP the rationale for why it is infeasible for the permittee to implement (a), (b), or (c) and describe any buffer width retained and supplemental BMPs installed.
 - (e) Where the permittee is retaining a buffer of any size, the buffer should be measured perpendicularly from any of the following points, whichever is further landward from the water:
 - 1) The ordinary high water mark of the water body, defined as the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris; or
 - 2) The edge of the stream or river bank, bluff, or cliff, whichever is applicable.
8. Slopes for disturbed areas must be identified in the SWPPP. A site map or maps defining the sloped areas for all phases of the project must be included in the SWPPP. The disturbance of steep slopes shall be minimized.
9. Manage stockpiles or land clearing debris piles composed, in whole or in part, of sediment and/or soil.
- (a) Locate the piles outside of any natural buffers zones, established under the condition above, and away from any stormwater conveyances, drain inlets, and areas where stormwater flow is concentrated;
 - (b) Install a sediment barrier along all downgradient perimeter areas;
 - (c) Divert surface flows around stockpiles to reduce and minimize erosion of the stockpile.

- (d) For piles that will be unused for 14 or more days, provide cover with appropriate temporary stabilization in accordance with Part V. BMP REQUIREMENTS, Condition 13.
 - (e) Rinsing, sweeping, or otherwise placing any soil, sediment, debris, or stockpiled product which has accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or water of the state is prohibited.
10. The site shall include BMPs for pollution prevention measures and shall be noted in the SWPPP. At minimum such measures must be designed, installed, implemented, and maintained to:
- (a) Minimize the discharge of pollutants from equipment and vehicle rinsing; no detergents, additives, or soaps of any kind shall be discharged. Rinse waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
 - (b) Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater;
 - (c) Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures, including, but not limited to, the installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers; and
 - (d) Prevent discharges from causing or contributing to an exceedance of water quality standards including general criteria.
11. Sedimentation Basins: The SWPPP shall include a sedimentation basin for each drainage area with ten or more acres disturbed at one time.
- (a) The sedimentation basin shall be sized, at a minimum, to treat a local 2-year, 24-hour storm.
 - (b) Sediment basins shall not be constructed in any waters of the state or natural buffer zones.
 - (c) Discharges from dewatering activities shall be managed by appropriate controls. The SWPPP shall include a description of any anticipated dewatering methods and specific BMPs designed to treat dewatering water.
 - 1) Appropriate controls include, but are not limited to, sediment socks, dewatering tanks, tube settlers, weir tanks, filtration systems (e.g. bag or sand filters), and passive treatment systems that are designed to remove or retain sediment.
 - 2) Erosion controls and velocity dissipation devices (e.g., check dams, riprap, and vegetated buffers) to minimize erosion at inlets, outlets, and discharge points from shall be utilized.
 - 3) Water with an oil sheen shall not be discharged and shall be marked in SWPPP.
 - 4) Visible floating solids and foam shall not be discharged.
 - (d) Until final stabilization has been achieved, sediment basins and impoundments shall utilize outlet structures or floating skimmers that withdraw water from the surface when discharging.
 - 1) Under frozen conditions, it may be considered infeasible to withdraw water from the surface and an exception can be made for that specific period as long as discharges that may contain sediment and other pollutants are managed by appropriate controls. If determined infeasible due to frozen conditions, documentation must be provided in the SWPPP to support the determination, including the specific conditions or time period when this exception applies.
 - (e) Accumulated sediment shall not exceed 50% of total volume or as prescribed in the design, whichever is less. Note in the SWPPP the locations for disposal of the material removed from sediment basins.
 - (f) Prevent discharges to the receiving stream causing excessive visual turbidity. For the purposes of this permit, visual turbidity refers to a sediment plume or other cloudiness in the water caused by sediment that can be identified by an observer.
 - (g) The SWPPP shall require the basin be maintained until final stabilization of the disturbed area served by the basin.

Where use of a sediment basin is infeasible, the SWPPP shall evaluate and specify other similarly effective BMPs to be employed to control erosion and sediment. These similarly effective BMPs shall be selected from appropriate BMP guidance documents authorized by this permit. The BMPs must provide equivalent water quality protection to achieve compliance with this permit. The SWPPP shall require both temporary and permanent sedimentation basins to have a stabilized spillway to minimize the potential for erosion of the spillway or basin embankment.

12. Soil disturbing activities on site that have ceased either temporarily or permanently shall initiate stabilization immediately in accordance with the options below. For soil disturbing activities that have been temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days:
 - (a) The permittee shall construct BMPs to establish interim stabilization; and
 - (b) Stabilization must be initiated immediately and completed within 14 calendar days.
 - (c) For soil disturbing activities that have been permanently ceased on any portion of the site, final stabilization of disturbed areas must be initiated immediately and completed within 14 calendar days.
 - 1) Allowances to the 14-day completion period for temporary and final stabilization may be made due to weather and equipment malfunctions. The use of allowances shall be documented in the SWPPP. Allowances may be determined unnecessary after review by the Department.
 - (d) Until stabilization is complete, interim sediment control shall consist of well-established and maintained BMPs that are reasonably certain to protect waters of the state from sediment pollution over an extended period of time. This may require adding more BMPs to an area than is normally used during daily operations. The types of BMPs used must be suited to the area disturbed, taking into account the number of acres exposed and the steepness of the slopes. If the slope of the area is greater than 3:1 (three feet horizontal to one foot vertical), then the permittee shall establish interim stabilization within seven days of ceasing operations on that part of the site. The following activities would constitute the immediate initiation of stabilization:
 - 1) Prepping the soil for vegetative or non-vegetative stabilization as long as seeding, planting, and/or installation of non-vegetative stabilization products takes place as soon as practicable;
 - 2) Applying mulch or other non-vegetative product to the exposed areas;
 - 3) Seeding or planting the exposed areas;
 - 4) Finalizing arrangements to have stabilization product fully installed in compliance with the deadlines for completing stabilization.
 - (e) If vegetative stabilization measures are being implemented, stabilization is considered "installed" when all activities necessary to seed or plant the area are completed. Installed does not mean established.
 - (f) If non-vegetative stabilization measures are being implemented, stabilization is considered "installed" when all such measures are implemented or applied.
 - 1) Non-vegetative stabilization shall prevent erosion and shall be chosen for site conditions, such as slope and flow of stormwater.
 - (g) Final stabilization is not considered achieved until vegetation has grown and established to meet the requirements below.
13. Prior to removal of BMPs, ceasing site inspections, and removing from the quarterly report, final stabilization must be achieved. Final stabilization shall be achieved as soon as possible once land disturbance activities have ceased. Document in the SWPPP the type of stabilization and the date final stabilization is achieved.
 - (a) The project is considered to have achieved final stabilization when perennial vegetation (excluding volunteer vegetation), pavement, buildings, or structures using permanent materials (e.g., riprap, gravel, etc.) cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetation must be at least 70% coverage of 100% of the vegetated areas on site. Vegetation must be evenly distributed.
 - (b) Disturbed areas on agricultural land are considered to have achieved final stabilization when they are restored to their preconstruction agricultural use. If former agricultural land is changing to non-agricultural use, this is no longer considered agricultural land and shall follow condition (a).
 - (c) If the intended function of a specific area of the site necessitates that it remain disturbed, final stabilization is considered achieved if all of the following are met:
 - 1) Only the minimum area needed remains disturbed (i.e., dirt access roads, motocross tracks, utility pole pads, areas being used for storage of vehicles, equipment, materials). Other areas must meet the criteria above.

- 2) Permanent structural BMPs (e.g., rock checks, berms, grading, etc.) or non-vegetative stabilization measures are implemented and designed to prevent sediment and other pollutants from entering waters of the state.
- 3) Inspection requirements in Part IV. SWPPP MANAGEMENT REQUIREMENT, Condition 11 are met and documented in the SWPPP.
- (d) Winter weather and frozen conditions do not excuse any of the above final stabilization requirements. If vegetation is required for stabilization the permittee must maintain BMPs throughout winter weather and frozen conditions until thawing and vegetation meets final stabilization criteria above. Document stabilization attempts during frozen conditions in the SWPPP. Consider future freezing when removing vegetation and plan with temporary stabilization techniques before the ground becomes frozen.

VI. SITE FINALIZATION & PERMIT TERMINATION

1. Until a site is finalized, the permittee must comply with all conditions in the permit, including continuation of site inspections and reporting quarterly to the Department. To finalize the site and remove from this permit coverage, the site shall meet the following requirements:
 - (a) For any areas that (1) were disturbed during construction, (2) are not covered over by permanent structures, and (3) over which the permittee had control during the construction activities, the requirements for final vegetative or non-vegetative stabilization in Part V. BMP REQUIREMENTS, Condition 13;
 - (b) The permittee has removed and properly disposed of all construction materials, waste, and waste handling devices and has removed all equipment and vehicles that were used during construction, unless intended for long-term beyond construction phase;
 - (c) The permittee has removed all temporary BMPs that were installed and maintained during construction, except those that are intended for long-term use or those that are biodegradable; and
 - (d) The permittee has removed all potential pollutants and pollutant-generating activities associated with construction, unless needed for long-term use following the construction activities.
2. The permit may be terminated if;
 - (a) There has been a transfer of control of all areas of the site for which the current permittee is responsible under this permit to another operator, and that operator has obtained coverage under this permit;
 - (b) Active sites obtain coverage under an individual or alternative general NPDES permit, with land disturbance conditions; or
 - (c) This permit may be terminated when all projects covered under this permit are finalized. In order to terminate the permit, the permittee shall notify the Department by submitting a Request for Termination along with the final quarterly report for the current calendar quarter.

VII. REPORTING AND SAMPLING REQUIREMENTS

1. The permittee is not required to sample stormwater under this permit. The Department may require sampling and reporting as a result of illegal discharges, compliance issues related to water quality concerns, or evidence of off-site impacts from activities at a site. If such an action is needed, the Department will specify in writing the sampling requirements, including such information as location and extent. If the permittee refuses to perform sampling when required, the Department may terminate the general permit and require the facility to obtain a site-specific permit with sampling requirements.
2. Electronic Discharge Monitoring Report (eDMR) Submission System. The NPDES Electronic Reporting Rule, 40 CFR Part 127, reporting of any report required by the permit shall be submitted via an electronic system to ensure timely, complete, accurate, and nationally consistent set of data for the NPDES program. The eDMR system is currently the only Department-approved reporting method for this permit unless specified elsewhere in this permit, or a waiver is granted by the Department. The facility must register in the Department's eDMR system through the Missouri Gateway for Environmental Management (MoGEM) before the first report is due.
3. Permittees shall prepare a quarterly report with a list of active land disturbance sites including any off-site borrow or depositional areas associated with the construction project and submit the following information electronically as an

attachment to the eDMR system until such a time when the current or a new system is available to allow direct input of the data:

- (a) The name of the project;
- (b) The location of the project (including the county);
- (c) The name of the primary receiving water(s) for each project;
- (d) A description of the project;
- (e) The number of acres disturbed;
- (f) The percent of completion of the project; and
- (g) The projected date of completion.

The quarterly report(s) shall be maintained by the permittee and readily available for review by the Department at the address provided on the application as well as submitted quarterly via the Department's eDMR system. The permittee shall submit quarterly reports according to Table A.

Table A	Schedule for Quarterly Reporting
Activity for the months of:	Report is due:
January, February, March (1st Quarter)	April 28
April, May, June (2nd Quarter)	July 28
July, August, September (3rd Quarter)	October 28
October, November, December (4th Quarter)	January 28

VIII. STANDARD PERMIT CONDITIONS

1. **Records:** The permittee shall retain copies of this general permit, the SWPPP and all amendments for the site named in the State Operating Permit, results of any monitoring and analysis, and all site inspection records required by this general permit.
 - (a) The records shall be accessible during normal business hours and retained for a period of at least three (3) years from the date of termination.
 - (b) The permittee shall provide a copy (electronic or otherwise) of the SWPPP to the Department, USEPA, or any local agency or government representative if they request a copy in the performance of their official duties within 24 hours of the request (or next working day), unless given more time by the representative.
 - (c) The permittee shall provide a copy of the SWPPP to those who are responsible for installation, operation, or maintenance of any BMP. The permittee, their representative, and/or the contractor(s) responsible for installation, operation and maintenance of the BMPs shall have a current copy of the SWPPP with them when on the project site.
2. **Land Ownership and Change of Ownership:** Federal and Missouri stormwater regulations [10 CSR 20-6.200(1) (B)] require a stormwater permit and erosion control measures for all land disturbances of one or more acres. These regulations also require a permit for less than one acre lots if the lot is part of a larger common plan of development or sale where that plan is at least one acre in size.
 - (a) If the permittee sells any portion of a permitted site to a developer for commercial, industrial, or residential use, this land remains a part of the common sale and the new owner must obtain a permit prior to conducting any land disturbance activity. Therefore, the original permittee must amend the SWPPP to show that the property has been sold and, therefore, no longer under the original permit coverage.
 - (b) Property of any size which is part of a larger common plan of development where the property has achieved final stabilization and the original permit terminated will require application of a new land disturbance permit for any future land disturbance activity unless the activity is by an individual residential building lot owner on a site less than one acre.
 - (c) If a portion of a larger common plan of development is sold to an individual for the purpose of building his or her own private residence, a permit is required if the portion of land sold is equal to or greater than one acre. No permit is required, however, for less than one acre of land sold.
3. **Permit Transfer:** This permit may not be transferred to a new owner.

4. Termination: This permit may be terminated when the project has achieved final stabilization, defined in Part VI. SITE FINALIZATION & PERMIT TERMINATION.
 - (a) In order to terminate the permit, the permittee shall notify the Department by submitting the form Request for Termination of Operating Permit Form MO 780-2814. The form should be submitted to the appropriate regional office or through an approved electronic system if it should become available.
 - (b) The Cover Page (Certificate Page) of the Master General Permit for Land Disturbance specifies the “effective date” and the “expiration date” of the Master General Permit. The “issued date” along with the “expiration date” will appear on the State Operating Permit issued to the applicant. **This permit does not continue administratively beyond the expiration date.**
5. Duty to Reapply: If the project or development completion date will be after the expiration date of this general permit, then the permittee must reapply to the Department for a new permit. This permit may be applied for and issued electronically in accordance with Section 644.051.10, RSMo.
 - (a) Due to the nature of the electronic permitting system, a period of time may be granted at the discretion of the Department in order to apply for a new permit after the new version is effective. Applicants must maintain appropriate best management practices and inspections during the discretionary period.
6. Duty to Comply: The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Missouri Clean Water Law and Federal Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.
7. Modification, Revocation, and Reopening:
 - (a) If at any time the Department determines that the quality of waters of the state may be better protected by reopening this permit, or revoking this permit and requiring the owner/operator of the permitted site to apply for a site-specific permit, the Department may revoke a general permit and require any person to obtain such an operating permit as authorized by 10 CSR20-6.010(13) and 10 CSR 20-6.200(1)(B).
 - (b) If this permit is reopened, modified, or revoked pursuant to this Section, the permittee retains all rights under Chapter 536 and 644 Revised Statutes of Missouri upon the Department’s reissuance of the permit as well as all other forms of administrative, judicial, and equitable relief available under law.
8. Other Information: Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or information.
9. Duty to Provide Information: The permittee shall furnish to the Department, within 24 hours unless explicitly granted more time in writing, any information which the Department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Department upon request, copies of records required to be kept by this permit.
10. Inspection and Entry: The permittee shall allow the Department, or an authorized representative (including an authorized contractor acting as a representative of the Department), upon presentation of credentials and other documents as may be required by law, to:
 - (a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of the permit;
 - (b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
 - (c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
 - (d) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Federal Clean Water Act or Missouri Clean Water Law, any substances or parameters at any location.

11. Signatory Requirement:

- (a) All permit applications, reports required by the permit, or information requested by the Department shall be signed and certified. (See 40 CFR 122.22 and 10 CSR 20-6.010)
- (b) The Federal Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit (including monitoring reports or reports of compliance or non-compliance) shall, upon conviction, be punished by a fine of not more than \$10,000 per violation, or by imprisonment for not more than six (6) months per violation, or by both.
- (c) The Missouri Clean Water Law provides that any person who knowingly makes any false statement, representation or certification in any application, record, report, plan, or other document filed or required to be maintained pursuant to sections 644.006 to 644.141 shall, upon conviction, be punished by a fine of not more than ten thousand dollars, or by imprisonment for not more than six months, or by both.

12. Property Rights: This permit does not convey any property rights of any sort or any exclusive privilege.

13. Notice of Right to Appeal: If you were adversely affected by this decision, you may be entitled to pursue an appeal before the administrative hearing commission (AHC) pursuant to Sections 621.250 and 644.051.6 RSMo. To appeal, you must file a petition with the AHC within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC. Any appeal should be directed to:

Administrative Hearing Commission
U.S. Post Office Building, Third Floor
131 West High Street, P.O. Box 1557
Jefferson City, MO 65102-1557
Phone: 573-751-2422
Fax: 573-751-5018
Website: <https://ahc.mo.gov>



MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

STORMWATER DISCHARGES FROM
THIS LAND DISTURBANCE SITE ARE
AUTHORIZED BY THE MISSOURI
STATE OPERATING PERMIT NUMBER:

ANYONE WITH QUESTIONS OR
CONCERNS ABOUT STORMWATER
DISCHARGES FROM THIS SITE,
PLEASE CONTACT THE MISSOURI
DEPARTMENT OF NATURAL
RESOURCES AT

1-800-361-4827

**MISSOURI DEPARTMENT OF NATURAL RESOURCES
FACT SHEET FOR MASTER GENERAL PERMIT
MO-R100xxx**

The Federal Water Pollution Control Act [Clean Water Act (CWA)] Section 402 of Public Law 92-500 (as amended) established the National Pollution Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States and the release of stormwater from certain point sources. All such discharges are unlawful without a permit (Section 301 of the CWA). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (MSOPs) are issued by the Missouri Department of Natural Resources (Department) under an approved program operated in accordance with federal and state laws (Federal CWA and Missouri Clean Water Law Section 644 as amended). Permits are issued for a period of five (5) years unless otherwise specified.

Per 40 CFR 124.56, 40 CFR 124.8, and 10 CSR 20-6.020(1)(A)2, a Fact Sheet shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the permit. A Fact Sheet is not an enforceable part of an MSOP.

DEFINITIONS FOR THE PURPOSES OF THIS PERMIT:

Common Promotional Plan: A plan undertaken by one (1) or more persons to offer lots for sale or lease; where land is offered for sale by a person or group of persons acting in concert, and the land is contiguous or is known, designated, or advertised as a common unit or by a common name or similar names, the land is presumed, without regard to the number of lots covered by each individual offering, as being offered for sale or lease as part of a common promotional plan.

Dewatering: The act of draining rainwater and/or groundwater from basins, building foundations, vaults, and trenches.

Effective Operating Condition: For the purposes of this permit, a stormwater control is kept in effective operating condition if it has been implemented and maintained in such a manner that it is working as designed to minimize pollutant discharges.

Emergency-Related Project: A project initiated in response to a public emergency (e.g. earthquakes, extreme flooding conditions, tornado, disruptions in essential public services, pandemic) for which the related work requires immediate authorization to avoid imminent endangerment to human health/safety or the environment or to reestablish essential public services.

Exposed Soils: For the purposes of this permit, soils that as a result of earth-disturbing activities are left open to the elements.

Immediately: For the purposes of this permit, immediately should be defined as within 24 hours.

Impervious Surface: For the purpose of this permit, any land surface with a low or no capacity for soil infiltration including, but not limited to, pavement, sidewalks, parking areas and driveways, packed gravel or soil, or rooftops.

Infeasible: Infeasible means not technologically possible or not economically practicable and achievable in light of best industry practices.

Install or Installation: When used in connection with stormwater controls, to connect or set in position stormwater controls to make them operational.

Land Disturbance Site or Site: The land or water area where land disturbance activities will occur and where stormwater controls will be installed and maintained. The land disturbance site includes construction support activities, which may be located at a different part of the property from where the primary land disturbance activity will take place or on a different piece of property altogether. Off-site borrow areas directly and exclusively related to the land disturbance activity are part of the site and must be permitted.

Larger Common Plan of Development or Sale: A continuous area where multiple separate and distinct construction activities are occurring under one plan, including any off-site borrow areas that are directly and exclusively related to the land disturbance activity. Off-site borrow areas utilized for multiple different land disturbance projects are considered their own entity and are not part of the larger common plan of development or sale. See definition of Common Promotional Plan to understand what a 'common plan' is.

Minimize: To reduce and/or eliminate to the extent achievable using stormwater controls that are technologically available and economically practicable and achievable in light of best industry practices.

Non-structural Best Management Practices (BMPs): Institutional, educational, or pollution prevention practices designed to limit the amount of stormwater runoff or pollutants that are generated in the landscape. Examples of non-structural BMPs include picking up trash and debris, sweeping up nearby sidewalks and streets, maintaining equipment, and training site staff on stormwater control practices.

Operational: for the purposes of this permit, stormwater controls are made "operational" when they have been installed and implemented, are functioning as designed, and are properly maintained.

Ordinary High Water Mark: The line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris.

Peripheral: For the purposes of this permit, peripheral should be defined as the outermost boundary of the area that will be disturbed.

Permanently: For the purposes of this permit, permanently is defined as any activity that has been ceased without any intentions of future disturbance.

Pollution Prevention Controls (or Measures): Stormwater controls designed to reduce or eliminate the addition of pollutants to construction site discharges through analysis of pollutant sources, implementation of proper handling/disposal practices, employee education, and other actions.

Qualified Person (inspections): A person knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention who possesses the appropriate skills and training to assess conditions at the construction site that could impact stormwater quality and the appropriate skills and training to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.

Stormwater Control (also referred to as sediment/erosion controls): refers to any temporary or permanent BMP or other method used to prevent or reduce the discharge of pollutants to waters of the state.

Structural BMP: Physical sediment/erosion controls working individually or as a group (treatment train) appropriate to the source, location, and area climate for the pollutant to be controlled. Examples of structural BMPs include silt fences, sedimentation ponds, erosion control blankets, and seeding.

Temporary Stabilization: A condition where exposed soils or disturbed areas are provided temporary vegetation and/or non-vegetative protective cover to prevent erosion and sediment loss. Temporary stabilization may include temporary seeding, geotextiles, mulches, and other techniques to reduce or eliminate erosion until either final stabilization can be achieved or until further construction activities take place to re-disturb this area.

Treatment Train: A multi-BMP approach to managing the stormwater volume and velocity and often includes erosion prevention and sediment control practices often applied when the use of a single BMP is inadequate in preventing the erosion and transport of sediment. A good option to utilize as a corrective action.

Volunteer Vegetation: A volunteer plant is a plant that grows on its own, rather than being deliberately planted for stabilization purposes. Volunteers often grow from seeds that float in on the wind, are dropped by birds, or are inadvertently mixed into soils. Commonly, volunteer vegetation is referred to as ‘weeds’. This does not meet the requirements for final stabilization.

Waters of the State: Section 644.016.1(27) RSMo. defines waters of the state as, “All waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common.”

PART I – BASIC PERMIT INFORMATION

Facility Type: Industrial Stormwater; Land Disturbance
Facility SIC Code(s): 1629
Facility Description: Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, filling, and other activities that result in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution to waters of the state).

This permit establishes a Stormwater Pollution Prevention Plan (SWPPP) requirement for pollutants of concern from this type of facility or for all facilities and sites covered under this permit. 10 CSR 20-6.200(7) specifies “general permits shall contain BMP requirements and/or monitoring and reporting requirements to keep the stormwater from becoming contaminated”.

Land disturbance activities include clearing, grubbing, excavating, grading, filling and other activities that result in the destruction of the root zone and/or other activities that are reasonably certain to cause pollution to waters of the state. A Missouri State Operating Permit for land disturbance permit is required for construction disturbance activities of one or more acres or for construction activities that disturb less than one acre when they are part of a larger common plan of development or sale that will disturb a cumulative total of one or more acres over the life of the project.

The primary requirement of a land disturbance permit is the development of a SWPPP which incorporates site-specific BMPs to minimize soil exposure, soil erosion, and the discharge of pollutants. The SWPPP ensures the design, implementation, management, and maintenance of BMPs in order to prevent sediment and other pollutants from leaving the site.

When it precipitates, stormwater washes over the loose soil on a construction site and various other materials and products being stored outside. As stormwater flows over the site, it can pick up pollutants like sediment, debris, and chemicals from the loose soil and transport them to nearby storm sewer systems or directly into rivers, lakes, or coastal waters.

The Missouri Department of Natural Resources is responsible for ensuring that construction site operators have the proper stormwater controls in place so that construction can proceed in a way that protects your community's clean water and the surrounding environment. One way the department helps protect water quality is by issuing land disturbance permits.

Local conditions are not considered when developing conditions for a general permit. A facility may apply for a site-specific permit if they desire a review of site-specific conditions.

PART II – RECEIVING STREAM INFORMATION

APPLICABLE DESIGNATIONS OF WATERS OF THE STATE:

Per Missouri Effluent Regulations (10 CSR 20-7.015), the waters of the state are divided into seven (7) categories. This permit applies to facilities discharging to the following water body categories:

- ✓ Missouri or Mississippi River [10 CSR 20-7.015(2)]
- ✓ Lakes or Reservoirs [10 CSR 20-7.015(3)]
- ✓ Losing Streams [10 CSR 20-7.015(4)]
- ✓ Metropolitan No-Discharge Streams [10 CSR 20-7.015(5)]
- ✓ Special Streams [10 CSR 20-7.015(6)]
- ✓ Subsurface Waters [10 CSR 20-7.015(7)]
- ✓ All Other Waters [10 CSR 20-7.015(8)]

Missouri Water Quality Standards (10 CSR 20-7.031) defines the Clean Water Commission water quality objectives in terms of "water uses to be maintained and the criteria to protect those uses." The receiving stream and/or 1st classified receiving stream's designated water uses shall be maintained in accordance with 10 CSR 20-7.031(24). A general permit does not take into consideration site-specific conditions.

MIXING CONSIDERATIONS:

This permit applies to receiving streams of varying low flow conditions. Therefore, the effluent limitations must be based on the smallest low flow streams considered, which includes waters without designated uses. As such, no mixing is allowed [10 CSR 20-7.031(5)(A)4.B.(I)(a)]. No Zone of Initial Dilution is allowed. [10 CSR 20-7.031(5)(A)4.B.(I)(b)].

RECEIVING STREAM MONITORING REQUIREMENTS:

There are no receiving water monitoring requirements recommended at this time.

PART III – RATIONALE AND DERIVATION OF EFFLUENT LIMITATIONS & PERMIT CONDITIONS

305(B) REPORT, 303(d) LIST, & TOTAL MAXIMUM DAILY LOAD (TMDL):

Section 305(b) of the Federal CWA requires each state identify waters not meeting Water Quality Standards and for which adequate water pollution controls have not been required. Water Quality Standards protect such beneficial uses of water as whole body contact, maintaining fish and other aquatic life, and providing drinking water for people, livestock, and wildlife. The 303(d) list helps state and federal agencies keep track of waters which are impaired but not addressed by normal water pollution control programs.

A TMDL is a calculation of the maximum amount of a given pollutant a body of water can absorb before its water quality is affected. If a water body is determined to be impaired as listed on the 303(d) list, then a watershed management plan will be developed which shall include the TMDL calculation. For facilities with an existing general permit before a TMDL is written on their receiving stream, the Department will evaluate the permit and may require any facility authorized by this general permit to apply for and obtain a site-specific operating permit.

ANTI-BACKSLIDING:

A provision in the Federal Regulations [CWA Section 303(d)(4); CWA Section 402(c); 40 CFR Part 122.44(l)] requires a reissued permit to be as stringent as the previous permit with some exceptions.

- ✓ Not Applicable: All effluent limitations in this permit are at least as protective as those previously established.

ANTIDEGRADATION:

Antidegradation policies ensure protection of water quality for a particular water body on a pollutant by pollutant basis to ensure Water Quality Standards are maintained to support beneficial uses such as fish and wildlife propagation and recreation on and in the water. This also includes special protection of waters designated as an Outstanding National Resource Water or Outstanding State Resource Water [10 CSR 20-7.031(3)(C)]. Antidegradation policies are adopted to minimize adverse effects on water.

The Department has determined the best avenue forward for implementing the Antidegradation requirements into general stormwater permits is by requiring the appropriate development and maintenance of a SWPPP. The SWPPP must identify all reasonable and effective BMPs, taking into account environmental impacts and costs. This analysis must document why no discharge or no exposure options are not feasible at the facility. This selection and documentation of appropriate control measures will then serve as the analysis of alternatives and fulfill the requirements of the Antidegradation Rule and Implementation Procedure 10 CSR 20-7.031(3) and 10 CSR 20-7.015(9)(A)5.

Any facility seeking coverage under this permit which undergoes expansion or discharges a new pollutant of concern must update their SWPPP and select reasonable and cost effective new BMPs. New facilities seeking coverage under this permit are required to develop a SWPPP including this analysis and documentation of appropriate BMPs. Renewal of coverage for a facility requires a review of the SWPPP to ensure the selected BMPs continue to be appropriate.

- ✓ Applicable; the facility must review and maintain stormwater BMPs as appropriate.

BENCHMARKS:

When a permitted feature or outfall consists of only stormwater, a benchmark may be implemented at the discretion of the permit writer. Benchmarks require the facility to monitor and, if necessary, replace and update stormwater control measures. Benchmark concentrations are not effluent limitations. A benchmark exceedance, therefore, is not a permit violation; however, failure to take corrective action is a violation of the permit. Benchmark monitoring data is used to determine the overall effectiveness of control measures and to assist the permittee in knowing when additional corrective actions may be necessary to comply with the limitations of the permit.

- ✓ Not applicable; this permit does not contain numeric benchmarks.

BEST MANAGEMENT PRACTICES (BMPs):

Minimum site-wide BMPs are established in this permit to ensure all permittees are managing their sites equally to protect waters of the state from certain activities which could cause negative effects in receiving water bodies. While not all sites require a SWPPP because the SIC codes are specifically exempted in 40 CFR 122.26(b)(14), these BMPs are not specifically included for stormwater purposes. These practices are minimum requirements for all industrial sites to protect waters of the state. If the minimum BMPs are not followed, the facility may violate general criteria [10 CSR 20-7.031(4)]. Statutes are applicable to all permitted facilities in the state; therefore, pollutants cannot be released unless in accordance with RSMo 644.011 and 644.016 (17).

CHANGES IN DISCHARGES OF TOXIC POLLUTANT:

This special condition reiterates the federal rules found in 40 CFR 122.44(f) and 122.42(a)(1). In these rules, the facility is required to report changes in amounts of toxic substances discharged. Toxic substances are defined in 40 CFR 122.2 as "...any pollutant listed as toxic under section 307(a)(1) or, in the case of "sludge use or disposal practices," any pollutant identified in regulations implementing section 405(d) of the CWA." Section 307 of the CWA then refers to those parameters found in 40 CFR 401.15.

The permittee should also consider any other toxic pollutant in the discharge as reportable under this condition.

EFFLUENT LIMITATION GUIDELINE:

Effluent Limitation Guidelines, or ELGs, are found at 40 CFR 400-499. These are limitations established by the EPA based on the SIC code and the type of work a facility is conducting. Most ELGs are for process wastewater and some address stormwater. All are technology based limitations which must be met by the applicable facility at all times.

- ✓ The industries covered under this permit have an associated Effluent Limit Guideline (ELG) which is applicable to the stormwater discharges in this permit and is applied under 40 CFR 125.3(a).

ELECTRONIC DISCHARGE MONITORING REPORT (EDMR) SUBMISSION SYSTEM:

The U.S. Environmental Protection Agency (EPA) promulgated a final rule on October 22, 2015, to modernize CWA reporting for municipalities, industries, and other facilities by converting to an electronic data reporting system. The final rule requires regulated entities and state and federal regulators to use information technology to electronically report data required by the National Pollutant Discharge Elimination System (NPDES) permit program instead of filing paper reports. To comply with the federal rule, the Department is requiring all permittees to begin submitting discharge monitoring data and reports online.

- ✓ Applicable; this permit requires quarterly reports.

GENERAL CRITERIA CONSIDERATIONS:

In accordance with 40 CFR 122.44(d)(1), effluent limitations shall be placed into permits for pollutants determined to cause, have reasonable potential to cause, or to contribute to, an excursion above any water quality standard, including narrative water quality criteria. In order to comply with this regulation, the permit writer has completed a reasonable potential determination on whether discharges have reasonable potential to cause or contribute to an excursion of the general criteria listed in 10 CSR 20-7.031(4). In instances where reasonable potential exists, the permit includes limitations within the permit to address the reasonable potential. In discharges where reasonable potential does not exist, the permit may include monitoring to later determine the discharge's potential to impact the narrative criteria. Additionally, RSMo 644.076.1, as well as Standard Permit Conditions Part VIII of this permit state it shall be unlawful for any person to cause or allow any discharge of water contaminants from any water contaminant or point source located in Missouri in violation of sections 644.006 to 644.141 of the Missouri Clean Water Law or any standard, rule, or regulation promulgated by the commission.

LAND APPLICATION:

Land application, or surficial dispersion of wastewater and/or sludge, is performed by facilities to maintain a basin as no-discharge. Requirements for these types of operations are found in 10 CSR 20-6.015; authority to regulate these activities is from RSMo 644.026.

- ✓ Not applicable; this permit does not authorize operation of a surficial land application system to disperse wastewater or sludge.

LAND DISTURBANCE:

Land disturbance, sometimes called construction activities, are actions which cause disturbance of the root layer or soil; these include clearing, grading, and excavating of the land. 40 CFR 122.26(b)(14) and 10 CSR 20-6.200(3) requires permit coverage for these activities. Coverage is not required for facilities when only providing maintenance of original line and grade, hydraulic capacity, or to continue the original purpose of the facility.

- ✓ Applicable; this permit provides coverage for land disturbance activities. These activities have SWPPP requirements and may be combined with the standard site SWPPP. Land disturbance BMPs should be designed to control the expected peak discharges. The University of Missouri has design storm events for the 25 year 24 hour storm; these can be found at: http://ag3.agebb.missouri.edu/design_storm/comparison_reports/20191117_25yr_24hr_comparison_table.htm; to calculate peak discharges, the website <https://www.lmnoeng.com/Hydrology/rational.php> has the rational equation to calculate expected discharge volume from the peak storm events.

NUTRIENT MONITORING:

Nutrient monitoring is required for facilities characteristically or expected to discharge nutrients (nitrogenous compounds and/or phosphorus) when the design flow is equal to or greater than 0.1 MGD per 10 CSR 20-7.015(9)(D)8.

- ✓ This is a stormwater only permit; therefore, it is not subject to provisions found in 10 CSR 20-7.015 per 10 CSR 20-7.015(1)(C).

OIL/WATER SEPARATORS:

Oil water separator (OWS) tank systems are frequently found at industrial sites where process water and stormwater may contain oils and greases, oily wastewaters, or other immiscible liquids requiring separation. Food industry discharges typically require pretreatment prior to discharge to municipally owned treatment works. Per 10 CSR 26-2.010(2)(B), all oil water separator tanks must be operated according to manufacturer's specifications and authorized in NPDES permits per 10 CSR 26-2.010(2) or may be regulated as a petroleum tank.

- ✓ Not applicable; this permit does not authorize the operation of OWS. The facility must obtain a separate permit to cover operation of and discharge from these devices.

PERMIT SHIELD:

The permit shield provision of the CWA (Section 402(k)) and Missouri Clean Water Law (644.051.16 RSMo) provides that when a permit holder is in compliance with its NPDES permit or MSOP, they are effectively in compliance with certain sections of the CWA and equivalent sections of the Missouri Clean Water Law. In general, the permit shield is a legal defense against certain enforcement actions but is only available when the facility is in compliance with its permit and satisfies other specific conditions, including having completely disclosed all discharges and all facility processes and activities to the Department at time of application. It is the facility's responsibility to ensure that all potential pollutants, waste streams, discharges, and activities, as well as wastewater land application, storage, and treatment areas, are all fully disclosed to the Department at the time of application or during the draft permit review process. Subsequent requests for authorization to discharge additional pollutants or expanded or newly disclosed flows, or for authorization for previously unpermitted and undisclosed activities or discharges, will likely require permit modification or may require the facility be covered under a site specific permit.

PRETREATMENT PROGRAM:

This permit does not regulate pretreatment requirements for facilities discharging to an accepting permitted wastewater treatment facility. If applicable, the receiving entity (the publicly owned treatment works - POTW) must ensure compliance with any effluent limitation guidelines for pretreatment listed in 40 CFR Subchapter N per 10 CSR 20-6.100. Pretreatment regulations per RSMo 644.016 are limitations on the introduction of pollutants or water contaminants into publicly owned treatment works or facilities.

- ✓ Not Applicable; the facilities covered under this permit are not required to meet pretreatment requirements under an ELG.

PUBLIC NOTICE OF COVERAGE FOR AN INDIVIDUAL FACILITY:

Public Notice of reissuance of coverage is not required unless the facility is a specific type of facility as defined in 10 CSR 20-6.200(1). The need for an individual public notification process shall be determined and identified in the permit [10 CSR 20-6.020(1)(C)5.].

- ✓ Not applicable; public notice is not required for coverage under this permit to individual facilities. The MGP is public noticed in lieu of individual permit PN requirements.

REASONABLE POTENTIAL ANALYSIS (RPA):

Federal regulation 40 CFR Part 122.44(d)(1)(i) requires effluent limitations for all pollutants which are or may be discharged at a level which will cause or have the reasonable potential to cause or contribute to an in-stream excursion above narrative or numeric water quality standard. In accordance with 40 CFR Part 122.44(d)(iii) if the permit writer determines any given pollutant has the reasonable potential to cause or contribute to an in-stream excursion above the water quality standard, the permit must contain effluent limits for the pollutant.

- ✓ The permit writer reviewed industry materials, available past inspections, and other documents and research to evaluate general and narrative water quality reasonable potential for this permit. Permit writers also use the Department's permit writer's manual, the EPA's permit writer's manual (<https://www.epa.gov/npdes/npdes-permit-writers-manual>), program policies, and best professional judgment. For each parameter in each permit, the permit writer carefully considers all applicable information regarding technology based effluent limitations, effluent limitation guidelines, and water quality standards. Best professional judgment is based on the experience of the permit writer, cohorts in the Department and resources at the EPA, research, and maintaining continuity of permits if necessary. For stormwater permits, the permit writer is required per 10 CSR 6.200(6)(B)2 to consider: A. application and other information supplied by the permittee; B. effluent guidelines; C. best professional judgment of the permit writer; D. water quality; and E. BMPs.

SCHEDULE OF COMPLIANCE (SOC):

Per § 644.051, RSMo, a permit may be issued with a Schedule of Compliance (SOC) to provide time for a facility to come into compliance with new state or federal effluent regulations, water quality standards, or other requirements. Such a schedule is not allowed if the facility is already in compliance with the new requirement or if prohibited by other statute or regulation. An SOC includes an enforceable sequence of interim requirements (e.g. actions, operations, or milestone events) leading to compliance with the Missouri Clean Water Law, its implementing regulations, and/or the terms and conditions of an operating permit. *See also* Section 502(17) of the CWA, and 40 CFR 122.2. For new effluent limitations, the permit may include interim monitoring for the specific parameter to demonstrate the facility is not already in compliance with the new requirement. Per 40 CFR 122.47(a)(1) and 10 CSR 20-7.031(11), compliance must occur as soon as possible. If the permit provides a schedule for meeting new water quality based effluent limits, an SOC must include an enforceable, final effluent limitation in the permit even if the SOC extends beyond the life of the permit.

- ✓ Not Applicable: This permit does not contain a SOC.

SETBACKS:

Setbacks, sometimes called separation distances, are common elements of permits and are established to provide a margin of safety in order to protect the receiving water and other features from accidents, spills, unusual events, etc. Specific separation distances are included in 10 CSR 20-8 for minimum design standards of wastewater structures. While wastewater is considered separately from stormwater under this permit, the guides and Chapter 8 distances may remain relevant to requirements under this permit if deemed appropriate by the permittee.

- ✓ Discharge to the watersheds of a Metropolitan No-Discharge Stream (10 CSR 20-7.031 Table F) is authorized by this permit if the discharges are in compliance with 10 CSR 20-7.015(5) and 10 CSR 20-7.031(7). Discharges to these watersheds are authorized for uncontaminated stormwater discharges only.
- ✓ This permit authorizes stormwater discharges which are located in a way to allow water to be released into sinkholes, caves, fissures, or other openings in the ground which could drain into aquifers (except losing streams) per 10 CSR 20-7.015(7). It is the best professional judgment of the permit writer to allow discharges to losing streams as the effluent is stormwater only.
- ✓ This permit authorizes stormwater discharge in the watersheds of Outstanding state Resource Waters (OSRW); Outstanding National Resources Waters (ONRW), which includes the Ozark National Riverways and the National Wild and Scenic Rivers System; and impaired waters as designated in the 305(b) Report provided no degradation of water quality occurs in the OSRW and ONRW due to discharges from the permitted facility per 10 CSR 20-7.015(6)(B) and 10 CSR 20-7.031(3)(C). Additionally, if the facility is found to be causing degradation or contributing to an impairment by discharging a pollutant of concern during an inspection or through complaint investigations, they will be required to become a no discharge facility or obtain a site specific permit with more stringent monitoring and SWPPP requirements. Missouri's impaired waters can be found at <https://dnr.mo.gov/water/what-were-doing/water-planning/quality-standards-impaired-waters-total-maximum-daily-loads/impaired-waters>. Sites within 1000 feet of a OSRW, ONRW, or water impaired for sediment must operate as a no-discharge facility. These additional protections are borrowed from the USEPA 2021 draft Construction General Permit.

SLUDGE – DOMESTIC BIOSOLIDS:

Biosolids are solid materials resulting from domestic wastewater treatment meeting federal and state criteria for beneficial use (i.e. fertilizer). Sewage sludge is solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in a treatment works; including, but not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment process; and material derived from sewage sludge. Sewage sludge does not include ash generated during the firing of sewage sludge in a sewage sludge incinerator or grit and screening generated during preliminary treatment of domestic sewage in a treatment works.

- ✓ This permit does not authorize discharge or land application of biosolids. Sludge/biosolids is not generated by this industry.

SLUDGE – INDUSTRIAL:

Industrial sludge is solid, semi-solid, or liquid residue generated during the treatment of industrial process wastewater in a treatment works; including, but not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment process; scum and solids filtered from water supplies and backwashed; and a material derived from industrial sludge.

- ✓ Not applicable; sludge is not generated by this industry.

SPILL REPORTING:

Any emergency involving a hazardous substance must be reported to the Department's 24 hour Environmental Emergency Response hotline at (573) 634-2436 at the earliest practicable moment after discovery. The Department may require the submittal of a written report detailing measures taken to clean up a spill. These reporting requirements apply when the spill results in chemicals or materials leaving the permitted property or reaching waters of the state. This requirement is in addition to the noncompliance reporting requirement found in Standard Conditions Part I. <https://dnr.mo.gov/waste-recycling/investigations-cleanups/environmental-emergency-response>.

Underground and above ground storage devices for petroleum products, vegetable oils, and animal fats may be subject to control under federal Spill Prevention, Control, and Countermeasure Regulation and are expected to be managed under those provisions, if applicable. Substances regulated by federal law under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) which are transported, stored, or used for maintenance, cleaning or repair shall be managed according to the provisions of RCRA and CERCLA.

STORMWATER POLLUTION PREVENTION PLAN (SWPPP):

In accordance with 40 CFR 122.44(k), BMPs must be used to control or abate the discharge of pollutants when: 1) Authorized under section 304(e) of the CWA for the control of toxic pollutants and hazardous substances from ancillary industrial activities; 2) Authorized under section 402(p) of the CWA for the control of stormwater discharges; 3) Numeric effluent limitations are infeasible; or 4) the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA. In accordance with the EPA's *Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites*, (Document number EPA 833-R-06-004) published by the EPA in 2007 https://www.epa.gov/sites/production/files/2015-10/documents/sw_swppp_guide.pdf, BMPs are measures or practices used to reduce the amount of pollution entering waters of the state from a permitted facility. BMPs may take the form of a process, activity, or physical structure. Additionally, in accordance with the Stormwater Management, a SWPPP is a series of steps and activities to 1) identify sources of pollution or contamination, and 2) select and carry out actions which prevent or control the pollution of storm water discharges. Additional information can be found in *Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices* (EPA 832-R-92-006; September 1992).

A SWPPP must be prepared if the SIC code for the facility is found in 40 CFR 122.26(b)(14) and/or 10 CSR 20-6.200(2). A SWPPP may be required of other facilities where stormwater has been identified as necessitating better management.

The purpose of a SWPPP is to comply with all applicable stormwater regulations by creating an adaptive management plan to control and mitigate stream pollution from stormwater runoff. Developing a SWPPP provides opportunities to employ appropriate BMPs to minimize the risk of pollutants being discharged during storm events. The following paragraph outlines the general steps the permittee should take to determine which BMPs will work to achieve the benchmark values or limits in the permit. This section is not intended to be all encompassing or restrict the use of any physical BMP or operational and maintenance procedure assisting in pollution control. Additional steps or revisions to the SWPPP may be required to meet the requirements of the permit.

Areas which should be included in the SWPPP are identified in 40 CFR 122.26(b)(14). Once the potential sources of stormwater pollution have been identified, a plan should be formulated to best control the amount of pollutant being released and discharged by each activity or source. This should include, but is not limited to, minimizing exposure to stormwater, good housekeeping measures, proper facility and equipment maintenance, spill prevention and response, vehicle traffic control, and proper materials handling. Once a plan has been developed, the facility will employ the control measures determined to be adequate to prevent pollution from entering waters of the state. The facility will conduct inspections of the BMPs to ensure they are working properly and re-evaluate any BMP not achieving compliance with permitting requirements. For example if the BMP being employed is deficient in controlling stormwater pollution, corrective action should be taken to repair, improve, or replace the failing BMP. If failures do occur, continue this trial and error process until appropriate BMPs have been established.

The EPA has developed factsheets on the pollutants of concern for specific industries along with the BMPs to control and minimize stormwater (<https://www.epa.gov/npdes/stormwater-discharges-industrial-activities>). Along with EPA's factsheets, the International Stormwater BMP database (<https://bmpdatabase.org/>) may provide guidance on BMPs appropriate for specific industries.

For new, altered, or expanded stormwater discharges, the SWPPP shall identify reasonable and effective BMPs while accounting for environmental impacts of varying control methods. The antidegradation analysis must document why no discharge or no exposure options are not feasible. The selection and documentation of appropriate control measures shall serve as an alternative analysis of technology and fulfill the requirements of antidegradation [10 CSR 20-7.031(3)].

Alternative analysis evaluation of the BMPs is a structured evaluation of BMPs which are reasonable and cost effective. The alternative analysis evaluation should include practices designed to be: 1) non-degrading; 2) less degrading; or 3) degrading water quality. The glossary of the *Antidegradation Implementation Procedure* defines these three terms. The chosen BMP will be the most reasonable and effective management strategy while ensuring the highest statutory and regulatory requirements are achieved and the highest quality water attainable for the facility is discharged. The alternative analysis evaluation must demonstrate why "no discharge" or "no exposure" is not a feasible alternative at the facility. This structured analysis of BMPs serves as the antidegradation review, fulfilling the requirements of 10 CSR 20-7.031(3) Water Quality Standards and *Antidegradation Implementation Procedure*, Section II.B.

- ✓ Applicable: A SWPPP shall be developed and implemented for each site and shall incorporate required practices identified by the Department with jurisdiction, incorporate control practices specific to site conditions, and provide for maintenance and adherence to the plan.

UNDERGROUND INJECTION CONTROL (UIC):

The UIC program for all classes of wells in the State of Missouri is administered by the Missouri Department of Natural Resources and approved by EPA pursuant to section 1422 and 1425 of the Safe Drinking Water Act (SDWA) and 40 CFR 147 Subpart AA. Injection wells are classified based on the liquids which are being injected. Class I wells are hazardous waste wells which are banned by RSMo 577.155; Class II wells are established for oil and natural gas production; Class III wells are used to inject fluids to extract minerals; Class IV wells are also banned by Missouri in RSMo 577.155; Class V wells are shallow injection wells; some examples are heat pump wells and groundwater remediation wells. Domestic wastewater being disposed of sub-surface is also considered a Class V well.

In accordance with 40 CFR 144.82, construction, operation, maintenance, conversion, plugging, or closure of injection wells shall not cause movement of fluids containing any contaminant into Underground Sources of Drinking Water (USDW) if the presence of any contaminant may cause a violation of drinking water standards or groundwater standards under 10 CSR 20-7.031 or other health-based standards or may otherwise adversely affect human health. If the Department finds the injection activity may endanger USDWs, the Department may require closure of the injection wells or other actions listed in 40 CFR 144.12(c), (d), or (e). In accordance with 40 CFR 144.26, the permittee shall submit a Class V Well Inventory Form for each active or new underground injection well drilled, or when the status of a well changes, to the Missouri Department of Natural Resources, Geological Survey Program, P.O. Box 250, Rolla, Missouri 65402. Single family residential septic systems and non-residential septic systems used solely for sanitary waste and having the capacity to serve fewer than 20 persons a day are excluded from the UIC requirements (40 CFR 144.81(9)).

- ✓ Not applicable; this permit does not authorize subsurface wastewater systems or other underground injection. These activities must be assessed under an application for a site specific permit. Certain discharges of stormwater into sinkholes may qualify as UIC. It is important the permittee evaluate all stormwater basins, even those holding water; as sinkholes have varying seepage rates. This permit does not allow stormwater discharges into sinkholes. The facility must ensure sinkholes are avoided in the construction process. The State's online mapping resource <https://modnr.maps.arcgis.com/apps/webappviewer/index.html?id=87ebef4af15d438ca658ce0b2bbc862e> has a sinkhole layer.

VARIANCE:

Per the Missouri Clean Water Law Section 644.061.4, variances shall be granted for such period of time and under such terms and conditions as shall be specified by the commission in its order. The variance may be extended by affirmative action of the commission. In no event shall the variance be granted for a period of time greater than is reasonably necessary for complying with the Missouri Clean Water Law Section 644.006 to 644.141 or any standard, rule, or regulation promulgated pursuant to Missouri Clean Water Law Section 644.006 to 644.141.

- ✓ Not Applicable: This permit is not drafted under premises of a petition for variance.

WASTELOAD ALLOCATIONS (WLA) FOR LIMITATIONS:

Per 10 CSR 20-2.010(78), the amount of pollutant each discharger is allowed by the Department to release into a given stream after the Department has determined total amount of pollutant which may be discharged into the stream without endangering its water quality. Water quality based maximum daily and average monthly effluent limitations were calculated using methods and procedures outlined in USEPA's Technical Support Document For Water Quality-based Toxics Control (TSD) (EPA/505/2-90-001).

- ✓ Not applicable; water quality limitations were not applied in this permit.

WATER QUALITY STANDARDS:

Per 10 CSR 20-7.031(4), General Criteria shall be applicable to all waters of the state at all times, including mixing zones. Additionally, 40 CFR 122.44(d)(1) directs the Department to include in each NPDES permit conditions to achieve water quality established under Section 303 of the CWA, including state narrative criteria for water quality.

WHOLE EFFLUENT TOXICITY (WET) TEST:

Per 10 CSR 20-7.031(1)(FF), a toxicity test conducted under specified laboratory conditions on specific indicator organism; and per 40 CFR 122.2, the aggregate toxic effect of an effluent measured directly by a toxicity test. A WET test is a quantifiable method of determining if a discharge from a facility may be causing toxicity to aquatic life by itself, in combination with, or through synergistic responses when mixed with receiving water.

- ✓ Not applicable: At this time, permittees are not required to conduct a WET test. This permit is for stormwater only.

PART IV – EFFLUENT LIMITATIONS DETERMINATION

EPA Construction General Permit (CGP)

The CGP was used to research and support best professional judgment decisions made in establishing technology-based conditions for this general permit which are consistent with national standards. The permit writer determined the standards established by the CGP are achievable and consistent with federal regulations. Additionally, the conditions reflecting the best practicable technology currently available are utilized to implement the ELG.

In this general permit, technology-based effluent conditions are established through the SWPPP and BMP requirements. Effective BMPs should be designed on a site-specific basis. The implementation of inspections provides a tool for each facility to evaluate the effectiveness of BMPs to ensure protection of water quality. Any flow through an outfall is considered a discharge. Future permit action due to permit modification may contain new operating permit terms and conditions which supersede the terms and conditions, including effluent limitations, of this operating permit.

PART V–REPORTING REQUIREMENTS

SAMPLING:

The permittee is not required to sample stormwater under this permit. The Department may require sampling and reporting as a result of illegal discharges, compliance issues related to water quality concerns or BMP effectiveness, or evidence of off-site impacts from activities at the facility. If such an action is needed, the Department will specify in writing the sampling requirements, including such information as location and extent. If the permittee refuses to perform sampling when required, the Department may terminate the general permit and require the facility to obtain a site-specific permit with sampling requirements.

REPORTING:

There are quarterly reporting requirements for MO-R100xxx land disturbance permits. Project specific information is required to be report to the Department through the eDMR system.

PART VI – RAINFALL VALUES FOR MISSOURI & SURFACE WATER BUFFER ZONES

Knowledge of the 2-year, 24-hour storm event is used in this permit for two main reasons:

- 1) The design, installation, and maintenance of effective erosion and sediment controls to minimize the discharge of pollutants.
- 2) If the seven-day inspection frequency is utilized, an inspection must occur within 48 hours after any storm event equal to or greater than a 2-year, 24 hour storm has ceased.

For site-specific 2-year, 24-hour storm event information utilize the National Oceanic and Atmospheric Administration's National Weather Service Atlas 14 (NOAA Atlas 14) which is located at https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html. For more information visit; https://www.weather.gov/media/owp/oh/hdsc/docs/Atlas14_Volume8.pdf.

Surface Water Buffer Zones: In order to design controls that match the sediment removal efficiency of a 50-foot buffer, you first need to know what this efficiency is for your site. The sediment removal efficiencies of natural buffers vary according to a number of site-specific factors, including precipitation, soil type, land cover, slope length, width, steepness, and the types of erosion and sediment controls used to reduce the discharge of sediment prior to the buffer. For additional information; https://www.epa.gov/sites/default/files/2017-02/documents/2017_cgp_final_appendix_g_-_buffer_reqs_508.pdf

PART VII – ADMINISTRATIVE REQUIREMENTS

On the basis of preliminary staff review and applicable standards and regulations, the Department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the permit. The proposed determinations are tentative pending public comment.

PUBLIC MEETING:

The department hosted three public meetings for this permit. The meetings were held on January 27, February 17, and March 9, 2021.

PUBLIC NOTICE:

The Department shall give public notice when a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest or because of water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and facility must be notified of the denial in writing.

The Department must give public notice of a pending permit or of a new or reissued Missouri State Operating Permit. The public comment period is a length of time not less than thirty (30) days following the date of the public notice, during which interested persons may submit written comments about the proposed permit.

For persons wanting to submit comments regarding this proposed permit, please refer to the Public Notice page located at the front of this draft permit. The Public Notice page gives direction on how and where to submit appropriate comments.

- ✓ The Public Notice period for this permit is started March 25, 2022 and ended April 25, 2022. Two comment letters were received.

DATE OF FACT SHEET: 03/2/2022

COMPLETED BY:

SARAH WRIGHT

MS4 & LAND DISTURBANCE PERMITTING COORDINATOR

MISSOURI DEPARTMENT OF NATURAL RESOURCES

WATER PROTECTION PROGRAM

OPERATING PERMITS SECTION - STORMWATER AND CERTIFICATION UNIT

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