PROJECT MANUAL

Modify Campground Loop 1
Long Branch State Park

Macon, Missouri

Designed By: Klingner & Associates, P.C.
616 N. 24th Street
Quincy, Ill, 62301

Date Issued: December 17, 2025

Project No.: X2517-01

STATE *of* MISSOURI

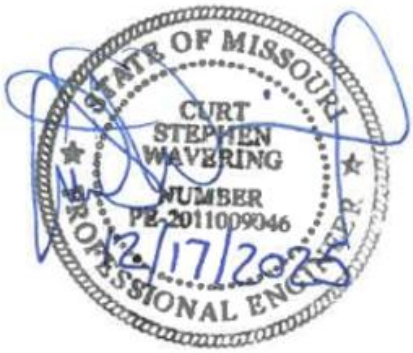
OFFICE *of* ADMINISTRATION

Facilities Management, Design and Construction

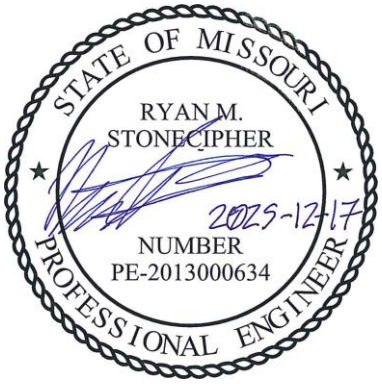
SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: X2517-01

THE FOLLOWING DESIGN PROFESSIONALS HAVE SIGNED AND SEALED THE ORIGINAL PLANS AND SPECIFICATIONS FOR THIS PROJECT, WHICH ARE ON FILE WITH THE DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION:



Curt S. Wavering, Engineer
PE - 20111009046
Project Manual Division 31, 32, 33



Ryan M. Stoencipher, Engineer
PE – 2013000634
Project Manual Division 26

TABLE OF CONTENTS

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

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:

	TITLE	SHEET #	DATE	CAD #
1	Cover Sheet	G001	12/17/2025	G001
2	Index of Sheets	G002	12/17/2025	C001
3	General Notes & Legend	C001	12/17/2025	C002
4	Existing Conditions Site Plan	C002	12/17/2025	C003
5	Traffic Control Plan & Details	C003	12/17/2025	C004
6	Overall Site Demolition Plan	CD100	12/17/2025	CD100
7	Site Demolition Plan STA 1+00 TO STA 7+00	CD101	12/17/2025	CD101
8	Site Demolition Plan STA 7+00 TO STA 12+00	CD102	12/17/2025	CD102
9	Site Demolition Plan STA 12+00 TO STA 20+50	CD103	12/17/2025	CD103
10	Site Demolition Plan STA 20+50 TO STA 23+50	CD104	12/17/2025	CD104
11	Overall Site Plan	C100	12/17/2025	C100
12	Overall Road Plan Southwest	C101	12/17/2025	C101
13	Overall Road Plan Northeast	C102	12/17/2025	C102
14	Road Plan & Profile STA 1+00 TO STA 4+50	C103	12/17/2025	C103
15	Road Plan & Profile STA 4+50 TO STA 9+50	C104	12/17/2025	C104
16	Road Plan & Profile STA 9+50 TO STA 12+00	C105	12/17/2025	C105
17	Road Plan & Profile STA 12+00 TO STA 17+00	C106	12/17/2025	C106
18	Road Plan & Profile STA 17+00 TO STA 20+50	C107	12/17/2025	C107
19	Road Plan & Profile STA 20+50 TO STA 23+50	C108	12/17/2025	C108
20	Intersection Details	C109	12/17/2025	C109

21	Retaining Wall Profiles	C110	12/17/2025	C110
22	Retaining Wall Profile	C111	12/17/2025	C111
23	Site Grading & Erosion Control Plan STA 1+00 to STA 4+50	C201	12/17/2025	C200
24	Site Grading & Erosion Control Plan STA 4+50 TO STA 9+50	C202	12/17/2025	C202
25	Site Grading & Erosion Control Plan STA 9+50 TO STA 17+00	C203	12/17/2025	C203
26	Site Grading & Erosion Control Plan STA 17+00 TO STA 20+50	C204	12/17/2025	C204
27	Site Grading & Erosion Control Plan STA 20+50 TO STA 23+50	C205	12/17/2025	C205
28	Site Utility Plan	C301	12/17/2025	C301
29	Sanitary Sewer Profiles & Utility Details	C302	12/17/2025	C302
30	Utility Details	C303	12/17/2025	C303
31	Storm Water Pollution Prevention Plan	C401	12/17/2025	C401
32	Site Details	C501	12/17/2025	C501
33	Site Details	C502	12/17/2025	C502
34	Site Details	C503	12/17/2025	C503
35	Site Details	C504	12/17/2025	C504
36	Site Details	C505	12/17/2025	C505
37	Site Details	C506	12/17/2025	C506
38	Power Distribution Plan	E101	12/17/2025	E101
39	Electrical Diagrams and Schedules	E501	12/17/2025	E501
40	Structural Notes	S001	12/17/2025	S001
41	Ramp and Stair Structural Details	S101	12/17/2025	S101

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. Modify Campground Loop 1
Long Branch State Park
Macon, Missouri
Project No.: X2517-01

3.0 BIDS WILL BE RECEIVED:

A. Until: 1:30 PM, March 10, 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 modifications to Long Branch State Park Campground Loop 1 to develop 17 campsites with full hook up (water, sewer and 50-amp electrical), 11 campsites with 50-amp electric only and 6 sites for new camper cabins with 50-amp electric only, for a total of 34 sites within this area.

B. MBE/WBE/SDVE Goals: MBE 0%, WBE 0%, and SDVE 3%. **NOTE: Only MBE/WBE firms certified by the State of Missouri Office of Equal Opportunity as of the date of bid opening, or SDVE(s) meeting the requirements of Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE participation goals for this project.**

5.0 PRE-BID MEETING:

A. Place/Time**:** 10:00 AM, February 24, 2026, at Long Branch State Park Office, 28615 Visitor Center Road, Macon, MO.

B. Access to State of Missouri property requires presentation of a photo ID by all persons.

6.0 HOW TO GET PLANS & SPECIFICATIONS:

A. View Only Electronic bid sets are available at no cost or paper bid sets for a deposit of $100.00 from American Document Solutions (ADS). MAKE CHECKS PAYABLE TO: American Document Solutions. Mail to: American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433, https://www.adsplanroom.net. NOTE: Prime contractors will be allowed a maximum of two bid sets at the deposit rate shown above. Other requesters will be allowed only one bid set at this rate. Additional bid sets or parts thereof may be obtained by any bidder at the cost of printing and shipping by request to American Document Solutions at the address shown above. Bidder must secure at least one bid set to become a planholder.

B. **Refunds: Return plans and specifications in unmarked condition within 15 working days of bid opening to American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433. Deposits for plans not returned within 15 working days shall be forfeited.**

C. Information for upcoming bids, including downloadable plans, specifications, Invitation for Bid, bid tabulation, award, addenda, and access to the ADS planholders list, is available on the Division of Facilities Management, Design and Construction's web site: https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans.

7.0 POINT OF CONTACT:

A. Designer: Klingner & Associates, P.C., Curt Wavering, 217-223-3670, email: csw@klingner.com

B. Project Manager: Nathan Graessle, 573-508-6646, 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 Designer and Project Manager identified in Section 007300 – Supplementary Conditions with all necessary supporting documentation no less than five (5) working days before opening of bids. Responses to requests for interpretation will be issued via a written addendum and will be sent as promptly as is practicable to all official planholders and posted on the Owner's website. All such addenda shall become part of the bid and contract documents.

C. Bidders shall make all requests for an "Acceptable Substitution" on the Section 006325 Substitution Request Form. The request shall be emailed to the Project Designer and Project Manager identified in Section 007300 – Supplementary Conditions no less than five (5) working days before opening of bids. Responses to requests for substitutions will be issued via a written addendum and will be sent as promptly as is practicable to all official planholders and posted on the Owner's website. All such addenda shall become part of the bid and contract documents.

D. An "Acceptable Substitution" requested after the award of bid will only be approved if proven to the satisfaction of the Owner and the Designer that the product is acceptable in design, strength, durability, usefulness, and convenience for the purpose intended. Approval of the substitution after award is at the sole discretion of the Owner and all requests of this nature must be submitted in accordance with Article 3.1 of the General Conditions.

5.0 - BIDS AND BIDDING PROCEDURE

A. Bidders shall submit all submission forms and accompanying documents listed in Section 004113 – Bid Form, Article 5.0, Attachments to Bid by the stated time on the bid documents or the bid will be rejected for being non-responsive.

B. Depending on the specific project requirements, **the following is a GENERIC list** of all possible bid forms that may be due with bid submittals. Bidders must verify each specific project's requirements in Section 004113 to ensure they have provided all the required documentation with their submission.

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

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

C. The Bidder shall submit its bid on the forms provided by the Owner in the same file format (PDF) with each space fully and properly completed, typewritten or legibly printed, including all amounts required for alternate bids, unit prices, cost accounting data, etc. The Owner will reject bids that are not on the Owner's forms or that do not contain all requested information. All forms can be found on the Owner's website at https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans and shall be submitted with your bid to FMDCBids@oa.mo.gov.

D. All bids shall be submitted without additional terms and conditions, modifications, or reservations. The completed forms should not include interlineations, alterations, or erasures. Bids not in compliance with the requirements of this paragraph will be rejected as non-responsive.

E. All bids shall be accompanied by a bid bond executed by the bidder and a duly authorized surety company, certified check, cashier's check or bank draft made payable to the Division of Facilities Management, Design and Construction, State of Missouri, in the amount indicated in the bid documents in Section 004113. Failure of the Bidder to submit the duly authorized bid bond or the full amount required shall be sufficient cause to reject his bid. The Bidder agrees that the proceeds of the check, draft, or bond shall become the property of the State of Missouri, if for any reason the Bidder withdraws his bid after bid closing or if the Bidder, within ten (10) working days after notification of award, refuses or is unable to 1) execute the tendered contract, 2) provide an acceptable performance and payment bond, or 3) provide evidence of required insurance coverage.

F. The bid bond check or draft submitted by the successful Bidder will be returned after the receipt of an acceptable performance and payment bond and execution of the formal contract. Checks or drafts of all other Bidders will be returned within a reasonable time after it is determined that the bid represented by same will receive no further consideration by the State of Missouri.

6.0 - SIGNING OF BIDS

A. A bid should contain the full and correct legal name of the Bidder. If the Bidder is an entity registered with the Missouri Secretary of State, the Bidder's name on the bid form should appear as shown in the Secretary of State's records. If the Bidder is an entity organized in a state other than Missouri, the Bidder must provide a Certificate of Authority to do business in the State of Missouri.

B. If the successful Bidder is doing business in the State of Missouri under a fictitious name, the Bidder shall furnish to Owner, attached to the Bid Form, a properly certified copy of the certificate of Registration of Fictitious Name from the State of Missouri, and such certificate shall remain on file with the Owner.

C. A bid from an individual shall be signed as noted on the Bid Form.

D. A bid from a partnership or joint venture shall require only one signature of a partner, an officer of the joint venture authorized to bind the venture, or an attorney-in-fact. If the bid is signed by an officer of

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

E. A bid from a limited liability company (LLC) shall be signed by a manager or a managing member of the LLC.

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

7.0 - RECEIVING BID SUBMITTALS

A. It is the Bidder's sole responsibility to ensure receipt of the bid submittals by Owner on or before the date and time specified in the Invitation for Bid or as modified via written addenda. Bids received after the date and time specified will not be considered by the Owner.

B. All bids shall be received via email at FMDCBids@oa.mo.gov and bids received by the Owner through any other means, including hard copies, will not be considered, and will be discarded by the Owner unopened.

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

A. Bidder may withdraw a bid at any time prior to the scheduled closing time for receipt of bids, but no bidder may withdraw his bid for a period of twenty (20) working days after the scheduled closing time for receipt of bids.

B. Bidder may modify a bid until the scheduled closing time by sending a revised bid to FMDCBids@oa.mo.gov with a note in the subject line and body of the email that it is a revised bid. All revised bids must be submitted to FMDCBids@oa.mo.gov, revised bids sent any other way will not be considered.

9.0 - AWARD OF CONTRACT

A. The Owner reserves the right to reject any and/or all bids and further to waive all informalities in bidding when deemed in the best interest of the State of Missouri.

B. The Owner reserves the right to let other contracts in connection with the work including, but not limited to, contracts for the furnishing and installation of furniture, equipment, machinery, appliances and other apparatuses.

C. The Owner will award a contract to the lowest, responsive, and responsible Bidder in accordance with Section 8.250, RSMo. No contract will be awarded to any Bidder who has had a contract with the Owner terminated within the preceding twelve months for material breach of contract or who has been suspended or debarred by the Owner.

D. Award of alternates, if any, will be made in numerical order unless all bids received are such that the order of acceptance of alternates does not affect the determination of the lowest, responsive, responsible bidder.

E. No award shall be considered binding upon the Owner until the written contract has been properly executed and the following documentation has been provided: 1) performance and payment bond consistent with Article 6.1 of the General Conditions; 2) proof of the required insurance coverage; 3) an executed Section 004541 - Affidavit of Work Authorization form; and 4) documentation evidence enrollment and participation in a federal work authorization program.

F. Failure to execute and return the contract and associated documents within the prescribed period shall be treated, at the option of the Owner, as a breach of Bidder's obligation and the Owner shall be under no further obligation to Bidder.

G. Transient employers subject to Sections 285.230 and 285.234, RSMo, (out-of-state employers who temporarily transact any business in the State of Missouri) may be required to file a bond with the

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

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

I. The successful Bidder must be registered in MissouriBUYS powered by MOVERS at https://missouribuys.mo.gov/supplier-registration# as an approved vendor prior to being issued a contract.

10.0 - CONTRACT SECURITY

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

11.0 - LIST OF SUBCONTRACTORS

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

12.0 - WORKING DAYS

A. Contract duration time is stated in working days and will use the following definition in determining the actual calendar date for contract completion:

1. Working days are defined as all calendar days except Saturdays, Sundays and the following State of Missouri observed holidays: New Year's Day, Martin Luther King, Jr. Day, Lincoln Day, Washington's Birthday, Truman Day, Memorial Day, Juneteenth, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and Christmas Day.

13.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

A. By signing the bid form and submitting a bid on this project, the Bidder certifies that it will use American and Missouri products as set forth in Article 1.7 of the General Conditions. Bidders are advised to review those requirements carefully prior to bidding.

B. A preference shall be given to Missouri firms, corporations or individuals, or firms, corporations or individuals that maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less.

C. Pursuant to Section 34.076, RSMo, a contractor or Bidder domiciled outside the boundaries of the State of Missouri shall be required, in order to be successful, to submit a bid the same percent less than the lowest bid submitted by a responsible contractor or Bidder domiciled in Missouri as would be required for such a Missouri domiciled contractor or Bidder to succeed over the bidding contractor or Bidder domiciled outside Missouri on a like contract or bid being let in the Bidder's domiciliary state and, further, the contractor or Bidder domiciled outside the boundaries of Missouri shall be required to submit an audited financial statement as would be required of a Missouri domiciled contractor or Bidder on a like contract or bid being let in the domiciliary state of that contractor or Bidder.

14.0 – ANTI-DISCRIMINATION AGAINST ISRAEL ACT CERTIFICATION:

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

15.0 - MBE/WBE/SDVE INSTRUCTIONS

A. Definitions:

1. **"MBE"** means a Minority Business Enterprise.

2. **"MINORITY"** has the same meaning as set forth in 1 C.S.R. 10-17.010.

3. **"MINORITY BUSINESS ENTERPRISE"** has the same meaning as set forth in section 37.020, RSMo.

4. **"WBE"** means a Women's Business Enterprise.

5. **"WOMEN'S BUSINESS ENTERPRISE"** has the same meaning as set forth in section 37.020, RSMo.

6. **"SDVE"** means a Service-Disabled Veterans Enterprise.

7. **"SERVICE-DISABLED VETERAN"** has the same meaning as set forth in section 34.074, RSMo.

8. **"SERVICE-DISABLED VETERAN ENTERPRISE"** has the same meaning as "Service-Disabled Veteran Business" set forth in section 34.074, RSMo.

B. MBE/WBE/SDVE General Requirements:

1. For all bids greater than $100,000, the Bidder shall obtain MBE, WBE and SDVE participation in an amount equal to or greater than the percentage goals set forth in the Invitation for Bid and the Bid Form, unless the Bidder is granted a Good Faith Effort waiver by the Director of the Division, as set forth below. If the Bidder does not meet the MBE, WBE and SDVE goals, or make a good faith effort to do so, the Bidder shall be nonresponsive, and its bid shall be rejected.

2. The Bidder should submit with its bid all the information requested in the MBE/WBE/SDVE Compliance Evaluation Form for every MBE, WBE, or SDVE subcontractor or material supplier the Bidder intends to use for the contract work. The Bidder is required to submit all MBE/WBE/SDVE documentation before the stated time and date set forth in the Invitation for Bid. If the Bidder fails to provide such information by the specified date and time, the Owner shall reject the bid.

3. The Director reserves the right to request additional information from a Bidder to clarify the Bidder's proposed MBE, WBE, and/or SDVE participation. The Bidder shall submit the clarifying information requested by the Owner within two (2) working days of receiving the request for clarification.

4. Pursuant to section 34.074, RSMo, a Prime Bidder that qualifies as an SDVE shall receive a three-percentage point bonus preference in the contract award evaluation process. The bonus preference will be calculated and applied by reducing the bid amount of the eligible SDVE by three percent of the apparent low responsive Bidder's bid. Based on this calculation, if the eligible SDVE's evaluation is less than the apparent low responsive Bidder's bid, the eligible SDVE's bid will become the apparent low responsive bid. This reduction is for evaluation purposes only and will have no impact on the actual amount(s) of the bid or the amount(s) of any contract awarded. In order to be eligible for the SDVE preference, the Bidder must complete and submit with its bid the Missouri Service-Disabled Veteran Business Form, and any information required by the form.

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

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

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

2. The total dollar value of the work granted to a certified MBE, WBE or SDVE by the Bidder shall be counted towards the applicable goal.

3. Expenditures for materials and supplies obtained from a certified MBE, WBE, or SDVE supplier or manufacturer may be counted towards the MBE, WBE and SDVE goals, if the MBE, WBE, or SDVE assumes the actual and contractual responsibility for the provision of the materials and supplies.

4. The total dollar value of the work granted to a second or subsequent tier subcontractor or a supplier may be counted towards a Bidder's MBE, WBE and SDVE goals, if the MBE, WBE, or SDVE properly assumes the actual and contractual responsibility for the work.

5. The total dollar value of work granted to a certified joint venture equal to the percentage of the ownership and control of the MBE, WBE, or SDVE partner in the joint venture may be counted towards the MBE/WBE/SDVE goals.

6. Only expenditures to a MBE, WBE, or SDVE that performs a commercially useful function in the work may be counted towards the MBE, WBE and SDVE goals. A MBE, WBE, or SDVE performs a commercially useful function when it is responsible for executing a distinct element of the work and carrying out its responsibilities by performing, managing and supervising the work or providing supplies or manufactured materials.

D. Certification of MBE/WBE/SDVE Subcontractors:

1. In order to be counted towards the goals, an MBE or WBE must be certified by the State of Missouri Office of Equal Opportunity and an SDVE must be certified by the State of Missouri, Office of Equal Opportunity or by the Federal U.S. Small Business Administration directory.

2. The Bidder may determine the certification status of a proposed MBE or WBE subcontractor or supplier by referring to the Office of Equal Opportunity (OEO)'s online MBE/WBE directory https://apps1.mo.gov/MWBCertifiedFirms/. The Bidder may determine the eligibility of a SDVE subcontractor or supplier by referring to the Office of Equal Opportunity online SDVE directory at https://oeo.mo.gov/sdve-certification-program/ or the Federal U.S. Small Business Administration directory https://veterans.certify.sba.gov/#search.

3. Additional information, clarifications, or other information regarding the MBE/WBE/SDVE listings in the directories may be obtained by contacting the Contract Specialist of record as shown in the Supplementary Conditions (Section 007300).

E. Waiver of MBE/WBE/SDVE Participation:

1. If a Bidder has made a good faith effort to secure the required MBE, WBE and/or SDVE participation and has failed, the Bidder shall submit with its bid the information requested in MBE/WBE/SDVE Good Faith Effort (GFE) Determination form. The Director will determine if the Bidder made a good faith effort to meet the applicable goals. If the Director determines that the Bidder did not make a good faith effort, the bid shall be rejected as being nonresponsive to the bid requirements. Bidders who demonstrate that they have made a good faith effort to include MBE, WBE, and/or SDVE participation will be granted a waiver and will be considered to be responsive to the applicable participation goals, regardless of the percent of actual participation obtained, if the bid is otherwise acceptable.

2. In determining whether a Bidder has made a good faith effort to obtain MBE, WBE and/or SDVE participation, the Director may evaluate the factors set forth in 1 CSR 30-5.010(6)(C) and the following:

   a. The amount of actual participation obtained;

b. How and when the Bidder contacted potential MBE, WBE, and SDVE subcontractors and suppliers;

c. The documentation provided by the Bidder to support its contacts, including whether the Bidder provided the names, addresses, phone numbers, and dates of contact for MBE/WBE/SDVE firms contacted for specific categories of work;

d. If project information, including plans and specifications, were provided to MBE/WBE/SDVE subcontractors;

e. Whether the Bidder made any attempts to follow-up with MBE, WBE or SDVE firms prior to bid;

f. Amount of bids received from any of the subcontractors and/or suppliers that the Bidder contacted;

g. The Bidder's stated reasons for rejecting any bids;

F. Contractor MBE/WBE/SDVE Obligations

1. If awarded a contract, the Bidder will be contractually required to subcontract with or obtain materials from the MBE, WBE, and SDVE firms listed in its bid, in amounts equal to or greater than the dollar amount in the bid, unless the amount is modified in writing by the Owner.

2. If the Contractor fails to meet or maintain the participation requirements contained in the Contractor's bid, the Contractor must satisfactorily explain to the Director why it cannot comply with the requirement and why failing meeting the requirement was beyond the Contractor's control. If the Director finds the Contractor's explanation unsatisfactory, the Director may take any appropriate action including, but not limited to:

   a. Declaring the Contractor ineligible to participate in any contracts with the Division for up to twelve (12) months (suspension); and/or

   b. Declaring the Contractor be nonresponsive to the Invitation for Bid, or in breach of contract and rejecting the bid or terminating the contract.

3. If the Contractor replaces an MBE, WBE, or SDVE during the course of the contract, the Contractor shall replace it with another MBE, WBE, or SDVE or make a good faith effort to do so. All MBE, WBE and SDVE substitutions must be approved by the Director in writing.

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

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: **Modify Campground Loop 1**
Long Branch State Park
Macon, Missouri

Project Number: **X2517-01**

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

ARTICLE 3. LIQUIDATED DAMAGES

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

ARTICLE 4. CONTRACT SUM

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

Base Bid: $

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

TOTAL CONTRACT AMOUNT: ($CONTRACT AMOUNT)

UNIT PRICES: The Owner accepts the following Unit Prices:

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

ARTICLE 5. PREVAILING WAGE RATE

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

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

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

The Contractor has been granted a waiver of the 10% MBE and 10% WBE and 3% SDVE participation goals. The Contractor agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows: (OR)

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

MBE/WBE/SDVE Firm: Subcontract Amt:$
MBE/WBE/SDVE Firm: Subcontract Amt:$
MBE/WBE/SDVE Firm: Subcontract Amt:$

Total $

MBE/WBE/SDVE assignments identified above shall not be changed without a contract change signed by the Owner.

The Director of the Division of Facilities Management, Design and Construction or his Designee shall be the final authority to resolve disputes and disagreements between the Contractor and the MBE/WBE/SDVE firms listed above when such disputes impact the subcontract amounts shown above.

ARTICLE 7. CONTRACT DOCUMENTS

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

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

ARTICLE 8 – CERTIFICATION

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

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

APPROVED:

_____
Brian Yansen, Director
Division of Facilities Management,
Design and Construction

_____
Contractor's Authorized Signature

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

_____
Corporate Secretary

Bond No._____

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

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

MBE/WBE/SDVE PROGRESS REPORT

Remit with **ALL** Progress and Final Payments

(Please check appropriate box) ☐CONSULTANT ☐CONSTRUCTION

PROJECT TITLE	
PROJECT LOCATION	
FIRM	
ORIGINAL CONTRACT SUM (Same as Line Item 1. on Form A of Application for Payment) **$**	TOTAL CONTRACT SUM TO DATE (Same as Line Item 3. on Form A of Application for Payment) **$**

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

SELECT MBE, WBE, SDVE	ORIGINAL CONTRACT PARTICIPATION AMOUNT	PARTICIPATION AMOUNT PAID-TO-DATE (includes approved contract changes)	CONSULTANT/SUBCONSULTANT OR CONTRACTOR/SUBCONTRACTOR/SUPPLIER COMPANY NAME
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	

Revised 06/2023

INSTRUCTIONS FOR MBE/WBE/SDVE PROGRESS REPORT

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

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

At Initial Pay Application fill in the following:

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

For all subsequent Pay Applications fill in the following:

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

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

PROJECT NUMBER

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

State of _____ personally came and appeared _____
(NAME)

_____ of the _____
(POSITION) (NAME OF THE COMPANY)

(a corporation) (a partnership) (a proprietorship) and after being duly sworn did depose and say that all provisions and requirements set out in Chapter 290, Sections 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on public works project have been fully satisfied and there has been no exception to the full and completed compliance with said provisions and requirements and with Wage Determination No: _____ issued by the Department of Labor and Industrial Relations, State of Missouri on the _____ day of _____ 20 __ in carrying out the contract and working in connection with _____
(NAME OF PROJECT)

Located at _____ in _____ County
(NAME OF THE INSTITUTION)

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

SIGNATURE

NOTARY INFORMATION

NOTARY PUBLIC EMBOSSER OR BLACK INK RUBBER STAMP SEAL	STATE		COUNTY (OR CITY OF ST. LOUIS)
	SUBSCRIBED AND SWORN BEFORE ME, THIS DAY OF YEAR		**USE RUBBER STAMP IN CLEAR AREA BELOW**
	NOTARY PUBLIC SIGNATURE	MY COMMISSION EXPIRES	
	NOTARY PUBLIC NAME (TYPED OR PRINTED)		

FILE: Closeout Documents

GENERAL CONDITIONS

INDEX

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 place data, shop drawings and air and water balance reports.

4. Service Instructions: Provide the following information for all pieces of equipment.

   a. Recommended spare parts including catalog number and name of local supplier or factory representative.

   b. Belt sizes, types, and lengths.

   c. Wiring diagrams.

5. Manufacturer's Certificate of Warranty as described in Article 3.4.

6. Prior to the final payment, furnish to the Designer three (4) copies of parts catalogs for each piece of equipment furnished by him/her on the project with the components identified by number for replacement ordering.

B. Submission of operating instructions shall be done in the following manner.

1. Manuals shall be in quadruplicate, and all materials shall be bound into volumes of standard 8½" x 11" hard binders. Large drawings too bulky to be folded into 8½" x 11" shall be separately bound or folded and in envelopes, cross referenced and indexed with the manuals.

2. The manuals shall identify project name, project number, and include the name and address of the Contractor, subcontractors and manufacturers who were involved with the activity described in that particular manual.

3. Internally subdivide the binder contents with permanent page dividers, logically organized with tab titles clearly printed under reinforced laminated plastic tabs.

4. Contents: Prepare a Table of Contents for each volume, with each product or system description identified.

ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES

A. The Contractor shall keep on site, during progress of the work, a competent superintendent satisfactory to the Construction Representative. The superintendent shall represent the Contractor and all agreements made by the superintendent shall be binding. The superintendent shall carefully study and compare all drawings, specifications and other instructions and shall promptly notify the Construction Representative and Designer, in writing, any error, inconsistency or omission which may be discovered. The superintendent shall coordinate all work on the project. Any change of the superintendent shall be approved by the Construction Representative.

B. Contractor shall, at all times, enforce strict discipline and good order among his employees, and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him/her.

C. The Contractor shall supply sufficient labor, material, plant and equipment and pay when due any laborer, subcontractor or supplier for supplies furnished and otherwise prosecute the work with diligence to prevent work stoppage and 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 <u>without</u> 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 contact price, whichever is greater, with loss payable to Contractor and Owner as their respective interests may appear.

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

C. Minimum Limits of Insurance

1. General Liability

Contractor

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

2. Automobile Liability

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

3. Workers' Compensation and Employers Liability

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

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

D. Deductibles and Self-Insured Retentions

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

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

E. Other Insurance Provisions and Requirements

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

1. General Liability

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

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

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

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

2. Automobile Insurance

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

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

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

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

3. Workers' Compensation/Employer's Liability

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

4. All Coverages

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

F. Insurer Qualifications and Acceptability

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

G. Verification of Insurance Coverage

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

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

ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

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

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

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

2. In the event the Owner suspends Contractor's right to proceed with the work or terminates the contract, the Owner may demand that the Contractor's surety take over and complete the work on this contract, after the surety submits a written proposal to the Owner and receives written approval and upon the surety's failure or refusal to do so within ten (10) consecutive calendar days after demand therefore, the Owner may take over the work and prosecute the same to completion by bid or negotiated contract, or the Owner may elect to take possession of and utilize in completing the work such materials, supplies, appliances and plant as may be on the site of the work, and all subcontractors, if the Owner elects, shall be bound to perform their contracts.

B. The Contractor and its surety shall be and remain liable to the Owner for any excess cost or damages occasioned to the Owner as a result of the actions above set forth.

C. The Contractor in the event of such suspension or termination shall not be entitled to receive any further payments under this contract until the work is wholly finished. Then if the unpaid balance under this contract shall exceed all expenses of the Owner as certified by the Director, such excess shall be paid to the Contractor; but, if such expenses shall exceed the unpaid balance as certified by the Director, the Contractor and their surety shall be liable for and shall pay the difference and any damages to the Owner.

D. In exercising Owner's right to secure completion of the work under any of the provisions hereof, the Director shall have the right to exercise Owner's sole discretion as to the manner, methods and reasonableness of costs of completing the work.

E. The rights of the Owner to suspend or terminate as herein provided shall be cumulative and not exclusive and shall be in addition to any other remedy provided by law.

F. The Contractor in the event of such suspension or termination may be declared ineligible for Owner contracts for a minimal period of twelve (12) months. Further, no contract will be awarded to any Contractor who lists in their bid form any subcontractor whose prior performance has contributed, as determined by the Owner, to a breach of a contract. In order to be considered for state-awarded contracts after this period, the Contractor/subcontractor will be required to forward acceptance reports to the Owner regarding successful completion of non-state projects during the intervening twelve (12) months from the date of default. No contracts will be awarded to a subcontractor/Contractor until the ability to perform responsibly in the private sector has been proven to the Owner.

ARTICLE 7.3 -- FOR CONVENIENCE

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

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

B. Upon receipt of notification, the Contractor shall:

1. Cease operations when directed.

2. Take actions to protect the work and any stored materials.

3. Place no further subcontracts or orders for material, supplies, services or facilities except as may be necessary to complete the portion of the Contract that has not been terminated. No claim for payment of materials or supplies ordered after the termination date shall be considered.

4. Terminate all existing subcontracts, rentals, material, and equipment orders.

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

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

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

SECTION 007300 - SUPPLEMENTARY CONDITIONS

1.0 GENERAL:

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

2.0 CONTACTS:

Designer:
Curt Wavering
Klingner & Associates, P.C.
616 N. 24th Street
Quincy, Ill, 62301
Telephone: 217-223-3670
Email: csw@klingner.com

Construction Representative:
Ken Sheputis
Division of Facilities Management, Design and Construction
805 Clinic Rd
Hannibal, MO 63401
Telephone: 417-576-7161
Email: kenneth.sheputis@oa.mo.gov

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

Contract Specialist:
April Howser
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: 573-751-0053
Email: april.howser@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.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MIKE KEHOE, Governor

Annual Wage Order No. 32

Section 061
MACON COUNTY

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

Original Signed by
Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2025**

Last Date Objections May Be Filed: **April 9, 2025**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$25.20*
Boilermaker	$25.20*
Bricklayer-Stone Mason	$25.20*
Carpenter	$53.76
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$25.20*
Plasterer	
Communication Technician	$25.20*
Electrician (Inside Wireman)	$25.20*
Electrician Outside Lineman	$25.20*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$25.20*
Glazier	$25.20*
Ironworker	$62.59
Laborer	$46.69
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$25.20*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$25.20*
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$25.20*
Plumber	$72.11
Pipe Fitter	
Roofer	$25.20*
Sheet Metal Worker	$25.20*
Sprinkler Fitter	$25.20*
Truck Driver	$25.20*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

Heavy Construction Rates for
MACON County

Section 061

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$69.21
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$25.20*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$25.20*
General Laborer	
Skilled Laborer	
Operating Engineer	$70.78
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$25.20*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

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

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

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

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

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

OVERTIME
and
HOLIDAYS

OVERTIME

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

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

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

HOLIDAYS

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

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

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Project consists of the modifications to Long Branch State Park Campground Loop 1 to develop 17 campsites with full hook up (water, sewer and 50-amp electrical), 11 campsites with 50-amp electric only and 6 sites for new camper cabins with 50-amp electric only, for a total of 34 sites within this area.

1. Project Location: Long Branch State Park (LBSP) is located at 28615 Visitor Center Road in Macon, Missouri.

2. Owner: State of Missouri, Office of Administration, Division of Facilities Management, Design and Construction, Harry S Truman State Office Building, Post Office Box 809, 301 West High Street, Jefferson City, Missouri 65102.

B. Contract Documents, dated December 17, 2025 were prepared for the Project by Klingner & Associates, P.C, 3622 Endeavor Avenue, Columbia, Missouri.

C. The Work consists of modifications to Long Branch State Park Campground Loop 1.

a. The project consists of the removal and replacement of existing asphalt loop pavement and drainage infrastructure.

b. The addition of seventeen (17) new full hook-up campsites will include the concrete campsite pads, storm and sanitary sewers to serve the new campsites, water services, electrical services, site grading, and connecting to the asphalt access road loop.

c. The addition of eleven (11) new electric only campsites will include the concrete campsite pads, storm and electrical services, site grading, and connecting to the asphalt access road loop.

d. The addition of six (6) new premium camper cabin sites graded and prepped to receive prefabricated camper cabins. The sites include site improvements such as grading, additional parking space, patio, picnic table, lantern post, fire ring and pedestal grill. The camper cabins will be provided by the owner.

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

1.3 WORK SEQUENCE

A. The Work will be conducted in one phase.

1.4 CONTRACTOR USE OF PREMISES

A. 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.

B. 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.

1.5 OCCUPANCY REQUIREMENTS

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

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.

B. Types of allowances include the following:

1. Weather allowances.

C. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.

1.3 WEATHER ALLOWANCE

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

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

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

D. There will be no modification to the time of contract performance due solely to the failure to deplete the “bad weather” day allowance.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALLOWANCES

A. Weather Allowance: Included within the completion period for this Project twenty (20) "bad weather" days.

END OF SECTION 012100

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include the following:

1. Division 1, Section 012100 "Allowances" for procedural requirements for handling and processing Allowances.
2. Division 1, Section 013115 “Project Management Communications” for administrative requirements for communications.
3. Division 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
4. Division 0, Section 007213, Article 4.0 "Changes in the Work" for Change Order requirements.

1.3 REQUESTS FOR INFORMATION

A. In the event that the Contractor or Subcontractor, at any tier, determines that some portion of the Drawings, Specifications, or other Contract Documents requires clarification or interpretation, the Contractor shall submit a “Request for Information” (RFI) in writing to the Designer. A RFI may only be submitted by the Contractor and shall only be submitted on the RFI forms provided by the Owner. The Contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed. In the RFI, the Contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.

B. Responses to RFI shall be issued within ten (10) working days of receipt of the Request from the Contractor unless the Designer determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Designer, the Designer will, within five (5) working days of receipt of the request, notify the Contractor of the anticipated response time. If the Contactor 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 "Schedule-Bar Chart" for preparing and submitting Contractor's Construction Schedule.
2. Articles 1.8.B and 1.8.C of Section 007213 "General Conditions" for coordinating meetings onsite.
3. Article 5.4.H of Section 007213 "General Conditions" for coordinating Closeout of the Contract.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections, which depend on each other for proper installation, connection, and operation.

B. Coordination: Each Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each Contractor shall coordinate its operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other Contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required

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

C. Prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate Contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other Contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project Closeout activities.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 SUBMITTALS

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

B. Key Personnel Names: Within fifteen (15) work days of starting construction operations, submit a list of key personnel assignments including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 PROJECT MEETINGS

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

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

1. Minutes: Designer will record and distribute meeting minutes.

B. Progress Meetings: The Owner's Construction Representative will conduct Monthly Progress Meetings as stated in Articles 1.8.B and 1.8.C of Section 007213 "General Conditions".

1. Minutes: Designer will record and distribute to Contractor the meeting minutes.

C. Preinstallation Conferences: Contractor shall conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of Manufacturers and Fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer and Construction Representative of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration including requirements for the following:

a. Contract Documents

b. Options

c. Related RFIs

d. Related Change Orders

e. Purchases

f. Deliveries

g. Submittals

h. Review of mockups

i. Possible conflicts

j. Compatibility problems

k. Time schedules

l. Weather limitations

m. Manufacturer's written recommendations

n. Warranty requirements

o. Compatibility of materials

p. Acceptability of substrates

q. Temporary facilities and controls

r. Space and access limitations

s. Regulations of authorities having jurisdiction

t. Testing and inspecting requirements

u. Installation procedures

v. Coordination with other Work

w. Required performance results

x. Protection of adjacent Work

y. Protection of construction and personnel

3. Contractor shall record significant conference discussions, agreements, and disagreements including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

6. Revise paragraph below if Project requires holding progress meetings at different intervals. Insert special intervals such as "every third Tuesday" to suit special circumstances.

7. Project name

8. Name and address of Contractor

9. Name and address of Designer

10. RFI number including RFIs that were dropped and not submitted

11. RFI description

12. Date the RFI was submitted

13. Date Designer's response was received

14. Identification of related DSI or Proposal Request, as appropriate

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013115 - PROJECT MANAGEMENT COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Division 1, Section 013300 - Submittals

C. Division 1, Section 012600 – Contract Modification Procedures

1.2 SUMMARY

A. Project Management Communications: The Contractor shall use the Internet web based project management communications tool, E-Builder® ASP software, and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.
   1. Project management communications is available through E-Builder® as provided by "e-Builder®" in the form and manner required by the Owner.
   2. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited

B. Support: E-Builder® will provide on-going support through on-line help files.

C. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD files, processes or design information distributed in this system is intended only for the project specified herein.

D. Purpose: The intent of using E-Builder® is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files

E. Authorized Users: Access to the web site will be by individuals who are authorized users.
   1. Individuals shall complete the E-Builder New Company/User Request Form located at the following web site: https://oa.mo.gov/facilities/vendor-links/contractor-forms. Completed forms shall be emailed to the following email address: OA.FMDCE-BuilderSupport@oa.mo.gov.
   2. Authorized users will be contacted directly and assigned a temporary user password.
   3. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.

F. Administrative Users: Administrative users have access and control of user licenses and all posted items. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE! Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in

deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).

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

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

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

PART 2 - PRODUCTS (Not Applicable)
PART 3 - EXECUTION (Not Applicable.)

END OF SECTION 013115

[1] The normal work location is the place where the user is assigned for more than one-half of his time working on this project.
[2] The minimum system herein will not be sufficient for many tasks and may not be able to process all documents and files stored in the E-Builder® Documents area.

SECTION 013200 – SCHEDULE – BAR CHART

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS – (Not Applicable)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

A. The Contractor shall submit to the Designer, within ten (10) working days following the Notice to Proceed, a Progress Schedule including Schedule of Values showing the rate of progress the Contractor agrees to maintain and the order in which he proposed to carry out the various phases of Work. No payments shall be made to the Contractor until the Progress Schedule has been approved by the Owner.

1. The Schedule of Values must have the following line items included with the value of the item as indicated below:

   a. O&M's (Owner's Manual)

      1) $1,000,000.00 (One million) and under – 2% of the total contract amount

      2) Over $1,000,000.00 (One million) – 1% of the total contract amount

   b. Close Out Documents

      1) $1,000,000.00 (One million) and under – 2% of the total contract amount

      2) Over $1,000,000.00 (One million) – 1% of the total contract amount

   c. General Conditions

      1) No more than 10%

B. The Contractor shall submit an updated Schedule for presentation at each Monthly Progress Meeting. The Schedule shall be updated by the Contractor as necessary to reflect the current Schedule and its relationship to the original Schedule. The updated Schedule shall reflect any changes in the logic, sequence, durations, or completion date. Payments to the Contractor shall be suspended if the Progress Schedule is not adequately updated to reflect actual conditions.

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

3.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE

A. Bar-Chart Schedule: The Contractor shall prepare a comprehensive, fully developed, horizontal bar chart-type Contractor's Construction Schedule. The Contractor for general construction shall prepare the Construction Schedule for the entire Project. The Schedule shall show the percentage of work to be completed at any time, anticipated monthly payments by Owner, as well as significant dates (such as completion of excavation, concrete foundation work, underground lines, superstructure, rough-ins, enclosure, hanging of fixtures, etc.) which shall serve as check points to determine compliance with the approved Schedule. The Schedule shall also include an activity for the number of "bad" weather days specified in Section 012100 – Allowances.

1. The Contractor shall provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.

    a. If practical, use the same Schedule of Values breakdown for schedule time bars.

2. The Contractor shall provide a base activity time bar showing duration for each construction activity. Each bar is to indicate start and completion dates for the activity. The Contractor is to place a contrasting bar below each original schedule activity time for indicating actual progress and planned remaining duration for the activity.

3. The Contractor shall prepare the Schedule on a minimal number of separate sheets to readily show the data for the entire construction period.

4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on schedule with other construction activities. Include minor elements involved in the overall sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.

5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other required schedules and reports.

6. Indicate the Intent to Award and the Contract Substantial Completion dates on the schedule.

B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by the following:

1. Requirement for Phased completion

2. Work by separate Contractors

3. Work by the Owner

4. Pre-purchased materials

5. Coordination with existing construction

6. Limitations of continued occupancies

7. Un-interruptible services
8. Partial Occupancy prior to Substantial Completion
9. Site restrictions
10. Provisions for future construction
11. Seasonal variations
12. Environmental control

C. Work Stages: Use crosshatched bars to indicate important stages of construction for each major portion of the Work. Such stages include, but are not necessarily limited to, the following:

1. Subcontract awards
2. Submittals
3. Purchases
4. Mockups
5. Fabrication
6. Sample testing
7. Deliveries
8. Installation
9. Testing
10. Adjusting
11. Curing
12. Startup and placement into final use and operation

D. Area Separations: Provide a separate time bar to identify each major area of construction for each major portion of the Work. For the purposes of this Article, a "major area" is a story of construction, a separate building, or a similar significant construction element.

1. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    a. Structural completion.
    b. Permanent space enclosure
    c. Completion of mechanical installation
    d. Completion of the electrical portion of the Work
    e. Substantial Completion

3.3 SCHEDULE OF SUBMITTALS

A. Upon acceptance of the Construction Progress Schedule, prepare and submit a complete schedule of submittals. Coordinate the submittal schedule with Section 013300 SUBMITTALS, the approved Construction Progress Schedule, list of subcontracts, Schedule of Values and the list of products.

B. Prepare the schedule in chronological order. Provide the following information

1. Scheduled date for the first submittal
2. Related Section number
3. Submittal category
4. Name of the Subcontractor
5. Description of the part of the Work covered
6. Scheduled date for resubmittal
7. Scheduled date for the Designer's final release or approval

C. Distribution: Following the Designer's response to the initial submittal schedule, print and distribute copies to the Designer, Owner, subcontractors, and other parties required to comply with submittal dates indicated.

1. Post copies in the Project meeting room and temporary field office.
2. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the Work and are no longer involved in construction activities.

D. Schedule Updating: Revise the schedule after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

3.4 SCHEDULE OF INSPECTIONS AND TESTS

A. Prepare a schedule of inspections, tests, and similar services required by the Contract Documents. Submit the schedule with (15) days of the date established for commencement of the Contract Work. The Contractor is to notify the testing agency at least (5) working days in advance of the required tests unless otherwise specified.

B. Form: This schedule shall be in tabular form and shall include, but not be limited to, the following:

1. Specification Section number
2. Description of the test
3. Identification of applicable standards
4. Identification of test methods
5. Number of tests required
6. Time schedule or time span for tests
7. Entity responsible for performing tests
8. Requirements for taking samples
9. Unique characteristics of each service

C. Distribution: Distribute the schedule to the Owner, Architect, and each party involved in performance of portions of the Work where inspections and tests are required.

END OF SECTION 013200

SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Division 1, Section 013115 “Project Management Communications” for administrative requirements for communications.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work including the following:

1. Shop Drawings
2. Product Data
3. Samples
4. Quality Assurance Submittals
5. Construction Photographs
6. Operating and Maintenance Manuals
7. Warranties

B. Administrative Submittals: Refer to General and Supplementary Conditions other applicable Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Construction Progress Schedule including Schedule of Values
2. Performance and Payment Bonds
3. Insurance Certificates
4. Applications for Payment
5. Certified Payroll Reports
6. Partial and Final Receipt of Payment and Release Forms
7. Affidavit – Compliance with Prevailing Wage Law
8. Record Drawings
9. Notifications, Permits, etc.

C. The Contractor is obliged and responsible to check all shop drawings and schedules to assure compliance with contract plans and specifications. The Contractor is responsible for the content of the shop drawings and coordination with other contract work. Shop drawings and schedules shall indicate, in detail, all parts of an Item or Work including erection and setting instructions and integration with the Work of other trades.

D. The Contractor shall at all times make a copy, of all approved submittals, available on site to the Construction Representative.

1.3 SUBMITTAL PROCEDURES

A. The Contractor shall comply with the General and Supplementary Conditions and other applicable sections of the Contract Documents. The Contractor shall submit, with such promptness as to cause no delay in his work or in that of any other contractors, all required submittals indicated in Part 3.1 of this section and elsewhere in the Contract Documents. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

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

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

    a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

B. Each drawing and/or series of drawings submitted must be accompanied by a letter of transmittal giving a list of the titles and numbers of the drawings. Each series shall be numbered consecutively for ready reference and each drawing shall be marked with the following information:

1. Date of Submission
2. Name of Project
3. Location
4. Section Number of Specification
5. State Project Number
6. Name of Submitting Contractor
7. Name of Subcontractor
8. Indicate if Item is submitted as specified or as a substitution

1.4 SHOP DRAWINGS

A. Comply with the General Conditions, Article 3.2.

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

C. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings including the following information:

1. Dimensions
2. Identification of products and materials included by sheet and detail number
3. Compliance with specified standards
4. Notation of coordination requirements

5. Notation of dimensions established by field measurement

6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8½"x11" but no larger than 36"x48".

1.5 PRODUCT DATA

A. The Contractor shall comply with the General Conditions, Article 3.2.

B. The Contractor shall collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information including the following information:

   a. Manufacturer's printed recommendations

   b. Compliance with Trade Association standards

   c. Compliance with recognized Testing Agency standards

   d. Application of Testing Agency labels and seals

   e. Notation of dimensions verified by field measurement

   f. Notation of coordination requirements

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.6 SAMPLES

A. The Contractor shall comply with the General Conditions, Article 3.2.

B. The Contractor shall submit full-size, fully fabricated samples, cured and finished as specified, and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

1. The Contractor shall mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Designer's sample including the following:

   a. Specification Section number and reference

   b. Generic description of the Sample

   c. Sample source

   d. Product name or name of the Manufacturer

   e. Compliance with recognized standards

   f. Availability and delivery time

2. The Contractor shall submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show approximate limits of the variations.

b. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

c. Refer to other Sections for samples to be returned to the Contractor for incorporation in the Work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.

d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

3. Field samples are full-size examples erected onsite to illustrate finishes, coatings, or finish materials and to establish the Project standard.

a. The Contractor shall comply with submittal requirements to the fullest extent possible. The Contractor shall process transmittal forms to provide a record of activity.

1.7 QUALITY ASSURANCE DOCUMENTS

A. The Contractor shall comply with the General Conditions, Article 3.2

B. The Contractor shall submit quality control submittals including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

C. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the Manufacturer certifying compliance with specified requirements.

1. Signature: Certification shall be signed by an officer of the Manufacturer or other individual authorized to contractually bind the Company.

D. Inspection and Test Reports: The Contractor shall submit the required inspection and test reports from independent testing agencies as specified in this Section and in other Sections of the Contract Documents.

E. Construction Photographs: The Contractor shall submit record construction photographs as specified in this Section and in other Sections of the Contract Documents.

1. The Contractor shall submit digital photographs. The Construction Administrator shall determine the quantity and naming convention at the preconstruction meeting.

2. The Contractor shall identify each photograph with project name, location, number, date, time, and orientation.

3. The Contractor shall submit progress photographs monthly unless specified otherwise. Photographs shall be taken one (1) week prior to submitting.

4. The Contractor shall take four (4) site photographs from differing directions and a minimum of five (5) interior photographs indicating the relative progress of the Work.

1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REQUIRED SUBMITTALS

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

SPEC SECTION	TITLE	CATEGORY
013100	Coordination	Certification
013100	Coordination	Shop Drawings
013200	Schedules	Construction Schedule
013200	Schedules	Schedule of Values
013200	Schedules	List of Subcontractors
013200	Schedules	Major Material Suppliers
013513	Site Security and Health Requirements	Product Data
013513	Site Security and Health Requirements	Certification
013513	Site Security and Health Requirements	Construction Schedule
260519	Low Voltage Electrical Power Conductors and Cables	Product Data
260526	Grounding and Bonding for Electrical Systems	Product Data
260526	Grounding and Bonding for Electrical Systems	Test Report
260533	Raceway and Boxes for Electrical Systems	Product Data
262416	Panelboards	Product Data
262416	Panelboards	Shop Drawings

262726	Wiring Devices	Product Data
262816	Enclosed Switches and Circuit Breakers	Product Data
312513	Erosion Control Materials	Materials Lists
312513	Erosion Control Permit Compliance	Certification
321123	Base Courses Materials	Certifications & Shop Drawings
321216	Asphalt Paving Mix Design	Shop Drawings
321216	Asphalt Paving Materials	Certifications
321313	Concrete Paving Mix Designs	Shop Drawings & Certifications
321313	Concrete Paving Concrete Protection	Shop Drawings
321313	Concrete Paving Joint Sealant	Shop Drawings
321313	Concrete Jointing Plan	Shop Drawings
323113	Chain Link Fences	Shop Drawings
323224	Modular Block Retaining Walls	Shop Drawings & Design Plans
329219	Seed Planting	Schedule
329219	Seeding Materials	Certifications
329219	Seeding Maintenance	Maintenance Manual
330513	Sewer Structure Components	Shop Drawings
331100	Site Water Distribution Pipe Materials	Shop Drawings
334100	Storm Utility Drainage Piping Storm Sewer Pipe Material and Structures	Shop Drawings
334101	Sanitary Sewerage System Materials	Shop Drawings
C302	Campsite Power Pedestal	Product Data
C502	Campsite Water Pedestal	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 014529 - TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes

1. Contractor shall employ and pay for an independent testing laboratory to perform testing as specified.

    a. Testing laboratory and procedures shall be as approved by the Engineer/Architect.

2. Contractor shall fully cooperate with the Owner and/or Engineer/Architect for additional testing required as determined by the Engineer/Architect.

1.2 QUALITY ASSURANCE

A. Testing shall be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials (ASTM).

1.3 PAYMENT FOR TESTING

A. Contractor shall pay for all testing specified in the contract documents.

B. Payment for additional testing, not specified in original contract documents, but required as determined by the Engineer/Architect, shall be as follows:

1. The Owner will pay for initial testing.
2. When initial tests indicate noncompliance with the contract documents, the costs of initial tests associated with that noncompliance will be deducted from the contract sum.
3. Retesting: When initial tests indicate noncompliance with the contract documents, subsequent retesting occasioned by the noncompliance shall be performed by the same testing agency and costs thereof will be deducted from the contract sum.

END OF SECTION 014529

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. Construction aids and miscellaneous services and facilities

D. Security and protection facilities include, but are not limited to, to following:

1. Temporary fire protection
2. Barricades, warning signs, and lights
3. Sidewalk bridge or enclosure fence for the site
4. Environmental protection

1.3 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".

1.4 PROJECT CONDITIONS

A. 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 signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sized and thicknesses indicated.

2. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8" (16mm) thick exterior plywood.

C. Water: Provide potable water approved by local health authorities.

D. 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. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows, and serviceable finishes. Provide heated and air-conditioned units on foundations adequate for normal loading.

G. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated re-circulation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

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

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

PART 3 - EXECUTION

3.1 INSTALLATION

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

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

3.2 TEMPORARY UTILITY INSTALLATION

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

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

C. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

D. Temporary Heating and Cooling: The normal heating and/or cooling system of the building shall be maintained in operation during the construction. Should the Contractor find it necessary to interrupt the normal HVAC service to spaces, which have not been vacated for construction, such interruptions shall be pre-scheduled with the Construction Representative.

E. 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.

F. 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.

G. Drinking-Water Facilities: Provide drinking-water, including paper cup supply.

H. 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: The Owner will provide storage onsite as designated by the Facility Representative or the Construction Representative. Areas for use by the Contractor for storage will be identified at the Pre-Bid Meeting.

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

D. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered “tools and equipment” and not temporary facilities.

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. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

F. 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.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

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

B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonable predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations”.

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.
4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

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

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

E. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.

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

1. Storage: Where materials and equipment must be stored and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

G. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Designer requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.

2. 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 016600 - PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Work included: Protect products scheduled for use in the Work by means including, but not necessarily limited to, those described in this Section.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. Additional procedures also may be prescribed in other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Include within the Contractor's quality assurance program such procedures as are required to assure full protection of work and materials.

1.3 MANUFACTURERS' RECOMMENDATIONS

A. Except as otherwise approved by the Engineer/Architect, Contractor shall determine and comply with manufacturers' recommendations on product handling, storage, and protection.

1.4 PACKAGING

A. Deliver products to the job site in their manufacturer's original container, with labels intact and legible.

1. Maintain packaged materials with seals unbroken and labels intact until time of use.
2. Promptly remove damaged material and unsuitable items from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

B. The Engineer/Architect may reject as non-complying such material and products that do not bear identification satisfactory to the Engineer/Architect as to manufacturer, grade, quality, and other pertinent information.

1.5 PROTECTION

A. Protect existing facilities, finished surfaces, and vegetation during equipment and material handling.

1.6 REPAIRS AND REPLACEMENTS

A. In event of damage, promptly make replacements and repairs to the approval of the Engineer/Architect and at no additional cost to the Owner.

B. Additional time required to secure replacements and to make repairs will not be considered by the Engineer/Architect to justify an extension in the Contract Time of Completion.

END OF SECTION 016600

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for cleaning during the Project.

B. Environmental Requirements: Conduct cleaning and waste-disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General

1. Retain all stored items in an orderly arrangement allowing maximum access, not impending drainage or traffic, and providing the required protection of materials.

2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.

3. At least once each month, and more often if necessary, completely remove all scrap, debris, and waste material from the jobsite.

4. Provide adequate storage for all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the ecology.

B. Site

1. Daily, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

2. Weekly, inspect all arrangements of materials stored onsite. Re-stack, tidy, or otherwise service all material arrangements.

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

C. Structures

1. Daily, inspect the structures and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

2. Weekly, sweep all interior spaces clean. "Clean" for the purposes of this paragraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom.

3. In preparation for installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.

4. Following the installation of finish floor materials, clean the finish floor daily while work is being performed in the space in which finish materials have been installed. "Clean" for the purposes of this subparagraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Construction Representative, may be injurious to the finish of the finish floor material.

3.2 FINAL CLEANING

A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for the entire Project or a portion of the Project.

1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities including landscape development areas, of rubbish, waste material, litter, and foreign substances.

2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

3. Remove petrochemical spills, stains, and other foreign deposits.

4. Remove tools, construction equipment, machinery, and surplus material from the site.

5. Remove snow and ice to provide safe access to the building.

6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

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

D. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after Final Acceptance by the Owner, they become the Owner's property.

END OF SECTION 017400

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Contractor for this work is referred to the Drawings, Bidding Requirements, General Conditions, Special Conditions, Temporary Services and other pertinent Sections of these Specifications. These sections describe work which is a part of this Contract. The following General Provisions amplify and supplement these Sections of Specifications. In cases of conflicting requirements, the stipulations set forth in Division 1 supersede and must be satisfied by the Contractor.

1.2 SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Common electrical installation requirements.

1.3 COORDINATION

A. Contractor must read the entire Specifications covering other branches of Work. Contractor is responsible for coordination of his (her) work with work performed by other trades.

B. Consult all Contract Documents which may affect the location of any equipment or apparatus furnished under this Work and make minor adjustments in location as necessary to secure coordination.

C. System layout is schematic and exact locations shall be determined by structural and other conditions. This shall not be construed to mean that the design of the system may be arbitrarily changed. The equipment layout is to fit into the building as constructed and to coordinate with equipment included under other Divisions of Work.

D. Contractor shall contact the Owner’s Representative immediately if he (she) notices any discrepancies or omissions in either the Drawings or Specifications, or if there are any questions regarding the meaning or intent thereof.

E. Submit all changes, other than minor adjustments, to the Engineer/Architect for approval before proceeding with the work.

F. The Contractor is required to visit the site and fully familiarize himself or herself concerning all conditions affecting the scope of work. Failure to visit the site shall not relieve the Contractor from any responsibility in the performance of his or her Work.

G. All workmanship to be of the highest quality in accordance with the best practices of the trade by craftsmen/ craftswomen skilled in this particular work.

H. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. To ensure connecting raceways, cables, wireways, cable trays, and busways are clear of obstructions and of the working and access space of other equipment.

I. All buried conduits passing from below the proposed building to the exterior shall pass below the structural footing.

J. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

1.4 PERMITS, INSPECTIONS AND CODES

A. File all drawings, pay all fees, and obtain permits and certificate of inspection relative to this Work.

B. Complete installation shall conform with all applicable Federal, State and Local laws, Codes and Ordinances including, but not limited to the latest approved editions of the following:

1. State Building Codes.
2. Specific Construction Safety Requirements, State Industrial Commission.
3. National Electrical Code (NFPA-70).
4. Life Safety Code, NFPA-101.
5. Occupational Safety and Health Act (OSHA) of 1971 and all amendments thereto.

C. Nothing contained in the drawings and specifications shall be construed to conflict with these laws, codes, and ordinances and they are hereby included in these specifications.

1.5 RECORD DRAWINGS

A. Record all deviations from the Drawings, on a set of prints and deliver them to the Owner and Owner's Representative upon completion of the work. Special attention to record the location of concealed boxes, service runs shall be made at the point of installation to maintain accuracy.

1. Sufficient dimensional tie points to permanent building features shall be provided for all buried conduits to facilitate future location.

1.6 INSPECTION

A. Contractor shall arrange for and include in his (her) bid, inspection of this work by the appropriate stator or local code authority having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Furnish new, undeteriorated materials of a quality not less than what is specified.

B. Contractor to furnish and install only those brands of equipment mentioned specifically or accepted as substitutes.

2.2 EQUIPMENT SELECTION AND APPROVAL

A. The selection of materials and equipment to be furnished shall be governed by the following:

1. Where trade names, brands of manufacturer of equipment or materials are listed in the specification, the exact equipment listed shall be used in the bid or the contractor shall submit the necessary literature to show the alternative product meets the performance characteristics of that which has been called for. Where more than one name is listed, Contractor may select any one of the various brands specified.

2.3 SUBSTITUTIONS

A. Contractor must base his (her) bid on furnishing the brands of material and equipment listed in the Specifications or their approved equals.

B. The Contractor is entitled to bid on any other equal or similar brands of material and equipment he (she) may desire to substitute. In order to be considered, the Contractor must request approval to bid the substitution in writing no later than ten (10) days prior to the Bid Date. If permitted the substitutes will be approved by addendum.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Furnish all materials, labor, tools, transportation, incidentals, and appurtenances to complete in every detail and leave in working order all items of work called for herein or shown on the accompanying Drawings.

B. Include any minor items of work necessary to provide a complete and fully operative electrical system which meets all required codes.

C. Comply with NECA 1.

D. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

E. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

F. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

G. Right of Way: Give to piping systems installed at a required slope.

3.2 PROTECTION AND CLEANING

A. Protect all fixtures and equipment against damage from leaks or abuse and pay the cost of repair or replacement of fixtures or equipment made necessary by failure to provide suitable safeguards or protection.

B. After all fixtures and equipment have been set, thoroughly clean all fixtures and equipment with manufacturers recommended cleaning agents, removing stickers and other foreign matter and leave every part in acceptable condition, clean and ready for use.

C. Repair all dents and scratches in factory prime or finish coats on all electrical equipment. If damage is excessive, replacement may be required.

END OF SECTION 260500

SECTION 260519 - LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 STANDARDS

A. Insulation types, ratings and usage shall be in accordance with the National Electrical Code requirements.

B. All conductors shall be copper

C. Unless otherwise noted, minimum wire size for lighting and power branch circuits shall be No. 12 AWG. For control and auxiliary systems, the minimum size shall be No. 14 AWG.

D. Conductors for emergency power and exit wiring shall be a minimum No. 12 AWG.

2.2 CONDUCTORS AND CABLES

A. All wire and cable shall be UL listed.

B. Copper Conductors: Comply with NEMA WC 70.

C. Conductor Insulation: Comply with NEMA WC 70 for Type XHHW.

D. Multiconductor Cable: Comply with NEMA WC 70 for Types UF and USE-2 with ground wire.

2.3 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

B. All components used at wiring terminations, connections and splices shall be UL listed.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Feeders from Transformers to Panels: Type XHHW, single conductors in raceway.

B. Exposed Feeders and Branch Circuits: Type XHHW, single conductors in raceway.

C. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW, single conductors in raceway, or Underground branch-circuit cable Type UF, direct buried.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW, single conductors in raceway, or Type USE-2 multiconductor cable, direct buried.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. Install and make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

1. Use oxide inhibitor at each splice, tap conductor and equipment termination for aluminum conductors.

F. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

B. Grounding system shall be in compliance with all requirements of the National Electrical Code.

1.3 SUBMITTALS

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

B. Field Quality Report

1. Photo Report
2. Dimensioned as-built locations of grounding features

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.2 BONDING TERMINATIONS

A. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches in cross section, unless otherwise indicated; with insulators.

B. Intersystem Bonding Termination:

1. Lay-in connection clamp sized for connected grounding electrode conductor
2. Minimum of (5) bonding conductor terminals (#14 AWG- #4 AWG)
3. UV stabilized base and housing with stainless steel mounting hardware
4. UL listed as an intersystem bonding termination

2.3 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 5/8 inch in diameter by 10 feet or as noted on the Drawings.

B. Segmented Ground Rods: Copper-clad steel; 5/8 inch in diameter by 8 feet in length, capable of being threaded together to form a continuous vertical grounding electrode as noted on the drawings.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned copper conductor. Bury at least 24 inches below grade.

C. Grounding Bus: Install in mechanical rooms.

1. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Connections to Ground Rods: Bolted connectors.

3.2 EQUIPMENT GROUNDING

A. A separate equipment grounding conductor, minimum size per NEC, shall be installed in each feeder, branch circuit, and control circuit conduit. Conductor insulation shall be green. DO NOT use conduit as a means for grounding of receptacles or any other such devices.

B. Conduit system shall be electrically continuous. All enclosures and non-current carrying metals to be grounded. All locknuts must cut through enameled or painted surfaces on enclosures. Where enclosures and non-current carrying metals are isolated from the conduit system, use bonding jumpers with approved clamps.

C. All new receptacles shall be bonded to a ground conductor using a #12 AEG min. bonding jumper between receptacle terminal and ground conductor. Metal-to-metal contact between the device yoke and the outlet box is not acceptable for either surface mounted boxes or flush type boxes.

D. Junction boxes and pull boxes shall be bonded by the use of UL listed ground screws or lugs.

E. Lighting fixtures shall be grounded by the use of a pigtail fastened on bare metal that is free of paint.

F. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.

2. Segmented Ground Rods: Use manufacturer approved ground rod driving methods and equipment to ensure connecting threads on multiple segmented grounds are not damaged.

C. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

3.4 FIELD QUALITY CONTROL

A. Provide a photo report consisting of labeled pictures of all of the following grounding features:

1. Ground rods
2. Intersystem bonding termination
3. Grounding connection to rebar in footing/floor
4. Grounding connection to metallic water pipe

B. Dimensioned as-built plans showing the locations of the key grounding features contained in the photo report shall be submitted concurrently with the photo report.

END OF SECTION 260526

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 SUBMITTALS

A. Product Data: For handholes and/or manholes.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.

B. Nonmetallic Conduit: Sch 40 PVC

C. EMT: ANSI C80.3.

D. Fittings for Conduit (Including all types and flexible and liquid-tight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Fittings for EMT: Steel, set-screw type. Die cast fittings are not acceptable.

2.2 NONMETALLIC CONDUIT AND TUBING

A. PVC conduit shall be heavy wall, Schedule 40 ultra-violet resistant, UL listed under Standard 651. Conduit shall be suitable for use with 90°C insulated wire. Conduit fittings and cement shall be of the same manufacturer.

B. Fittings for Schedule 40 PVC: Match to conduit or tubing type and material.

2.3 METAL WIREWAYS

A. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.

B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

C. Wireway Covers: Screw-cover type.

D. Finish: Manufacturer's standard enamel finish. (COORDINATE COLOR WITH WIRING DEVICES SECTION)

2.4 BOXES AND ENCLOSURES

A. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

B. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

C. Nonmetallic Outlet Boxes: NEMA OS 2.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Green.

2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Non-skid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC.", "TELEPHONE.", “COMMUNICATIONS as appropriate for services contained.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or a combination of the two.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit up to 2’-0” above adjacent finished surface or grade: Rigid Steel Conduit.

2. Exposed Conduit more than 2'-0" above adjacent finished surface or grade: Schedule 40 PVC.
3. Underground Conduit: Schedule 40 PVC, direct buried.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Minimum Raceway Size: 3/4-inch trade size Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Install conduit parallel or perpendicular to building lines (except where run in or below floor slabs). Keep conduit runs as closed to underside of structure as possible.

C. Exercise necessary precautions to prevent accumulation of water, dirt, or concrete in conduits during execution of electrical work. Conduit in which water or foreign material has been permitted to accumulate shall be thoroughly cleaned or replaced where such accumulations cannot be removed.

D. Complete raceway installation before starting conductor installation.

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

H. Raceways below slabs:

1. Minimum conduit size shall be 1".
2. Where raceways turns up to pass through slab, transition from PVC conduit to rigid steel conduit with long radius elbow and rigid steel riser.

I. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

J. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 240-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.

K. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a

blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where required by NFPA 70.

L. Weather-proof boxes shall be die cast aluminum.

M. Secure rigid conduit at cabinets and boxes using insulated throat type grounding and bonding bushings. Locknuts shall be tightened to cut through painted surfaces.

N. Where a number of conduits are to be run exposed and parallel, one with another, they shall be grouped and supported by unistrut tight to the adjacent structure.

O. Mount junction and pull boxes in a location that meets the requirements of the National Electrical Code for accessibility and work space clearance. Coordinate exact locations of work with other trades.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit (not concrete encased):

1. Install direct buried conduit as follows:

a. Excavate by open cut unless otherwise directed on the Drawings.
b. Excavate to the depths necessary to provide at least the NEC required minimum burial depths upon project completion.
c. Over-excavate organic, soft, spongy, or otherwise unsuitable soils found at or below the bottom of the trench as needed to meet firm subsoil.
d. Trenches in non-pavement and non-structure areas:

1) After installing conduit, backfill and compact utilizing native backfill material. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction leaving a mound on the surface to accommodate future settling.

e. Trenches under pavement or structures and within 5’-0” of same:

1) After installing conduit, backfill with compacted aggregate to 95% standard proctor density in 8” maximum lifts. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling.

2. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at new risers reconnecting to existing buildings and structures.

a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches (minimum) of concrete.
b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

3. Buried Warning Identification Tape: Provide 6 wide plastic detectable tape with foil backing 12 inches minimum below grade, and 12 inches minimum above conduits.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

D. CABLE TAGS IN MANHOLES & HANDHOLES

1. Provide tags identifying, the origin and destination, for each cable located in each manhole. The tags shall be polyethylene. Do not provide handwritten letters.

2. Polyethylene Cable Tags:

Provide tags of polyethylene that have an average tensile strength of 22.4 MPa and that are two millimeter, non-corrosive non-conductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 77 degrees C. Provide 1.3 mm thick black polyethylene tag holder.

Provide a one-piece nylon, self-locking tie at each end of the cable tag. Ties shall have a minimum loop tensile strength of 778.75 N. The cable tags shall have black block letters, numbers, and symbols 25 mm high on a yellow background. Letters, numbers, and symbols shall not fall off or change positions regardless of the cable tags' orientation.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Identification for conductors and communication and control cable.
2. Data/Telephone outlet labels
3. Receptacle labels
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with 29 CFR 1910.145.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

PART 2 - PRODUCTS

2.1 CONDUCTOR, COMMUNICATION, AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Marker Tape: Vinyl or vinyl -cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 DATA/TELEPHONE OUTLET LABELS

A. Machine printed paper insert with black filled lettering located under clear label cover on face of plate and durable wire markers on inside of outlet box.

2.3 RECEPTACLE LABELS

A. Hot stamped or engraved machine printing with black filled lettering under clear label on face of plate and durable wire markers on inside of outlet box.

2.4 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches wide by 4 mils thick.
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend shall indicate type of underground line.

2.5 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.

C. Color Scheme

1. Emergency Warning labels: White background with red letters
2. All other warning labels: Yellow background with black letters

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

3. Service Equipment emergency sources warning: “CAUTION – TWO SOURCES OF SUPPLY- EMERGENCY POWER SOURCE LOCATED IN GENERATOR ROOM 207 ON NORTH SIDE OF BUILDING.”

4. Generator Warning Label: “EMERGENCY GENERATOR”

5. Automatic Transfer Switch Warning Label: “EMERGENCY TRANSFER SWITCH”

6. Emergency Panel Warning Label: “EMERGENCY PANEL”

7. Junction boxes containing emergency circuits: “EMERGENCY CIRCUITS- PANEL *insert name”*

8. As noted on drawings.

2.6 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.

1. Engraved legend with black letters on white face. (White letters on red background for emergency information)
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 EQUIPMENT IDENTIFICATION LABELS

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for fasteners, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

B. Fasteners for Labels: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

2.8 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

B. Covers for all junction boxes containing emergency circuits shall be red.

PART 3 - EXECUTION

3.1 APPLICATION

A. Auxiliary Electrical Systems Conductor and Cable Identification: Use marker tape to identify field-installed alarm, control, signal, sound, intercommunications, voice, and data wiring connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and cable pull points. Identify by system and circuit designation.
2. Use system of designations that is uniform and consistent with system used by manufacturer for factory-installed connections.

B. Data/Telephone Outlet Identification: Use outlet labels to identify each outlet connection. Use system of designation that is uniform and consistent with cable identification. Label face of plate and wire markers inside of box,

C. Receptacle Identification: Use labels to identify panelboard and circuit number from which served. Label face of plate and wire markers inside of box,

D. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

E. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

a. Power transfer switches.
b. Controls with external control power connections.

2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

F. Instruction Signs:

1. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for emergency shut down of generator or remote operation of main switch.

G. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

a. Indoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label, drilled for screw attachment.
c. Elevated Components: Increase sizes of labels and legend to those appropriate for viewing from the floor.

2. Equipment to Be Labeled:

a. Panelboards, electrical cabinets, and enclosures.
b. Electrical switchgear and switchboards.
c. Transformers.
d. Generators
e. Disconnect switches.
f. Power transfer equipment.
g. Contactors.
h. Timeclocks
i. Fire alarm control panel and annunciators
j. Motor control switches including Hand/Off/Auto switches

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach non-adhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded feeder, and branch-circuit conductors.

1. Color shall be factory applied or for sizes larger than No. 10 AWG field applied
2. Colors for 208/120-V Circuits:

    a. Phase A: Black.
    b. Phase B: Red.
    c. Phase C: Blue.

3. Colors for 480/277-V Circuits:

    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.

4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

G. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches overall.

END OF SECTION 260553

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Retain first subparagraph below if series rating of overcurrent protective devices is used.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency and marked for intended location and application.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

    a. Outdoor Locations: NEMA 250, Type 3R.
    b. Or as noted on the plans

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Finishes:

    a. Panels and Trim: Steel and galvanized steel factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Galvanized steel.

5. Directory Card: Provide typewritten circuit directory card inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location: Top and bottom.

C. Phase, Neutral, and Ground Buses:

1. Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.

3. Ground Lugs and Bus Configured Terminators: Mechanical type.

4. Feed-Through Lugs (When required): Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

5. Subfeed (Double) Lugs (When required): Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

E. Service Equipment Label (When applicable): NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

D. Mains: Circuit breaker or main lugs only as noted on Drawings.

E. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices: For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Square D; a brand of Schneider Electric.

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or main lugs only as noted on Drawings

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

3. AFCI Circuit Breakers: Single pole configurations for 15A and 20A circuits per NFPA 70 Article. 210.12.

4. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

a. Standard frame sizes, trip ratings, and number of poles.

b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

c. Shunt Trip (When indicated): 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

d. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Receive, inspect, handle, store and install panelboards and accessories according to NEMA PB 1.1.

B. Mount top of trim 90 inches Insert height above finished floor unless otherwise required keep the distance from the floor to top most circuit breaker within the height limitation contained in the NEC.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Recessed panels: Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

1.5 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).

4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 WEATHER RESISTANT GFCI RECEPTACLES

A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex, Weather-resistant GFCI Convenience Receptacles, 125 V, 20 A:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; GFTW20.
b. Pass & Seymour; WR20TRW.

2.3 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Unfinished Spaces: Galvanized steel.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

2.4 FINISHES

A. Color: Coordinate with Architect and Owner

1. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 RECEPTACLE APPLICATION

A. In all areas accessible to students: Tamper Resistant receptacles

B. In areas not accessible to students: Standard receptacles

C. Where required by the most recent version of the NEC and as indicated on the plan sheets: GFCI receptacles

3.2 INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to ensure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.

2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.

4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.

2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

4. Existing Conductors:

   a. Cut back and pigtail or replace all damaged conductors.
   b. Straighten conductors that remain and remove corrosion and foreign matter.
   c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.

4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.

5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.

7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.

8. Tighten unused terminal screws on the device.

9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.3 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

END OF SECTION 262726

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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. This Section includes the following individually mounted, enclosed switches and circuit breakers:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosures.

1.3 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current rating.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

1.5 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FUSIBLE AND NONFUSIBLE SWITCHES

A. Manufacturers:

1. Eaton Corporation; Cutler-Hammer Products.
2. General Electric Co.; Electrical Distribution & Control Division.
3. Square D/Group Schneider.

B. Fusible Switch, 600 A and Smaller: NEMA KS 1, 208/120V Type Heavy Duty three pole, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks interlocked with cover in closed position.

C. Non-fusible Switch, 600 A and Smaller: NEMA KS 1, 208/120V Type Heavy Duty three pole lockable handle with capability to accept two padlocks interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; and labeled for copper and aluminum neutral conductors.

2.3 ENCLOSURES

A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4
3. As noted in the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B. Mount individual wall-mounting switches and circuit breakers with tops at uniform height, unless otherwise indicated.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."

B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate as specified in Division 26 Section "Identification for Electrical Systems."

3.3 CLEANING

A. On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.

B. Inspect exposed surfaces and repair damaged finishes.

END OF SECTION 262816

SECTION 311600 - SITE PREPARATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Protecting existing plants and grass to remain
2. Removing and disposing of existing trees, shrubs, plants, and grasses
3. Clearing and grubbing
4. Stripping and stockpiling topsoil
5. Removing and disposing of above and below grade site structures and appurtenances
6. Removing and disposing of pavements and sidewalks
7. Disconnecting and capping or sealing site utilities
8. Temporary traffic control measures
9. Salvaging of specified materials for the Owner

1.2 MATERIAL OWNERSHIP

A. Except indicated items to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from or when applicable incorporated into the Project site.

1.3 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until Erosion Control Measures and any required Storm Water Pollution Prevention Plans (SWPPP) provisions are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 312300 "Excavation and Fill".

1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Provide to the Owner digital photography of existing site conditions prior to start of work including pavements to remain and which will be used during construction.

D. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary and applicable permanent erosion and sedimentation control measures to per Section 312513 “Erosion Control” and the Storm Water Pollution Protection Plan (SWPPP), including but not limited to prevention of soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties, streets and walkways.

B. Inspect, repair, and maintain and remove erosion and sedimentation control measures during construction until permanent vegetation has been established per the SWPPP.

3.3 TREE PROTECTION

A. Erect and maintain temporary fencing around tree protection zones before starting site clearing. Remove fence when construction is complete.

B. Do not excavate within tree protection zones, unless otherwise indicated.

C. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.

3.4 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

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

C. Utilities by Others: Coordinate with others installing utilities on site or relocating and adjusting utilities offsite for the project. Schedule and arrange for necessary tie-ins and connections.

3.5 CLEARING AND GRUBBING

A. Clear the site by removing and disposing of all obstructions such as fences, walls, foundations, buildings, accumulations of rubbish of whatever nature, shrubs, bushes, saplings, grass, weeds, stumps and other vegetation to a depth of at least 12" below proposed ground surface or proposed subgrade, whichever is lower. Removed materials shall be properly disposed offsite.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

C. Tree removal:

1. November 1 through March 31: No restrictions on tree cutting.
2. April 1 through October 31: Cut trees only after authorized by the Engineer/Owner and upon receiving a copy of the Determination of Effect indicating no affect to threatened or endangered species is expected within the work area.
3. Also, if tree removal is completed between April 1st and October 31st, the contractor will be required to contact the Missouri State Parks to complete the bat surveys of the affected area.
4. Cut off trees and stumps at the existing ground level. Remove stumps and roots as needed.
5. Remove trees and stumps within 2 feet of the proposed structures and underground piping to a depth of not less than 12 inches below the base elevation of proposed structures or underground piping.

D. Protection of persons and property:

1. Barricade open depressions and holes occurring as part of this Work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by operations under this Section.
4. Provide traffic control items in accordance with the Manual of Uniform Traffic Control Devices (MUTCD), and the requirements of the governmental agency having

jurisdiction, when work is being complete on or adjacent to public streets and/or Right-of-ways.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip and stockpile topsoil materials per Section 312300 “Excavation and Fill”.

3.7 SITE IMPROVEMENTS

A. Remove existing above and below grade structures, foundations, pavements and improvements as indicated and as necessary to facilitate new construction.

B. Pavements to be removed adjacent to pavement or structures to remain shall be saw cut to provide a uniform edge.

C. Below grade structures to be removed shall be removed to a minimum of three (3) feet below proposed grade unless in conflict with proposed improvements which may require full removal and disposal.

3.8 DISPOSAL

A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Any timber and or brush that is ground into mulch can be used on site as directed by the owner.

C. Do not burn debris at the site.

D. Do not conduct any generation, transportation, or recycling of construction or demolition debris, clean or general or uncontaminated soil generated during construction, remodeling, repair, and demolition of utilities, structures, and roads that is not commingled with any waste, without the maintenance of documentation identifying the hauler, generator, place of origin of the debris or soil, the weight or volume of the debris or soil, and the location, owner, and operator of the facility where the debris or soil was transferred, disposed, recycled or treated. Maintain documentation for three years.

END OF SECTION 311600

SECTION 312300 - EXCAVATION AND FILL

PART 1 - GENERAL

1.1 SUMMARY

A. Excavate, backfill, compact, and grade the site to the elevations shown on the Drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents. Work includes topsoil stripping, topsoil stockpiling, excavation, preparation & compaction of subgrades for buildings, drives & walks, mass earthwork, topsoil respreading and erosion control.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. Codes and Standards:

1. Perform Field Quality Controls Testing as specified herein.
2. Perform excavation and embankment work in compliance with applicable rules and regulations of DNR, MoDOT, and OSHA.
3. Obtain any necessary permits for this section of work and pay any fees required for permits.
4. The entire installation shall fully comply with all local and State laws and ordinances and with all established codes applicable thereto.

B. Testing and Inspection:

1. Cost of field and laboratory testing will be borne by the Contractor. Lab reports shall be simultaneously forwarded to the Owner, Contractor & Engineer.
2. Contractor shall cooperate with testing laboratory and geotechnical engineer in coordination of compaction tests.

1.3 REFERENCES

A. Standard Specifications for Highway Construction, 2024, Missouri Department of Transportation, herein noted as the Standard Specifications.

B. ASTM D698 Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures, Using 5.5 lb. Rammer and 12 inch Drop.

C. ASTM D1556 Test Method for Density of Soil in Place by the Sand Cone Method.

D. ASTM D2487 Classification of Soils for Engineering Purposes.

E. ASTM D6938 Test Method for Moisture Content of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).

1.4 CONSTRUCTION STAKING AND SURVEYS

A. General: From lines and levels established by property survey, and as shown in relation to the work, Contractor to establish and maintain bench marks, base lines, and other dependable markers to set lines and levels for the work.

B. Owner Property Surveys: Owner reserves the rights to hire an independent Engineer to survey the site for compliance with the contract documents. The Contractor will be required to correct all work not in compliance with the plans and specifications.

1.5 JOB CONDITIONS

A. Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during demolition operations.
2. Underground utilities shown on the drawings have been taken from existing public records, Owner's records, and available as-built drawings and are indicated to the best of our knowledge and provided for information only.
3. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities caused by Contractor's negligence to the satisfaction of utility owner at not cost to the Project Owner.
4. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, during occupied hours, except when permitted in writing by Owner and then only after acceptable temporary utility services have been provided.
5. Provide minimum of 48-hours notice to Owner and Engineer and receive written notice to proceed before interrupting any utility.
6. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

B. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.
2. Operate warning lights as recommended by authorities having jurisdiction.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by demolition operations.
4. Perform excavation within drip-line of large trees to remain by hand, and protect root system from damage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

C. Contract Limits:

1. Contract limits are shown on the drawing:

a. Contractor will maintain his construction operations within the contract limits.
b. Disturbance or damage occurring outside of the contract limits as a result of the Contractor's operations will be repaired to the original condition at no expense to the Owner.

1.6 SUBMITTALS

A. Samples: Submit, in air-tight containers, 50 lb. sample of each type of fill to testing laboratory.

B. Materials Source: Submit name of imported materials source.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Topsoil shall consist of friable, fertile soil of a loamy character. Use suitable topsoil of uniform quality, free from hard clods, roots, sod, stiff clay, hard pan, stones larger than 1 inch (1/2 inch for turfgrass seeding), lime cement, ash, slag, concrete, tar residue, tarred paper, boards, chips, sticks, or any undesirable material.

B. Use on-site topsoil from sources within the project limits, unless compost-amended or off-site topsoil is specified.

1. On-site Topsoil: On-site topsoil material is material excavated from the top 8 inches of the site. Use of on-site topsoil material is subject to the Engineer's approval.
2. Compost-amended On-site Topsoil: Amend low-quality on-site topsoil, not meeting the requirements specified for off-site topsoil, with a minimum of 1 inch of compost for every 3 inches of topsoil. Use compost meeting the requirements of mulch for pneumatic seeding in Section 329219 "Seeding".

2.2 Off-site Topsoil: Contains at least 3% organic matter, according to ASTM D 2974, has a high degree of fertility, is free of herbicides that prohibit plant growth, has a pH level between 5.5 and 7.5, and meets the following mechanical analysis of at least 90 percent must pass the No. 10 sieve. The Engineer will approve the source of off-site topsoil. Surface soils from ditch bottoms, drained ponds, and eroded areas, or soils that are supporting growth of noxious weeds or other undesirable vegetation, will not be accepted. The Engineer will determine if testing is necessary. The Contractor will be responsible for payment of the testing if the off-site topsoil does not meet the above requirements. If the testing verifies the off-site topsoil does meet the above requirements, payment for the testing will be the responsibility of the Jurisdiction.

2.3 SOIL MATERIALS

A. General embankment and fill materials:

1. Predominately granular or non-expansive soils, free from organic matter and deleterious substances, containing no rocks over 3" in greatest dimension and having a minimum Standard Proctor Density of not less than 100 lbs/cu ft.
2. Material is subject to the approval of the A/E, and may be removed from onsite excavations or imported from off-site borrow areas.

3. The upper 12” of fill or embankment shall not have rocks greater than 1” in dimension.
4. For soils to be placed below water, use clean granular material.

B. Structure embankment and fill materials:

1. In addition to the General embankment requirements, soils placed beneath and within 10 feet structures or pavements shall have the following the requirements:

a. Cohesive soils must meet all of the following:

1) Liquid limit of less than 45% and a plasticity index greater than 10 and less than or equal to 25%.
2) Density of 110 pcf or greater according to ASTM D 698 or AASHTO T 99 (Standard Proctor Density).

b. Granular soils must meet all of the following:

1) Density of 110 pcf or greater according to ASTM D 698 or AASHTO T 99 (Standard Proctor Density).
2) no more than 20% or less of fines passing the 200 sieve
3) Plasticity index of 3 or less

c. Drainage Layers:

1) Material consisting of clean crushed stone or gravel graded from 1” to no more than 5% passing the 200 sieve.

d. Crushed stone, crushed PCC, crushed composite pavement, or RAP; mixtures of gravel, sand, and soil; or uniformly-blended combinations of the above; as approved by the Engineer.

2. Subgrade Chemical Treatment (if necessary):

a. Cement: Meet the requirements of AASHTO M 85 for portland cement.
b. Fly ash: Provide Class C meeting the requirements of ASTM C 618 with a minimum of 22% CaO; the Loss of Ignition requirements in Table 1 will not apply. Approval of source required.
c. Lime: Hydrated lime should meet requirements of ASTM C 207, Type N or AASHTO M 216, and others.

C. Geotextile Materials:

1. Geotextile Fabric: Consisting of non-woven filaments of polyolefins or polyesters, meeting the following minimums:

a. Weight (oz/sy): 6.
b. Grab tensile Strength (lbs): 160 ASTM D 4632.
c. Elongation (%): 50 ASTM D 4632.
d. Trapezoidal Tear Strength (lbs): 60 ASTM D 4533.

2. Geogrid, Rectangular: Consisting of integrally-formed grid structure manufactured of a stress-resistant polypropylene material meeting the following minimums:

a. Minimum true initial modulus in use (lb/ft): 20,000 ASTM D 6637

b. Tensile strength, 2% strain (lb/ft): 400 ASTM D 6637
c. Flexural rigidity (mg-cm): 500,000 ASTM D 1388
d. Aperture Size (in): 1.0 minimum, 1.5 maximum

3. Geogrid, Triangular: punched and drawn polypropylene that is oriented in three substantially equilateral directions meeting the following minimums:

a. Tensar TX 140 and/or TX160, TX7 or approved equal.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISH ELEVATIONS AND LINES

A. Finish grading shall be worked to contours or elevations indicated on the drawings. Rocks and other debris unearthed during finish grading operations shall be removed from immediate construction area and disposed of elsewhere on site as approved by Owner and Engineer/Architect.

B. Final disking, harrowing, raking etc. and other preparations for seeding, sod or landscaping will covered in subsequent specification sections.

C. The Contractor shall provide field engineering services as required but not limited to:

1. Establish and maintain lines and levels.
2. Structural design of shores, forms, and similar items as part of his/her means and methods of construction.

3.3 PROCEDURES

A. Utilities:

1. Unless shown to be removed, protect active utility lines shown on the Drawings or otherwise made known to the Contractor prior to excavating. If damaged, repair or replace at no additional cost to the Owner.
2. If active lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.
3. If service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
4. Where existing underground utilities are in actual contact with the new work, so that such utilities cannot be replaced as originally found prior to excavation, and where relocation and changes are required, then the work shall be replaced or relocated by "others" at no cost to the Contractor. The Contractor shall so coordinate his work as to allow a

reasonable time for such replacement or relocation and in no event shall extra compensation be allowed for such coordination or any reasonable delay occasioned there from. Should it be found necessary or desirable by the Owner for the Contractor to perform the work of replacement or relocation, the Engineer/Architect will issue in writing a field order defining the extent of the additional work and instructing the Contractor to proceed with such construction. Compensation for such work shall be determined as set forth in the General Conditions.

5. Do not proceed with permanent relocation of utilities until written instructions are received from the Owner or his/her onsite representative.

B. Protection of persons and property:

1. Furnish, install and maintain barricades, warning lights, and/or warning tape at open holes and depressions or other potential hazards occurring as part of this Work.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
4. Provide traffic control items in accordance with the Manual of Uniform Traffic Control Devices (MUTCD), and the requirements of the governmental agency having jurisdiction, when work is being complete on or adjacent to public streets and/or Right-of-ways.

C. Dewatering:

1. Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.
2. Do not allow water to accumulate in excavations.
3. Remove all water, including rainwater, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.
4. Keep excavations and site construction area free from water.

D. Storm Water Permit:

1. The project will result in disturbance of one (1) or more acres of land compliance with the National Pollutant Discharge Elimination System (NPDES) Storm Water Permit is required.
2. A land disturbance permit is currently in place for this site (Permit #MOR100038):

    a. The Contractor and will be required to certify that he/she understands and will comply with all requirements of the permit.
    b. The Contractor shall be responsible for developing and implementing a storm water pollution prevention plan in accordance with good engineering practice.
    c. The plan shall identify potential sources of pollution, which may be expected to affect the quality of storm water discharges. In addition, the plan shall describe and ensure the implementation of practices which will be used to reduce the pollutants in the storm water discharges associated with the project. A copy of the permit form and a sample plan if not a part of these specifications can be obtained at the A/E's office.

3.4 TOPSOIL STRIPPING

A. Stripping and Salvaging Topsoil:

1. Mow all weeds, grass, and growing crops or other herbaceous vegetation close to the ground and remove from the site. Shred sod by shallow plowing or blading and thorough disking. Thoroughly shred to allow the soil to be easily spread in a thin layer over areas to be covered. If allowed by the Engineer, herbicides may be applied, and vegetation may be incorporated into the topsoil.
2. Remove an adequate amount of topsoil from the upper 8 inches of existing on-site topsoil to allow finish grading with a finished grade of 6 inches of salvaged or amended topsoil. The topsoil may be moved directly to an area where it is to be used, or may be stockpiled for future use.
3. Excess topsoil shall not be removed from the subdivision. It shall be stockpiled on the lots south of the site or as directed by the owner.

B. Preparation for Topsoil Placement:

1. Finish excavation and embankment work according to the specified grades and cross cross-sections; grade and slope all surfaces to drain away from buildings and prevent ponding. Conform to the grading plan within ± 2 inches.
2. Loosen surface to a minimum depth of 4 inches to reduce compaction.

C. Topsoil Spreading and Finish Grading:

1. Place the topsoil after all grading and trenching activities in the area have been completed.
2. Place topsoil at least 8 inches deep; smooth and finished grade according to the contract documents. If topsoil is being amended with compost, thoroughly blend compost with on onsite topsoil at the rate specified
3. After finish grading the topsoil, remove clods, lumps, roots, litter, other undesirable material, or stones larger than 1 inch (1/2 inch for turfgrass).
4. Excess topsoil shall not be removed from the subdivision. It shall be stockpiled on the lots south of the site or as directed by the owner, or incorporated into the embankment, if acceptable, in areas not requiring structural fill.

3.5 EXCAVATING

A. Perform excavation within the project limits to the lines, grades, and elevations indicated and specified herein. Excavation is unclassified, and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

B. Excavated Materials:

1. Satisfactory materials shall be used for fill or embankments within the project limits.
2. Unsatisfactory materials shall be excavated to a depth below grade sufficient to provide a suitable subgrade support and backfill and compact with satisfactory materials.

C. Surplus materials:

1. Dispose of unsatisfactory excavated materials, and surplus excavated material, offsite at disposal areas arranged and paid for by the Contractor.

D. Drainage:

1. Provide temporary drainage facilities to prevent damage to public or private interests when necessary to interrupt natural drainage or flow of artificial drains.
2. Excavate and fill in a manner and sequence that will provide proper drainage at all times.
3. Restore original drainage as soon as work allows.

E. Unauthorized Excavation:

1. Consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Geotechnical Engineer.
2. Unauthorized excavation, as well as remedial work directed by Geotechnical Engineer shall be at Contractor's expense.
3. Backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Geotechnical Engineer.

F. Off-site Borrow:

1. Obtain material required for fill or embankment in excess of that produced within the grading limits of the project from borrow areas selected and paid for by the Contractor and approved by the Owner or his/her representative. The Contractor shall obtain written agreements from the property owners for the removal of the materials.

G. Stability of Excavations:

1. Perform excavations and trenches in accordance with OSHA excavating and trenching rules and regulations.
2. Slope sides or shore and brace where sloping is not possible because of space restrictions of stability of the materials being excavated.
3. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

H. Excavating for Structures:

1. Excavate to elevations and dimensions shown within a tolerance of 0.05ft., and extending a sufficient distance from footings and foundations to permit placing and removing concrete formwork, installation of services and for inspection.
2. Excavation for footings and foundations shall not disturb the bottom of the excavation:

    a. Excavate and trim with hand tools as necessary to final grade just before concrete is placed.

I. Excavating for pavements:

1. Excavate subgrade under pavements to within 0.05 ft of the proposed subgrade.
2. Prepare subgrade as specified herein.

J. Cold weather protection:

1. Protect excavation surfaces from freezing when an atmospheric temperature is less than 35 degrees F.

3.6 EMBANKMENT

A. Fill excavations as promptly as progress of the Work permits, but not until:

1. Acceptance of construction below finish grade.
2. Concrete formwork is removed.
3. Shoring and bracing are removed, and voids have been backfilled with satisfactory materials.
4. Trash and debris have been removed.

B. Subgrade Preparation:

1. Remove vegetation, topsoil, obstructions, and deleterious materials from the ground surface prior to placement of embankment per Section 3.4 of this specification.
2. Disk excavated area to a depth of 8", unless sand or aggregate. Proof roll and prepare the surface per Section 3.8-D of this specification. Unsuitable material or material not achieving the specified stability, density, and moisture requirements after three consecutive good drying days of moisture conditioning and compaction, consisting of at least two processing's utilizing discs or tillers, shall be removed and/or replaced, or shall be further treated per instructions of the soils engineer. Additional work or materials required after the three-day conditioning period to stabilize the material, when approved in writing by the Owner or his/her representative, shall be performed and paid for in accordance with the General Conditions.

C. Subgrade Treatment:

1. Lime, Cement, or Fly Ash:

    a. Incorporate the subgrade treatment material uniformly during subgrade preparation to the depth and rate specified in the contract documents.
    b. Place subgrade treatment in the areas as specified or as directed by the Engineer.

2. Geogrid or Geotextiles:

    a. Install according to manufacturer's recommendations, on top of the prepared subgrade.
    b. Geogrid shall only be utilized when the aggregate base thickness will have a minimum of six (6) inches thick in order to prevent it from popping through the aggregate base. Minimum lap shall be 12" and minimum sewn lap shall be 4" or as specified by the manufacturer.
    c. Place subgrade treatment in the areas as specified or as directed by the Engineer.

D. Placing and compacting:

1. Place fill materials in layers not more than 8" in loose depth, unless otherwise approved by the A/E.
2. Before compacting, moisten or aerate each layer as necessary to provide the specified moisture content.
3. Compact each layer to required percentage of maximum density for the area.
4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.
5. Place backfill and fill materials evenly adjacent to structures, to required elevations.

6. Prevent wedging action of backfill against structures by carrying the material uniformly around the structures to approximately the same elevation in each lift.
7. The building embankment shall be constructed at minimum 5 feet beyond the proposed building line and pending approval of the compacted fill, shall be cut back at a 1:1 slope extending from the top of the proposed footing to 4 feet inside the building wall.
8. Placement of granular drainage material beneath the floor slab will be completed by the Building Contractor.

3.7 GRADING

A. General:

1. Uniformly grade the areas within project limits under this Section, including adjacent transition areas.
2. Finished surfaces within specified tolerance.
3. Compact with uniform levels or slopes between points where elevations are shown on the Drawings, or between such points and existing grades.
4. Where a change of slope is indicated on the Drawings, construct a rolled transition section having a minimum radius of approximately 8'-0", unless adjacent construction will not permit such a transition, or if such a transition defeats positive control of drainage.

B. Grading inside building lines:

1. Provide drainage away from structures during construction of the embankments to prevent ponding.
2. Finish surface within 0.05 foot of the proposed subbase elevation.

C. Grading outside building lines:

1. Provide drainage in areas adjacent to buildings away from the structures, and to prevent ponding.
2. Finish areas under walks and pavements to within 0.05 ft above or below the required subgrade elevation.

3.8 COMPACTING

A. Control material compaction during construction to provide the minimum Standard Proctor Density (SPD) specified, within moisture requirements, for each area as determined according to (ASTM D 698).

B. Provide not less than the following minimum densities for layer or lift of material placed:

1. Backfill or embankment under buildings, structures or within a 1:1 projected slope outside the finish structure grade @ 97% of Standard Proctor Density.
2. Backfill or embankment under pavements, walks, slabs or within a 1:1 projected slope outside the finish grade @ 98% of Standard Proctor Density.
3. All other backfill or embankment areas @ 85% of Standard Proctor Density.
4. Fills or embankments under buildings, structures, pavements, walks, slabs, and the projected slopes:

a. Prepared existing surface @ 90% of Standard Proctor Density.
b. The lower 1/4 of embankments greater than 4 ft in height but not exceeding the lower 2 ft. @ 90% of Standard Proctor Density.
c. Remainder as specified above.

C. Moisture control:

1. Moisture content for compaction purposes within building footprints shall be within the range of 2% below to 3% above optimum moisture as established by ASTM D 698.
2. Moisture content for subbase compaction purposes shall be within the range of 2% below to 2% above optimum moisture and granular base compaction purposes shall be within the range of 2% below to 2% above optimum moisture all as established by ASTM D 698.
3. Existing ground surface or embankment layer of material if necessary shall be moisture-conditioned before compacting by:

   a. For material below specified moisture parameters, uniformly apply water to surface of the material and incorporate with a disk or tiller.
   b. For material above the specified moisture parameters, air dry with disks and tillers or replaced with acceptable onsite soils at the Contractors expense. If moisture reduction is unable to be achieved after multiple attempts, due to temperature or excessive weather conditions the A/E may approve another method.

4. Process material to provide uniform moisture and clod reduction throughout.
5. Unsuitable material removed due to high moisture may be spread and allowed to dry until suitable.

D. Proof roll:

1. Prior to placement of granular subbase material on building and pavement areas, the subgrade shall be "proof rolled" with a minimum 25 ton gross vehicle weight (G.V.W.) truck to identify areas of soft or unstable subgrade. Permanent rutting in excess of 1" should be considered failure. Elastic (rebound) movement or rutting in excess of 1" with substantial cracking or substantial lateral movement should be considered failure. Rutting and cracking greater than detailed above is considered "pronounced elasticity." Elastic, rebound, or rolling movement is always associated with excess water in the subgrade system. Failing areas detected by proof rolling should be immediately repaired and retested or removed and replaced with suitable material.

3.9 EROSION PROTECTION

A. The Contractor shall comply with soil erosion control requirements of the Missouri DNR and the local ordinances. The Contractor shall take all necessary measurements to protect against erosion and dust pollution on this project site and all off-site borrow or deposit areas, during performance or as a result of performance.

B. The Contractor shall take all steps necessary to protect adjoining property, including public sanitary and storm drainage systems and streets, from any damage resulting from the movement of earth or other debris thereto from the site; and such steps as are necessary to prevent the accumulation of earth or debris on adjoining public or private property from the construction

site. The Contractor shall take into consideration all factors which might cause the movement of earth or debris from the construction site onto any adjoining public or private property.

C. The Contractor shall take immediate corrective action should damage occur to adjoining public or private property (including sanitary or storm drainage systems and streets). The Contractor shall take immediate corrective action to remove any debris should any earth or other debris move from the construction site to adjoining public or private property. Further, the Contractor shall take steps required to prevent the repetition of any instance where dirt or other debris moves from the construction site to adjoining public or private property.

D. The Contractor will hold the Owner harmless from any and all claims of any type whatsoever resulting from damages to adjoining public or private property, including reasonable attorney's fees incurred to Owner. Further, if the Contractor fails to take necessary steps to promptly remove earth or debris which comes onto adjoining public or private property, the Owner may, but need not, remove such debris and deduct the cost thereof from amounts due the Contractor.

E. The Contractor shall maintain storm sewer systems throughout construction and provide erosion control measures acceptable to protect against siltation and erosion or any adverse conditions resulting from storm water. Use silt fence and other means at all intakes and outfall structures and at all locations where erosion or siltation is anticipated or occurring; including drainage courses and swales.

3.10 FIELD QUALITY CONTROL

A. The **Contractor** shall provide testing services of a soils engineer and/or independent laboratory approved by the Owner.

B. Upon completion of each test and/or inspection, promptly distribute copies of test or inspection reports to the A/E.

C. Testing Requirements:

1. Pentrometer Tests:

    a. 1 per each spread footing.
    b. 1 per 25' of lineal footing.

2. Standard Proctor Density/Moisture (ASTM D 698):

    a. 1 per the insitu fill material.
    b. 1 per each source of offsite fill material.

3. Field density/moisture tests (ASTM D698):

    a. Paved Areas: 1 per 5000 sq ft per 8" lift.
    b. Building Area: 1 per 2500 sq ft per 8" lift.

4. Liquid Limit and Plasticity Index

    a. Building Area: 1 per each source of offsite fill material.

3.11 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Removal from Project Site: Remove excess soils, including unacceptable excavated material, from site to an approved location on the coordinate with owner.

B. Remove from the Owner's Property waste materials, trash, debris, utility pipes, etc. to an approved legal waste site.

3.12 MAINTENANCE

A. Protection of newly graded areas:

1. Protect newly graded areas from traffic and erosion, and keep free from trash and weeds;
2. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

3.13 CERTIFICATION

A. Upon completion of this portion of the work, and as a condition of its acceptance, deliver to the Owner or his/her site representative a written report from the independent soils engineer or testing laboratory certifying that the compaction requirements have been obtained. Include in the report the soil classification, standard proctor density, optimum moisture content and plasticity index of the onsite and borrow materials used in the areas of embankment,

END OF SECTION 312300

SECTION 312333 - TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

A. Trench, backfill, compact, as specified herein, and as needed for installation of underground utilities associated with the work.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

C. Perform Field Quality Controls Testing as specified herein.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of relevant sections.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Standard Trench Excavation: All materials encountered during trench excavation, except rock and over-excavation.
   1. Suitable Backfill Material: As noted in Section 2.1C
   2. Unsuitable Backfill Material: Includes, but is not limited to, the following materials:
      a. Soils not classified as suitable backfill material
      b. Individual stones or concrete chunks larger than 6 inches and averaging more than one per each cubic foot of soil.
      c. Frozen materials.
      d. Stumps, logs, branches, and brush.
      e. Trash, metal, or construction waste.
      f. Soil in clumps or clods larger than 6 inches, and without sufficient fine materials to fill voids during placement.
      g. Environmentally contaminated soils.

h. Materials removed as rock excavation or over-excavation.

3. Rock Excavation: Boulders or sedimentary deposits that cannot be removed in trenches without continuous use of pneumatic tools or blasting.
4. Over-excavation: Excavation of unsuitable or unstable material in trenches below the pipe zone

B. Bedding Materials:

1. Aggregate materials in accordance with Class II Material: Manufactured and non-manufactured open-graded (clean) or dense-graded (clean) processed aggregate, clean sand, or coarse-grained natural soils (clean) with little or no fines.

C. Trench backfill materials:

1. General: Soil materials removed from excavations or imported from off-site borrow areas free from organic matter and deleterious substances, and containing no rocks, stone or broken concrete over 4" in greatest dimension. No rocks larger than 1" diameter shall be permitted in the upper 12" of fill.
2. Non-expansive Soils: Soil or granular materials free from organic matter and deleterious substances having a Standard Proctor Density greater than 100 pcf and a plastic limit less than 22 percent.
3. Structural Fill: Cohesionless granular materials free from organic material and other foreign matter, complying with the requirements of Class III materials
4. Clean Granular Materials: Class II Material: Manufactured and non-manufactured open-graded (clean) or dense-graded (clean) processed aggregate, or coarse-grained natural soils (clean) with little or no fines.

2.2 TOPSOIL

A. Where and if shown on the Drawings of otherwise required, provide topsoil consisting of friable, fertile soil of a loamy character. It shall be relatively free from large roots, sticks, weeds, brush, or stones larger than 1 inch in diameter, or other litter and waste products. At least 90 percent must pass the No. 10 sieve and the pH must be between 5.0 and 8.0.

B. Obtain topsoil from sources within the project limits, or provide imported topsoil obtained from sources outside the project limits, or from both sources

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FINISH ELEVATIONS AND LINES

A. Finish grading shall be bladed off to contours or elevations indicated on the drawings. Rocks and other debris unearthed during finish grading operations shall be removed from immediate

construction area and disposed of elsewhere on site as approved by Owner and Engineer/Architect.

B. Final disking, harrowing, raking etc. and other preparations for seeding, sod or landscaping will be by others.

C. The Contractor shall provide field engineering services as required but not limited to:

1. Establish and maintain lines and levels.
2. Structural design of shores, forms, and similar items as part of his/her means and methods of construction.

3.3 PROCEDURES

A. Utilities:

1. No attempt is made to indicate or show accurate location of all underground utilities in the line of, or crossing the proposed work. In general, wherever record information was available of locations and wherever field location was possible during surveys, the approximate position of utilities is shown on the Drawings. These are primarily for the purpose of indicating the approximate position of the underground lines with respect to the proposed sewer lines.
2. The determination of the exact location of all existing facilities, and all other pipes, services and structures, and their proper protection, support and maintenance during all construction operations, is the expressed responsibility of the Contractor in the performance of his contract. Contractors are advised to secure any additional information, relative to the underground utility lines, by consulting with proper private and public officials, under whose jurisdiction the maintenance and operation of the utility lines lie, and/or by field investigations at his own expense.
3. Wherever underground utilities are disturbed or damaged as a result of the construction work proposed herein and such utilities can be replaced at their original locations and grades with all costs in connection with such replacement work to be borne by the Contractor and no separate or extra payment will be made therefore.
4. Where existing underground utilities are in actual contact with the new work, so that such utilities cannot be replaced as originally found prior to excavation, and where relocation and changes are required, then the work shall be replaced or relocated by "others" at no cost to the Contractor. The Contractor shall so coordinate his work as to allow a reasonable time for such replacement or relocation and in no event shall extra compensation be allowed for such coordination or any reasonable delay occasioned there from. Should it be found necessary or desirable by the Owner for the Contractor to perform the work of replacement or relocation, the Engineer/Architect will issue in writing a field order defining the extent of the additional work and instructing the Contractor to proceed with such construction. Compensation for such work shall be determined as set forth in the General Conditions.

B. Protection of persons and property:

1. Furnish, install and maintain barricades, warning lights, and/or warning tape at open holes and depressions or other potential hazards occurring as part of this Work.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this Section.
4. Provide traffic control items in accordance with the Manual of Uniform Traffic Control Devices (MUTCD), and the requirements of the governmental agency having jurisdiction, when work is being complete on or adjacent to public streets and/or Right-of-ways.

C. Dewatering:

1. Remove all water, including rain water, encountered during trench and substructure work to an approved location by pumps, drains, and other approved methods.
2. Keep excavations and site construction area free from water.

3.4 EXCAVATING

A. Perform excavating within the limits of the Work to the lines, grades, and elevations indicated and specified herein.

B. Surplus materials:

1. Dispose of unsatisfactory excavated materials, and surplus excavated material.

C. Excavate and backfill in a manner and sequence that will provide proper drainage at all times.

D. Excavation is unclassified, and includes excavation to subgrade elevations indicated, regardless of character of materials and obstructions encountered.

3.5 PIPE BEDDING

A. Place bedding material in the bottom of the trench in lifts no greater than 6 inches thick. Consolidate and moderately compact bedding material.

B. Shape bedding material to evenly support pipe at the proper line and grade, with full contact under the bottom of the pipe. Excavate for pipe bells.

C. Install pipe and system components.

D. Place, consolidate, and moderately compact additional bedding material adjacent to the pipe to a depth equal to 1/6 the outside diameter of the pipe.

3.6 HAUNCH SUPPORT

A. Granular Material:
1. Place aggregate material in lifts no greater than 6 inches thick.

2. Consolidate and moderately compact by slicing with a shovel or using other approved techniques.

B. Suitable Backfill Material:

1. Place in lifts no greater than 6 inches thick.
2. For suitable backfill materials, compact to at least 95% of Standard Proctor Density. Obtain required compaction within a soil moisture range of optimum moisture of -2% to 3% above optimum moisture content.

3.7 FILLING AND BACKFILLING

A. Backfill excavations as promptly as progress of the Work permits, but not until:

1. Acceptance of construction below finish grade.
2. Concrete formwork is removed.
3. Shoring and bracing are removed, and voids have been backfilled with satisfactory materials.
4. Trash and debris have been removed.

B. Placing and compacting:

1. Place backfill materials in layers not more than 8" in loose depth.
2. Before compacting, moisten or aerate each layer as necessary to provide the optimum moisture content.
3. Compact each layer to required percentage of maximum density for the area.
4. Do not place backfill or fill material on surfaces that are muddy, frozen, or containing frost or ice.
5. Hydraulic compaction (flooding with water) is not allowed unless authorized by the Engineer.
6. Place backfill and fill materials evenly adjacent to structures, to required elevations.
7. Take care to prevent wedging action of backfill against structures by carrying the material uniformly around the structures to approximately the same elevation in each lift.

3.8 COMPACTING

A. Control soil compaction during construction to provide the minimum percentage of density specified for each area as determined according to Standard Proctor Density (ASTM D 698).

B. Provide not less than the following maximum density of soil material compacted at optimum moisture content for the actual density of each layer of soil material in place.

1. Backfill under buildings or structures @ 97% of maximum density (compact to at least 70% relative density for clean aggregates).
2. Backfill under pavements and walks @ 98% of maximum density (compact to at least 75% relative density for clean aggregates)
3. All other backfill @ 90% of maximum density (compact to at least 60% relative density for clean aggregates).
4. Compaction by jetting is not allowed.

3.9 FIELD QUALITY CONTROL

A. Trench compaction testing is the **Contractor's** responsibility and they shall provide testing of trench backfill material using the services of an independent testing laboratory approved by the Engineer.

B. Soil Testing:
   1. Cohesive Soils:
      a. Determine moisture-density relationships by ASTM D 698 (Standard Proctor). Perform at least one test for each type of cohesive soil used.
      b. Determine in-place density and moisture content. Use ASTM D 1556 (sand-cone method) and ASTM D 2216 (laboratory moisture content), or use ASTM D 698 (nuclear methods for density and moisture content).
   2. Cohesionless Soils:
      a. Determine maximum and minimum index density and calculate relative density using ASTM D 4253 and ASTM D 4254.
      b. For clean aggregate granular bedding material and backfill, determine gradation according to ASTM C 136.

C. Field Testing:
   1. Testing Frequency and Locations: Perform testing of the final trench backfill, beginning at a depth of 2 feet above the top of the pipe, as follows:
      a. Coordinate the timing of testing with the Engineer.
      b. The Engineer/Inspector will determine the location of testing.
      c. For each 2 vertical feet of consolidated fill, provide tests at a maximum horizontal spacing of 200 feet and at all street crossings.
      d. Additional testing may be required by the Engineer in the event of non-compliance or if conditions change.
      e. If necessary, excavate to the depth and size as required by the Engineer to allow compaction tests. Place backfill material and recompact.
   2. Test Failure and Retesting: Rework, recompact, and retest as necessary until specified compaction and moisture content is achieved in all areas of the trench. In the event of failed tests, the Engineer may require retesting as deemed necessary.

3.10 MAINTENANCE

A. Protection of newly graded areas:

   1. Repair and reestablish grades in settled, eroded, and rutted areas to the specified tolerances.

B. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, reshape, and compact to the required density prior to further construction.

END OF SECTION 312333

SECTION 312513 -EROSION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all materials; install, construct, maintain, and remove specified erosion control devices; at locations specified in the contract documents, or where specified by the Engineer.

B. Complete the required construction work on this project, while minimizing soil erosion and controlling water pollution. Maintain these features as specified, from initial construction stages to final completion of the project

C. Other related documents.

1.2 GENERAL

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

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

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

1.3 DEFINITIONS

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

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

1.4 SUBMITTALS

A. Product data: If requested by the Engineer/Architect (A/E), within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section;

2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

B. The Contractor and will be required to certify that he/she understands and will comply with all requirements of the permit.

C. The Contractor shall be responsible for developing and implementing a storm water pollution prevention plan in accordance with good engineering practice.

D. A land disturbance permit is currently in place for this site (Permit #MOR100038). The Contractor shall review the Storm Water Pollution Prevention Plan (SWPPP) provided in these plans and make appropriate field corrections to the document, and submit final corrected copies of the SWPPP to the Owner and facility.

1.5 **RELATED SECTIONS**

A. Section 312300 – Excavation and Fill.

PART 2 - PRODUCTS

2.1 **MATERIALS**

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

B. Geotextile Silt Fence meeting the following requirements:

1. Woven material with a minimum width of 36 inches.
2. Top edge of the fabric hemmed or modified otherwise so that a braided cord or woven belt can be suitably attached for loop tying to fence posts.
3. The cord or belt of minimum tensile strength of 150 pounds.
4. Required properties:
   a. Grab tensile Strength (lbs): 150 ASTM D 4632.
   b. Ultraviolet Stability (Retained Strength): 70% ASTM D 4355.
   c. Permittivity: 0.05 ASTM D 4491.
   d. Apparent Opening Size, maximum: US Sieve No. 30 ASTM D 4751
5. Posts: 4 foot minimum steel (T-section) weighing at least 1.25 pounds per foot, exclusive of anchor plate. Painted posts are not required, or a minimum cross-sectional area of 2” x 2” nominal size.
6. Fastener: Wire or plastic ties with a minimum tensile strength of 50 pounds.

C. Wattles:

1. Netting: Open weave, degradable netting. Nominal diameter of 9 inches, or as specified.
2. Fill Material: Straw, wood excelsior, coir, or other natural materials approved by the Engineer.
3. Stakes: 1 inch by 1 inch (minimum) wooden stakes, or stakes of equivalent strength.

D. Filter Sock

1. For slope and sediment control applications, use a continuous, tubular, knitted, mesh netting with 3/8 inch openings, constructed of 5 mil thickness, photodegradable HDPE.

E. Erosion Control Blankets

1. Short Term Erosion Control Blanket, Functional longevity of between 3 and 12 months and classified as follows:

a. Single-net erosion control blankets and open weave textiles, consisting of an erosion control blanket composed of processed degradable natural or polymer fibers, mechanically bound together by a single degradable synthetic or natural fiber netting to form a continuous matrix, or an open weave textile composed of processed degradable natural or polymer yarns or twines woven into a continuous matrix.

2. Long Term Erosion Control Blanket, Functional longevity of 36 months and classified as follows:

a. Erosion control blankets and open weave textiles, consisting of processed slow-degrading natural or polymer fibers, mechanically bound together between two slow degrading synthetic or natural fiber nettings to form a continuous matrix, or an open weave textile composed of processed slow-degrading natural or polymer yarns or twines woven into a continuous matrix.

F. Turf Reinforcement Mats (TRM)

1. TRM that is constructed of a web of mechanically or melt-bonded polymer netting, monofilaments, or fibers that are entangled or woven to form a strong and dimensionally stable mat. Non-woven bonding methods include polymer welding, thermal or polymer fusion, or the placement of fibers between two high-strength, biaxially oriented nets, mechanically bound by parallel stitching with polyolefin thread. Use only components that are 100% synthetic and resistant to biological, chemical, and ultraviolet degradation. Meet the minimum material and performance requirements contained below:

a. Grab tensile Strength (lb/ft): 240 ASTM D 6818.

b. UV Stability (%): 80 - ASTM D4355 (1000 Hour Exposure)

c. Allowable Shear Stress (lb/sq ft): 10 ASTM 6460

d. Maximum Slope Grade: 1:1(H:V) or Flatter

G. Ditch Checks:

1. Rock ditch checks: 2" to 3" clean gravel or limestone.

2. Straw bale ditch checks: Rectangular wheat straw bales in good condition.

3. Silt fence ditch checks: Geotextile meeting the requirements of this specification.

H. Rock Ditch Liner:

1. The rock ditch liner shall meet the following requirements:

a. Type 1 Rock Ditch Liner shall consist of material with a predominant rock size of 3 inches, a maximum rock size of 6 inches and a gradation such that no more than 15 percent will be less than one inch.

b. Type 2 Rock Ditch Liner shall consist of material with a predominant rock size of 6 inches, a maximum rock size of 10 inches and a gradation such that no more than 15 percent will be less than 3 inches.

c. Type 3 Rock Ditch Liner shall consist of material with a predominant rock size of 12 inches, a maximum rock size of 20 inches and a gradation such that no more than 15 percent will be less than 4 inches.

d. Type 4 Rock Ditch Liner shall consist of material with a predominant rock size of 19 inches, a maximum rock size of 28 inches and a gradation such that no more than 15 percent will be less than 6 inches.

e. Bedding material shall be used under Type 3 and Type 4 Rock Ditch Liner. Bedding material shall consist of crushed stone or gravel with a gradation consisting of 100 percent passing the 3-inch sieve, 30 to 70 percent passing the 1 1/2-inch sieve and 0 to 15 percent passing the No. 4 sieve.

2. All stone for the protection work shall be of a hard, durable quality such as will not disintegrate under the elements or be easily broken in handling. It shall be clean and free from earth, dust, or other refuse. The faces of individual pieces of stone shall be roughly angular, not rounded in shape. Field stone will not be accepted. Broken concrete is not acceptable material.

I. Temporary Pipe:

1. PVC, HDPE, and metal pipes meeting requirements as specified in Section 334100 Storm Utility Drainage Piping.

J. Temporary Seeding:

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

2.2 CERTIFICATION AND SAMPLING:

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

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

C. The Owner's Representative reserves the right to sample and test any material offered for use.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

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

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

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

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

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

F. Perform inspections according to and at frequency required by the General Permit and local governing agencies

3.2 LIMITATION OF AREA DISTURBED:

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

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

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

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

3.3 BORROW AND WASTE AREAS

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

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

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

3.5 TEMPORARY SLOPE DRAINS

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

B. Temporary slope drains shall be anchored to prevent disruption by the force of the water flowing in the drain.

C. The inlet end shall be constructed to channel water into the drain.

D. The outlet ends of these temporary slope drains shall have some means of dissipating the energy of this water to reduce erosion downstream.

E. Unless otherwise directed by the Owner's Representative, temporary slope drains shall be removed when no longer necessary and the site restored to match the surroundings.

3.6 GEOTEXTILE SILT FENCE

A. Installation:

1. Install material along the contour of the ground, as specified in the contract documents, or as directed by the Engineer.
2. Install silt fence with a mechanical soil slicing machine that creates a slit in the ground while simultaneously installing the fabric. The trenching method may be used when situations will not allow soil slicing, as determined by the Engineer.
3. Construct a "J-hook" at each end of a continuous run of silt fence, by turning the end of the silt fence uphill, as necessary to prevent runoff from flowing around ends when water behind the fence ponds to a level even with the top of the fence.
4. Insert 12 inches of fabric to a minimum depth of 6 inches (fabric may be folded below the ground line).
5. Compact installation by driving along each side of the silt fence, or by other means, as necessary to adequately secure the fabric in the ground, to prevent pullout and water flow under the fence.
6. Drive posts into the ground alongside the silt fence, to a minimum depth of 20 inches, unless otherwise specified by the Engineer. Space posts as shown on these construction documents.

B. Maintenance:

1. Repair or replace non-functioning silt fence that allows water to flow under the fence, is torn, or is otherwise damaged, due to inadequate installation, at no additional cost to the Owner.
2. When accumulated sediment reaches a level one-half the height of the fence, remove the silt fence as described above, and replace according to the installation instructions above.

C. Removal:

1. Remove the silt fence upon final stabilization of the project area, or according to the staging indicated in the SWPPP.
2. Remove and dispose of silt fence and posts.
3. Remove sediment or spread to match finished grade; ensure proper drainage.
4. Stabilize the area disturbed by removal operations.

3.7 WATTLES

A. Installation:

1. Construct a shallow trench, 2 to 4 inches deep, matching the width and contour of the wattle.
2. Install wattle along contour of slope.
3. Turn ends of wattle uphill to prevent water from flowing around ends.
4. Place and compact excavated soil against the wattle, on the uphill side.

5. Drive stakes through the center of the wattle, into the ground at a maximum spacing of 4 feet along the length of the wattle, and as needed to secure the wattle and prevent movement.

6. Abut ends of adjacent wattles tightly. Wrap joint with a 36 inch wide section of silt fence and secure with stakes.

B. Maintenance:

1. When accumulated sediment reaches a level one-half the height of the wattle, or when the wattle becomes clogged with sediment and no longer allows runoff to flow through, remove the wattle as described above, and replace according to the installation instructions above.

C. Removal:

1. When specified in the contract documents, or as directed by the Engineer, remove the wattle upon completion of the project, and after final stabilization is achieved; or as indicated in the SWPPP, if applicable.

2. Completely remove the wattle netting, filler material, and stakes.

3. Spread the accumulated sediment to match finished grade and to ensure proper drainage.

4. When allowed by the Engineer, the wattle netting may be sliced open and the filler material spread out over the ground. Removal of netting and stakes and spreading of sediment is still required.

3.8 FILTER SOCKS

A. Installation:

1. Fill mesh filter sock with filler material to the size and length specified in the contract documents.

2. Place the filter sock along the contour as specified in the contract documents, or as directed by the Engineer.

3. Construct a “J-hook” at each end of a continuous run of filter sock, by turning the end of the sock uphill, as necessary to prevent runoff from flowing around the ends when water behind the sock ponds up to a level even with the top of the sock.

4. Drive stakes into the ground at a maximum spacing of 10 feet, and as required to secure the sock and prevent movement.

5. Repair or replace non-functioning filter socks that allow water to flow under the sock, are torn, or are otherwise damaged, due to inadequate installation.

6. Remove filter material from damaged socks that are located along streambanks, around intakes, in ditches, or in other locations where the material may be carried to surface waters.

B. Maintenance:

1. When accumulated sediment reaches a level one-half the height of the sock, or when the sock becomes clogged with sediment and no longer allows runoff to flow through, remove the sock as described above, and replace according to the installation instructions above.

C. Removal:

1. When specified in the contract documents, or as directed by the Engineer, remove the wattle upon completion of the project, and after final stabilization is achieved; or as indicated in the SWPPP, if applicable.
2. Upon completion of the project, completely remove socks and filter material that are located along streambanks, around intakes, in ditches, or in other locations where the filter material may be carried to surface waters if the sock degrades and/or tears.
3. Slice the sock longitudinally. Remove and dispose of the filter sock material and stakes.
4. Spread the filter material and accumulated sediment to match finished grade and to ensure proper drainage.
5. If the site has been brought to finished grade and prepared for permanent seeding, spread and incorporate the filter material into the surface by tilling, or as required to break up any large particles and provide a finished surface suitable for permanent seeding.

3.9 EROSION CONTROL BLANKET

A. Slope Application

1. Grade and smooth surface. Remove all rocks, clods, vegetation, or other obstructions that will prevent direct contact between the erosion control blanket and the soil surface.
2. When specified, prepare seedbed and place seed and fertilizer according with these specifications prior to placing erosion control blanket.
3. Install anchor trench at top of slope. Seed and fertilize trench after backfill and compaction, if seeding is specified.
4. Unroll the erosion control blanket down or horizontally across the slope.
5. Place consecutive blankets down the slope end-over-end, shingle style.
6. Overlap ends of consecutive rolls a minimum of 3 inches, and install anchors at a maximum spacing of 18 inches along all overlaps.
7. Overlap edges of adjacent rolls a minimum of 2 inches.
8. Install anchors at edge seams between rows.

B. Channel/Ditch Application:

1. When specified, prepare seedbed and place seed and fertilizer according with these specifications prior to placing erosion control blanket.
2. Place end of first roll in the anchor slot at the center of the upstream channel and secure with anchors.
3. Position adjacent rolls in the anchor slot, overlapping adjacent rolls a minimum of 3 inches.
4. Place backfill material in anchor slot and compact. Unroll erosion control blanket over compacted slot and secure with anchors.
5. Unroll erosion control blanket downstream. Maintain a minimum 3 inch overlap between adjacent rolls. Secure edge lap with anchors.
6. Install intermittent staple check slots every 30 feet.
7. Construct end lap at end of roll and beginning of new roll. Overlap roll ends with upstream erosion control blanket on top.

8. Excavate longitudinal trench along both sides of the channel at the outside edges of installation. Place outer edges of erosion control blanket into longitudinal slot. Install anchors, place backfill material, and compact.

9. Terminate installation at downstream end with staple check.

10. Install anchors in a regular pattern over entire area covered according to manufacturer's published recommendations (minimum three anchors per square yard).

3.10 TURF REIFORCEMENT MATS (TRM)

A. Install according to the manufacturer's published installation literature for the product specified and application (slope or channel).

3.11 DITCH CHECKS

A. Installation:

1. Construct rock ditch checks in accordance with the drawing detail.

   a. Achieve complete coverage of the ditch or swale and insure the center of the check is lower than the edges.

2. Construct straw bale ditch checks in accordance with the drawing detail.

3. Construct silt fence ditch checks in accordance with the drawing detail.

B. Maintenance:

1. Inspect ditch checks for sediment accumulation after each rainfall.

2. Sediment shall be removed when it reaches one-half of the original height.

   a. Regular inspections shall insure that the center of a rock check is lower than the edges. Correct erosion caused by high flows around the edges of the check immediately.

C. Removal:

1. When specified in the contract documents, or as directed by the Engineer, remove the wattle upon completion of the project, and after final stabilization is achieved; or as indicated in the SWPPP, if applicable.

2. Remove the check dam and dispose of materials, or salvage to the contractor.

3. Remove the accumulated sediment or spread to match finished grade; ensure proper drainage.

4. Stabilize the area disturbed by removal operations.

3.12 ROCK DITCH LINER

A. Installation:

1. Subgrade shall be graded to elevations shown on the drawings.

2. Keys shall be excavated to elevations shown on the drawings.

3. All excavated spoil shall be placed in an area designated by the Owner. Spoil materials shall be graded to provide a smooth transition and shall be suitable for seeding.

4. The rock ditch liner shall be placed to the lines and grades shown on the drawings.

5. The rock ditch liner shall be placed to achieve the depth shown on the drawings.

6. The final surface shall be free of mounds and windrows using hand or machine leveling as required to achieve a uniform, reasonably even surface.

7. The rock ditch liner shall be placed beginning at the bottom of the slope working upward using a method to minimize segregation of the various sized riprap components.

8. Excess handling or the passage of heavy equipment over the rock ditch liner which cause breakage of the stones shall be avoided.

9. Compaction of the rock ditch liner is not required.

10. Fill slopes above rock ditch liner as required to produce the grades indicated on the Drawings.

3.13 TEMPORARY PIPE

A. Installation:

1. All temporary pipes shall be installed in the same manner as permanent pipe is installed on the project to assure that the water does not cause erosion around the pipe.

2. Material to backfill the pipe should be placed in 6" lifts and mechanically compacted. Compaction testing will not be required.

3. Discharge slope drain to a stable outlet or to a sediment retention device.

3.14 TEMPORARY SEEDING AND MULCHING

A. Installation:

1. Permanent seeding and mulching following temporary seeding will be performed during the favorable seeding seasons only.

2. Temporary seeding mixtures and planting season:

   a. December 1 to March 1: 50 lbs. oat grain per acre

   b. March 1 to December 1: 50 lbs. (cereal rye or wheat) per acre

3. Temporary mulch, fertilizer, and lime for seeding:

   a. Fertilizer and mulch for temporary seed mixtures shall be applied in accordance with Section 329219.

   b. Fertilizer shall be applied at the rate specified for permanent seeding.

   c. Lime will not be required for temporary seeding.

3.15 **SEDIMENT REMOVAL**

A. Sediment deposits shall be removed when:

1. The deposits reach approximately one-half the height of a ditch check, straw bale barrier or silt fence.

2. The sediments have reduced the ponded volume of sediment basins to one-third of the original volume.

3. Requested by the Owner's Representative.

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

END OF SECTION 312513

SECTION 321123 - AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide aggregate base courses on a prepared subbase where shown on the Drawings, and as specified herein.

1.2 SUBMITTALS

A. Comply with pertinent provisions of other Sections

B. If requested by the Engineer/Architect (A/E), within 15 calendar days after the Contractor has received the Owner's Notice Award, submit:

1. Certifications of material compliance for:

a. Aggregate base course
b. Geotextile fabric
c. Geogrid materials

1.3 REFERENCES

A. Standard Specifications for Highway Construction, 2024, Missouri Department of Transportation, herein noted as the Standard Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Geotextile Fabric: As specified in Section 312300 Excavation and Fill.

B. Geogrid Material: As specified in Section 312300 Excavation and Fill.

C. Aggregate Base Course:

1. Article 1007.3 - Type 5.

PART 3 - EXECUTION

3.1 SUBGRADE PREPARATION

A. Subgrade preparation shall be in accordance with Section 3.6 of 312300 Excavation and Fill of these specifications.

3.2 GEOTEXTILE FABRIC

A. Geotextile fabric when specified shall be placed on the prepared subbase prior to placement of the aggregate base course. Fabric of insufficient width or length to fully cover the specified area shall be lapped or sown. Minimum lap shall be 12" and minimum sewn lap shall be 4".

B. Placement of the base course on the fabric shall be accomplished in a manner as to prevent tearing or shoving of the material. Fabric damaged shall be repaired or replaced prior to placement of the base course.

3.3 GEOGRID

A. Geogrid when specified shall be placed on the prepared subbase prior to placement of the aggregate base course. When geogrid is used for stabilization, the aggregate base thickness shall be a minimum of six (6) inches thick in order to prevent it from popping through the aggregate base. Minimum lap shall be 12" or as specified by the manufacturer.

3.4 AGGREGATE PLACEMENT

A. General: The aggregate shall be uniform in gradation. The base course shall be constructed in layers not more than four (4) inches thick when compacted, except that if tests indicate that the desired results are being obtained, the compacted thickness of any layer may be increased to a maximum of six (6) inches. When placed, it shall be free from segregation and shall require minimum blading or manipulation. Immediately after the material has been placed, it shall be compacted with a tamping roller, a vibratory machine or combination of the two.

B. Compaction: Before the aggregate is deposited on the subgrade, the aggregate shall contain the amount of moisture required for compaction. The granular material shall be compacted to not less than 98 percent of the Standard Laboratory Density, determined in accordance with ASTM D 698. If test indicate that the base course does not comply with the density requirements, additional wetting, if necessary, and rolling will be required until the density is obtained. Moisture shall be added to the material during compaction only when it is necessary to increase the percentage of moisture to obtain the required density.

C. Staging: The aggregate base shall initially be placed and compacted to 90% of the design thickness shown on the Drawings. The remaining 10% of the aggregate base and final finishing shall be completed after the curbs and driveways are installed. The final surface shall be within + or - 0.5".

D. Flatness: Maximum variation of 1/2 inch measured with 10-foot straight edge.

3.5 FIELD QUALITY CONTROL

A. The **Contractor** will provide testing services of a soils engineer and/or independent laboratory for this project.

B. Upon completion of each test and/or inspection, promptly distribute copies of test or inspection reports to the A/E.

C. Testing Requirements:

1. Determine moisture-density relationships by ASTM D 698 (Standard Proctor). Perform at least one test for each type of material used.

2. Provide not less 100% of maximum density of material compacted at optimum moisture content for the actual density of each layer of material in place.

3. Field density/moisture tests (ASTM D 698):

   a. Aggregate Base: 1 per 5000 sq ft.

PART 4 - APPENDIX

4.1 MODOT standard specifications referenced by this document follow, and are removed from "Missouri Standard Specifications for Highway Construction", 2025 Third Edition, January 2026.

SECTION 304
AGGREGATE BASE COURSE

304.1 Description. This work shall consist of furnishing and placing one or more courses of aggregate on a prepared subgrade in accordance with these specifications, and as shown on the plans or as directed by the engineer. The type of aggregate to be used will be specified in the contract.
304.2 Material. Material for Type 1, 5 and 7 aggregate bases shall be crushed stone or reclaimed asphalt or concrete which meet the requirements of Sec 1007.
304.3 Construction Requirements.

304.3.1 Field Laboratory. When authorized by the engineer, the contractor shall provide a Type 2 field laboratory in accordance with Sec 601. Payment for the laboratory will be made in accordance with Sec 601.
304.3.2 Subgrade. All work on that portion of subgrade on which the base is to be constructed shall be completed in accordance with Sec 209.2.1 prior to placing any base material on that portion. Aggregate base shall not be placed on frozen subgrade.
304.3.3 Placing.

304.3.3.1 The contractor shall place base material on the roadbed as shown in the contract documents. The maximum compacted thickness of any one layer shall not exceed 6 inches. If the specified compacted depth of the base course exceeds 6 inches, the base shall be constructed in two or more layers of approximately equal thickness. The compacted depth of a single layer of the base course may be increased to 8 inches for shoulders.
304.3.3.2 Types 1 and 5 aggregate base used for shoulders adjacent to rigid or flexible type pavement, including pavement resurfacing, shall be simultaneously deposited and spread on the subgrade. Aggregate shall not be deposited on the pavement and bladed or dozed into place.
304.3.4 Shaping and Compacting. Each layer shall be compacted to the specified density or dynamic cone penetration index value before another layer is placed.
304.3.4.1 Segregated surface areas constructed of Type 1 aggregate base may be corrected by adding and compacting limestone screenings of such gradation and quantity as required to fill the surface voids, and firmly bind the loose material in place. Screenings used in correcting segregated surface areas will be measured and paid for as base material. Type 5 and Type 7 aggregate bases are intended to provide some drainage and shall not be segregated. Trimmed Type 5 and 7 aggregate base may not be reused until the material is verified as meeting the required specifications. Base material contaminated to the extent that the material no longer complies with the specifications shall be removed and replaced with satisfactory material at the contractor's expense.
304.3.4.2 Type 1 aggregate base used for shoulders shall be compacted to a minimum 95 percent of standard maximum density. Type 1 aggregate base used on other than shoulders shall be compacted to no less than standard maximum density. Type 5 aggregate base under both roadway and shoulders shall be compacted to a minimum 95 percent of standard maximum density. The Standard Compaction Test

will be conducted in accordance with AASHTO T 99, Method C. Field density will be determined in accordance with AASHTO T 191 or AASHTO T 310, Direct Transmission, for wet density. The volume of the test hole may be reduced as necessary to accommodate available testing equipment. If nuclear density test methods are used, moisture content will be determined in accordance with AASHTO T 310, except a moisture correction factor will be determined for each aggregate in accordance with MoDOT Test Method TM 35. In lieu of the density requirements for Type 1 aggregate base used for shoulders with thicknesses less than 4 inches, the aggregate shall be compacted by a minimum of three complete coverages with a 5 ton roller. Rolling shall be continued until there is no visible evidence of further consolidation.

304.3.4.3 Type 7 aggregate base under both roadway and shoulders shall be compacted to achieve an average dynamic cone penetration index value through the base lift thickness less than or equal to 0.4 inches per blow, as determined by a standard dynamic cone penetrometer (DCP) device with a 17.6 lb hammer meeting the requirements of ASTM D6951.

304.3.4.3.1 Water shall be applied to the Type 7 base material during the mixing and spreading operations so that at the time of compaction the moisture content is not less than 5 percent of the dry weight.

304.3.4.3.2 Type 7 base shall be tested with the DCP within 24 hours of placement and final compaction.

304.3.4.4 If at any time the compacted aggregate base or subgrade becomes unstable, the contractor, at the contractor's expense, shall restore the earth subgrade and the aggregate base to the required grade, cross section and density.

304.3.5 Substitutions for Aggregate Base. If available, the contractor may substitute bituminous pavement cold millings or crushed recycled concrete in lieu of aggregate base for any temporary surface, regardless of the type or thickness of aggregate shown on the plans. If this option is exercised, the contractor shall notify the engineer at least two weeks prior to using the millings or recycled concrete, and shall identify the location from where the millings or concrete will be removed. The millings or recycled concrete shall be installed to the same dimensions shown on the plans for the aggregate base. Millings or recycled concrete shall be placed in maximum 4-inch lifts, and each lift shall be compacted by a minimum of three passes with a 10-ton roller.

304.3.6 Maintenance. The contractor shall maintain, at the contractor’s expense, the required density and surface condition of any portion of the completed aggregate base until either the prime coat or a succeeding course or pavement is placed. If a prime coat is specified in the contract, the contractor will be required to apply the prime coat on any completed portion of the aggregate base as soon as practical, or as otherwise specified. The contractor will not be permitted to apply prime if the moisture in the top 2 inches of the Type 1 or 5 aggregate base exceeds the higher of either (1) the average of the optimum moisture as determined by the Standard Compaction Test and the absorption of the plus No. 4 fraction, or (2) two-thirds of the optimum moisture as determined by the Standard Compaction Test.

304.4 Quality Control/Quality Assurance (QC/QA).

304.4.1 Quality Control. The contractor shall control operations to ensure the aggregate base, in place, meets the specified requirements for density, thickness, gradation, deleterious, and plasticity index. Tests shall be taken at random locations designated by the engineer at the following frequency:

Tested Property	Test Method	Contractor Frequency	Engineer Frequency
Density	AASHTO T 191 or AASHTO T 310	1 per 1000 tons, minimum of 1 per day	1 per 4,000 tons, minimum of 1 per project
Dynamic Cone Penetrometer Index Value (for Type 7 base)	ASTM D6951	1 per 1000 tons, minimum of 1 per day	1 per 4,000 tons, minimum of 1 per project
Thickness	Applicable method meeting engineer’s approval	1 per 1000 tons, minimum of 1 per day	1 per 4,000 tons, minimum of 1 per project
Gradation and Deleterious Material[a]	AASHTO T 11, AASHTO T 27 and MoDOT Test Method TM 71	1 per 2000 tons, minimum of 1 per day[b]	1 per 8,000 tons, minimum of 1 per project

Plasticity Index[a]	AASHTO T 89 and AASHTO T 90	1 per 10,000 tons, minimum of 1 per project	1 per 40,000 tons, minimum of 1 per project

[a]Sampled at point of delivery, prior to rolling.

[b]When production for a week is anticipated to be 1,000 tons or less, the contractor may test the material at a frequency of 1 per 250 tons or 1 per week, whichever occurs first.

304.4.1.1 The contractor shall provide copies of the test results, including all raw data, to the engineer the next business day following testing or sampling.

304.4.1.2 The contractor or the contractor's representative shall also determine the standard maximum dry density and the optimum moisture content for Type 1 and 5 base material and the dry weight for Type 7 base material and supply all test data to the engineer.

304.4.1.3 When density or DCP index value tests are less than specified or when thickness measurements indicate the thickness is deficient by more than 1/2 inch from the plan thickness, additional measurements will be taken at 100-foot intervals parallel to centerline ahead and behind the tested location until the extent of the deficiency has been determined. Each measurement will be assumed as representative of the base thickness for a distance extending one-half the distance to the next measurement, measured along centerline, or in the case of a beginning or ending measurement, the distance will extend to the end of the base section. Any deficient areas shall be corrected by reworking or adding material within the limits of the deficiency.

304.4.1.4 When two consecutive tests for gradation, deleterious material, or plasticity index do not meet the specification limits, the material shall be removed beginning at the point where the first test was conducted.

304.4.1.5 The contractor shall retain the untested portion of the plasticity index, gradation and deleterious sample for the engineer's use.

304.4.2 Quality Assurance. The contractor's QC test results and the engineer's QA test results shall meet the specifications and the following. For Type 1 and 5 base the contractor's compaction standard tests shall compare within 3.0 pounds of the maximum density of the MoDOT determined compaction standard. For Type 7 base the contractor's average DCP penetration index shall compare within 0.1 inches per blow of the MoDOT determined average penetration index. For retained samples, the contractor's test results and the engineer's test results shall compare within the following limits:

(a) The total deleterious material shall be within 2.0 percentage points.

(b) The plasticity index shall be within 2.

(c) The gradation test results shall compare within the following limits:

Sieve	Tolerance (%)
1-inch	± 6.0
1/2-inch	± 6.0
No. 4	± 6.0
No. 30	± 4.0
No. 200	± 3.0

304.4.3 Small Quantities. Small quantities are less than 50 ton, and will apply to individual projects, individual projects in combination contracts or projects with short discontinuous sections. The following acceptance procedures shall be used:

(a) QC/QA tests for gradation, deleterious material, plasticity index, density and DCP index will not berequired.

(b) Each list will be compacted by a minimum of three complete coverages with a 5-ton roller untilthere is no visible evidence of further consolidation.

(c) Acceptance will be based on visual inspection of each compacted lift by the engineer.

In lieu of this section, the contractor has the option of electing in the QC Plan to use all testing frequencies in accordance with Sec 304.4.1 for each separate aggregate base course type qualifying as a small quantity.

304.5 Method of Measurement. Final measurement of the completed aggregate base course will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. Measurement will include aggregate course placed under curb and gutter. Where required, measurement of aggregate base course, complete in place, will be made to the nearest square yard . Where the aggregate base course extends to the inslope of the shoulder, the pay limit of the aggregate base course will be measured from the mid-point of the sloped portion. The revision or correction will be computed and added to or deducted from the contract quantity.

304.6 Basis of Payment. The accepted quantities of aggregate base course of the thickness and type specified will be paid for at the contract unit price for each of the pay items included in the contract. Payment will be considered full compensation for water used in performing this work. When bituminous pavement cold millings or recycled crushed concrete are substituted for aggregate base, payment will be made for the aggregate base quantity provided in the plans, regardless of whether millings, recycled crushed concrete or the aggregate base is used. Payment will be considered full compensation for hauling of millings, cold milling operations, and all other material or labor necessary to substitute bituminous pavement millings for aggregate base.

SECTION 1007
AGGREGATE FOR BASE

1007.1 Scope. This specification covers aggregate to be used for base.

1007.2 Type 1 Aggregate.

1007.2.1 Type 1 aggregate for base shall consist of crushed stone, sand and gravel or reclaimed asphalt or concrete. The aggregate shall not contain more than 15 percent deleterious rock and shale. The fraction passing No. 40 sieve shall have a maximum plasticity index of six. Any sand, silt and clay and any deleterious rock and shale shall be uniformly distributed throughout the material.

1007.2.2 The aggregate shall be in accordance with the following gradation requirements:

Sieve	Percent by Weight
Passing 1-inch	100
Passing 1/2-inch	60-90
Passing No. 4	35-60
Passing No. 30	10-35

1007.3 Type 5 Aggregate.

1007.3.1 Type 5 aggregate for base shall consist of crushed stone, sand and gravel or reclaimed asphalt or concrete. The aggregate shall not contain more than 15 percent deleterious rock and shale. The fraction passing the No. 40 sieve shall have a plasticity index not to exceed six. Any sand, silt and clay, and any deleterious rock and shale shall be uniformly distributed throughout the material.

1007.3.2 Type 5 aggregate shall be in accordance with the following gradation requirements:

Sieve	Percent by Weight
Passing 1-inch	100
Passing 1/2-inch	60-90

Passing No. 4	35-60
Passing No. 30	10-35
Passing No. 200	0-15

1007.4 Type 7 Aggregate.

1007.4.1 Type 7 aggregate for base shall consist of crushed stone, sand and gravel, or reclaimed asphalt or concrete. The aggregate shall not contain more than 15 percent deleterious rock and shale. The fraction passing the No. 40 sieve shall have a plasticity index not to exceed six. Any sand, silt and clay, and any deleterious rock and shale shall be uniformly distributed throughout the material.
1007.4.2 Type 7 aggregate shall be in accordance with the following gradation requirements:

Sieve	Percent by Weight
Passing 1 1/2-inch	100
Passing 1-inch	70-100
Passing No. 8	15-50
Passing No. 200	0-12

END OF SECTION 321123

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Provide bituminous concrete pavement consisting of and aggregate or bituminous base course, binder course(s), and bituminous concrete surface course on a prepared subbase and pavement markings where shown on the Drawings, and as specified herein.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 013300.

B. If requested by the Architect/Engineer (A/E), within 15 calendar days after the Contractor has received the Owner's Notice Award, submit:

1. Bituminous Mix Designs as applicable for:

   a. Bituminous Base Course.
   b. Bituminous Binder Course.
   c. Bituminous Surface Course.

2. Certifications of material compliance for:

   a. Aggregate base Course.
   b. Traffic Paint.

1.3 REFERENCES

A. A.Standard Specifications for Missouri Department of Transportation, 2024 herein noted as the Standard Specifications.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Geotextile Fabric: Consisting of woven or non-woven filaments of polypropylene, polyester or polyethylene meeting the following minimums:

1. Grab tensile Strength (lbs): 200, ASTM D 4632.
2. Elongation (%): 50, ASTM D 4632.
3. Trapezoidal Tear Strength (lbs): 75, ASTM D 4533.

B. Aggregate Base Course:

1. Section 1007 – Type 5.

C. Bituminous Base Course:

1. Section 1015 – BP – 1, PG 64-22.

D. Bituminous Binder Course:

1. Section 1015 – BP – 1, PG 64-22.

E. Bituminous Surface Course:

1. Section 1015 – BP – 2, PG 64-22.

F. Prime Coat:

1. Section 1015 – MC – 30.

G. Wheel Stops: Precast, air-entrained concrete, 3500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners, drainage slots on underside, and holes for anchoring to substrate.

1. Dowels: Galvanized steel, 3/4-inch diameter, 10-inch minimum length.

H. Traffic (Jersey) Barriers: Precast segmental barriers (8 foot long) commonly used for traffic control, with anchoring slots or pins hole to secure in place.

I. Marking paint shall be a quality paint specifically manufactured for pavement marking applications. The A/E shall approve the manufacturer and select colors from standard colors of the manufacturer.

PART 3 - EXECUTION

3.1 FABRIC

A. Geotextile fabric when specified shall be placed on the prepared subbase prior to placement of the aggregate of bituminous base course. Fabric of insufficient width or length to fully cover the specified area shall be lapped or sown. Minimum lap shall be 12” and minimum sewn lap shall be 4”.

B. Placement of the base course on the fabric shall be accomplished in a manner as to prevent tearing or shoving of the material. Fabric damaged shall be repaired or replaced prior to placement of the base course.

3.2 AGGREGATE

A. General:The aggregate shall be uniform in gradation. The base course shall be constructed in layers not more than four (4) inches thick when compacted, except that if tests indicate that the desired results are being obtained, the compacted thickness of any layer may be increased to a maximum of eight (8) inches. When placed, it shall be free from segregation and shall require minimum blading or manipulation. Immediately after the material has been placed, it shall be compacted with a tamping roller, a vibratory machine or combination of the two.

B. Compaction: Before the aggregate is deposited on the subgrade, it shall contain the amount of moisture required for compaction. The granular material shall be compacted to not less than 98 percent of the Standard Laboratory Density, determined in accordance with ASTM D 698 (Standard Proctor Density). If test indicate that the base course does not comply with the density requirements, additional wetting, if necessary, and rolling will be required until the density is obtained. Moisture shall be added to the material during compaction only when it is necessary to increase the percentage of moisture to obtain the required density.

C. Staging: The aggregate base shall initially be placed and compacted to 90% of the design thickness shown on the Drawings. The remaining 10% of the aggregate base and final finishing shall be completed after the curbs and driveways are installed. The final surface shall be within + or - 0.5".

D. Proof roll: After the Contractor has finish graded the base course, the base shall be proof rolled with a tandem axle truck loaded with a minimum gross weight of 40,000 lbs. Any significant deflections that occur during the proof rolling shall be immediately repaired and retested.

3.3 BITUMINOUS PRIME COAT

A. The prime coat shall be applied in accordance with Section 408. Application rates shall be 0.25 gal/sy on aggregate bases and 0.10 gal/sy on concrete brick and bituminous bases. A sand coat shall be applied following the prime application when the area being primed is open to traffic.

3.4 BITUMINOUS BINDER AND SURFACE COURSES

A. The bituminous binder and surface courses shall in general be constructed in compliance with Section 401 as specified herein:

3.5 FIELD QUALITY CONTROL

A. The Contractor shall provide testing services of an independent testing firm and/or laboratory approved by the Owner.

B. Upon completion of each test and/or inspection, promptly distribute copies of test or inspection reports to the A/E.

C. Testing Requirements:

1. Field density/moisture tests (ASTM D2922, D2950 and D3017):

    a. Aggregate Base: 1 per 5000 sq ft.
    b. Bituminous Pavement:1 per 5000 sq ft per lift.

3.6 PAVEMENT MARKINGS

A. Preparation: The pavement surface shall be dry and free of dirt or grease. Clean if necessary.

B. Installation: Paint shall not be applied at air temperatures below 40 ^{o} F unless approved by the A/E. Two (2) coats of paint shall be applied at a minimum thickness of 16 mils. Glass beads

shall be applied to all traffic control markings other than curbs, parking stall lines and cross hatched areas. Pavement marking words and symbols shall be as detailed in the Drawings.

PART 4 - APPENDIX

4.1 MODOT standard specifications referenced by this document follow, and are removed from "Missouri Standard Specifications for Highway Construction", 2025 Third Edition, January 2026.

A.

SECTON 401

PLANT MIX BITUMINOUS BASE AND PAVEMENT

401.1 Description. This work shall consist of a bituminous mixture placed, spread and compacted as shown on the plans or as directed by the engineer.

401.2 Material.

401.2.1 The grade of asphalt binder will be specified in the contract. When the plasticity index on individual aggregate fractions with 10 percent or more passing the No. 30 sieve exceeds 3, a moisture susceptibility test shall be required in accordance with Sec 401.4.5 during the mix design process. If the plasticity index exceeds that of the material approved for the mix design, additional testing may be required. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Coarse Aggregate	1004.2
Fine Aggregate	1002.3
Mineral Filler	1002.4
Hydrated Lime	1002.5
Asphalt Binder, Performance Graded (PG)	1015

401.2.2 Reclaimed Asphalt. Reclaimed Asphalt may be obtained from Reclaimed Asphalt Pavement (RAP) and Reclaimed Asphalt Shingles (RAS). The asphalt binder content of recycled asphalt materials shall be determined in accordance with AASHTO T 164, ASTM D 2172 or other approved method of solvent extraction. A correction factor for use during production may be determined for binder ignition by burning a sample in accordance with AASHTO T 308 and subtracting from the binder content determined by extraction.

The use of reclaimed asphalt shall be limited to one of the following options with the exception of bituminous base. For bituminous base the limits specified may be increased according to the recycled materials used as follows; 10% for RAP only, 5% for RAS only and 10% for the appropriate RAP and RAS combination.

Binder	Percent Effective Virgin Binder Replacement		
	RAP	RAS	RAP and RAS combination
Contract Grade Virgin Binder shall be used	0 - 20	0 -10	RAP + (2*RAS) ≤ 20
PG 58-28 Virgin Binder shall be required[a]	21 - 30	11 - 15	20 < RAP + (2*RAS) ≤ 30
Blend Chart[b]	0 - 100	N/A	N/A
Extraction and Grading of Binder from final Mix-	0 - 100		

ture[c]	

[a]Contract grades within recycling limits specified in the table shall have a high temperature grade of PG58 or higher and a low temperature grade meeting a PG-28 (Ex. Contract grade PG 64-22; virgin binder could be either PG 58-28 or PG 64-28. Contract grade PG 58-28H; virgin binder remains at PG 58-28H or PG 58-28.). The Pressure Aging Vessel (PAV) test temperature (AASHTO M320) shall be tested at 19° C, regardless of the high temperature grade of the selected virgin binder.

[b]Testing in accordance with AASHTO M323 including raw data shall be included with the mix design which demonstrates that the grade of the combine mixture meets the contract requirements.

[c]Testing in accordance with either AASHTO T319, or AASHTO T164 and R59 along with grading in accordance with AASHTO M320 including raw data shall be included with the mix design which demonstrates that the grade of the combine mixture and rejuvenator, if applicable, meets the contract requirements. **401.2.2.1 Reclaimed Asphalt Pavement.** Reclaimed Asphalt Pavement (RAP) may be used in any Sec 401, Plant Mix Bituminous Base and Pavement. All RAP material, except as noted below, shall be tested in accordance with AASHTO T 327, Method of Resistance of Coarse Aggregate Degradation by Abrasion in the Micro-Deval Apparatus. Aggregate shall have the asphalt coating removed either by extraction or binder ignition during production. The material shall be tested in the Micro-Deval apparatus at a frequency of once per 1500 tons. The percent loss shall not exceed the Micro-Deval loss of the combined virgin material by more than five percent. Micro-Deval testing will be waived for RAP material obtained from MoDOT roadways. All RAP material shall be in accordance with Sec 1002 for deleterious and other foreign material. The aggregate specific gravity shall be determined by performing AASHTO T 209 in accordance with Sec 403.19.3.1.2 and calculating the G_{se} to which a 0.98 correction factor will be applied in order to determine G_{sb} as follows:

$$G_{se} = \frac{100 - P_b}{\frac{100}{G_{mm}} - \frac{P_b}{G_b}}$$

RAP G_{sb} = RAP G_{se} X 0.98

See Sec 401.4.4.1 for mixes containing more than 40% effective binder replacement from reclaimed asphalt.

401.2.2.2 Reclaimed Asphalt Shingles. Reclaimed Asphalt Shingles (RAS) may be used in any mixture specified to use PG 64-22 in accordance with AASHTO PP 53. In addition, shingles shall be ground to 3/8-inch minus. Waste, manufacturer or new, shingles shall be essential free of deleterious materials. Post-consumer RAS shall not contain more than 1.5 percent wood by weight or more than 3.0 percent total deleterious by weight. Post-consumer RAS shall be certified to contain less than the maximum allowable amount of asbestos as defined by national or local standards. The bulk specific gravity of RAS used in the job mix formula shall be 2.600.

RAS G_{sb} = 2.600

See Sec 401.4.4.1 for mixes containing more than 40% effective binder replacement from reclaimed asphalt.

The gradation of the aggregate may be determined by solvent extraction of the binder or using the following as a standard gradation:

Shingle Aggregate Gradation	
Sieve Size	**Percent Passing by Weight**
3/8 in.	100
No. 4	95
No. 8	85

No. 16	70
No. 30	50
No. 50	45
No. 100	35
No. 200	25

401.2.2.3 Rejuvenators. Rejuvenators may be used in any asphalt mixture containing recycled material. When a rejuvenator is used for the purpose of softening the binder grade, the requirements for the Extraction and Grading of Binder from Final Mixture option in Sec 401.2.2 must be satisfied.

401.3 Composition of Mixtures. Aggregate sources shall be from the specific ledge or combination of ledges within a quarry, or processed aggregate from a particular product, as submitted in the mix design. The total aggregate prior to mixing with asphalt binder shall be in accordance with the following gradation requirements:

Sieve Size	**Percent Passing by Weight**			
	Base	**BP-1**	**BP-2**	**BP-3**
1 inch	100	100	100	100
3/4 inch	85-100	100	100	100
1/2 inch	60-90	85-100	95-100	100
3/8 inch	---	---	---	100
No. 4	35-65	50-70	60-90	90-100
No. 8	25-50	30-55	40-70	---
No. 16	---	---	---	30-60
No. 30	10-35	10-30	15-35	---
No. 200	4-12	5-12	5-12	7-12

401.4 Job Mix Formula. At least 30 days prior to placing any mixture on the project, the contractor shall submit a mix design for verification and approval by Construction and Materials. The mixture shall be designed in accordance with Asphalt Institute Publication MS-2, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types. The mixture shall be compacted and tested at a minimum of three asphalt contents separated by a maximum of 0.5 percent in accordance with AASHTO T 245, except as herein noted. The test method shall be modified by short-term aging the specimens in accordance with AASHTO R 30. A detailed description of the mix design process shall be included with the job mix formula. Representative samples of each ingredient for the mixture shall be submitted with the mix design. Aggregate fractions shall be in accordance with the same proportions as the proposed job mix formula. A minimum of 150 pounds will be required for any individual fraction. The amount of each ingredient submitted shall be as follows for each mix design to be verified:

Ingredient	**Minimum Amount**
Aggregate	300 lbs
Hydrated Lime, Mineral Filler and/or Baghouse Fines	20 lbs

Asphalt Binder	10 gal.

401.4.1 Mixture Design. Laboratories that participate and achieve a score of 3 or greater in the AASHTO proficiency sample program for T 11, T 27, T 84, T 85, T 166, T 209, T 308 and T 245 or T 312 will have the mixture verification process waived. The mix design shall be submitted to Construction and Materials for approval at least seven days prior to mixture production.

401.4.2 Required Information. The mix design shall include raw data from the design process and shall contain the following information:

(a) All possible sources intended for use, and grade and specific gravity of asphalt binder.

(b) Source, type (formation, etc.), ledge number(s) if applicable, gradation, and percent chert of eachaggregate fraction.

(c) Plasticity index of each aggregate fraction which has 10 percent or more passing the No. 30 sieve.

(d) Bulk and apparent specific gravities and absorption of each aggregate fraction in accordance withAASHTO T 85 for coarse aggregate and AASHTO T 84 for fine aggregate, including all raw data, or in accordance with TM 81.

(e) Specific gravity of hydrated lime, mineral filler or baghouse fines, if used, in accordance withAASHTO T 100.

(f) Percentage of each aggregate component.

(g) Combined gradation of the job mix.

(h) Percent of asphalt binder, by weight, based on the total mixture.

(i) Bulk specific gravity (G_{mb}) by AASHTO T 166, Method A of a laboratory compacted mixture.

(j) Percent air voids (V_a) of the laboratory compacted specimen.

(k) Voids in the mineral aggregate (VMA) and voids in the mineral aggregate filled with asphalt binder(VFA).

(l) Theoretical maximum specific gravity (G_{mm}) as determined by AASHTO T 209 in accordance with Sec 403.19.3 after the sample has been short-term aged in accordance with AASHTO R 30.

(m) Mixing temperature and molding temperature.

(n) Bulk specific gravity (G_{mb}) of the combined aggregate.

(o) Percent deleterious content of the combine aggregate.

(p) Baghouse fines added for design. Provide the combine gradation with and without the baghousepercentage.

401.4.3 Mixture Approval. No mixture will be accepted for use until the job mix formula for the project is approved by Construction and Materials. The job mix formula approved for each mixture shall be in effect until modified in writing by the engineer. When unsatisfactory results or other conditions occur, or should a source of material be changed, a new job mix formula may be required. In lieu of a new laboratory design, mixtures requiring adjustment beyond the limits allowed in Sec 401.8.2 may be designed in the field based on characteristics of plant-produced mixture in accordance with Sec 401 and verified by Construction and Materials, which may require new aggregate characteristics.

401.4.4 Mixture Characteristics.

401.4.4.1 Base, BP-1, BP-2 and BP-3 mixtures shall have the following properties, when tested in accordance with AASHTO T 245 or AASHTO T 312. The number of blows with the compaction hammer shall be 35 or the number of gyrations shall be 35 with the gyratory compactor. BP-1 and BP-2 mixtures shall have between 60 and 80 percent of the VMA filled with asphalt binder and dust to effective binder ratio of 0.8 to 1.6. BP-3 mixtures shall be com-

pacted with the gyratory compactor to 35 gyrations and shall have a minimum 75 percent of the VMA filled with asphalt binder and dust to effective binder ratio of 0.9 to 2.0.

Mix Type	Percent Air Voids	AASHTO T 245 Stability lb	Voids in Mineral Aggregate (VMA)[b]
BB	3.5	750	13.0[a]
BP-1	3.5	750	13.5
BP-2	3.5	750	14.0
BP-3	3.5	750	15.0

[a]Bituminous base mixtures that would require 12.0 percent VMA following Asphalt Institute MS-2 will have a minimum 12.0 percent requirement.
[b]If the effective virgin binder replacement from RAP, RAS, or any combination of RAP and RAS is greater than 40 percent; then the minimum VMA required shall be increased by 0.5.

401.4.4.2 When specified in the contract as BP-3NC, BP-3 mixtures containing limestone aggregate shall contain a minimum amount of non-carbonate aggregate as shown in the table below, or the aggregate blend shall have an acid-insoluble residue (A.I.R.), MoDOT Test Method TM 76, meeting the criteria of crushed noncarbonate material. The A.I.R. shall be determined on the minus No. 4 sieve. Non-carbonate aggregate shall have an A.I.R. of at least 85 percent insoluble residue.

Aggregate	Minimum Non-Carbonate by Volume
Limestone	20% Minus No. 4
Dolomite	No Requirement

401.4.5 Moisture Susceptibility. When required moisture susceptibility shall be tested in accordance with AASHTO T 283. The mixture shall have a tensile strength ratio (TSR) of 70 percent or greater when compacted to 3.7 inches with 7 ± 0.5 percent air voids. An approved anti-strip additive may be added to increase retained strength to a passing level. When testing is required by Sec 401.2.1 or Sec 401.9, the mixture shall be tested during production in accordance with Sec 403.19.

401.4.6 Time Limit. A mix design may be transferred to other projects for a period of three years from the original approval date provided satisfactory results are obtained during production and placement.

401.5 Gradation and Deleterious Content Control. The engineer shall be notified as soon as possible, but no later than 24 hours if a change is made to the cold feed settings, hot bin settings or the binder content. The contractor shall determine the mixture gradation at the frequency stated in Sec 401.8.1. The mixture gradation may be determined directly by using residual aggregate from the binder ignition process or by mathematical combination of the cold feed and recycled materials gradations. When the mathematical combination method is used, the RAS gradation shall be from the JMF and RAP gradation from the ignition or extraction residual aggregate. Mixtures as produced shall be subject to the following tolerances and controls:

(a) The maximum variations from the approved job-mix formula shall be within the tolerances as shown in the table below:

Sieve Size	Percent Passing by Weight	
	Tolerance	Action Limit
No. 8[a]	± 5.0	± 10.0
No. 200	± 2.0	± 4.0

[a] Use No. 16 sieve for BP-3

(b) The deleterious content of the material retained on the No. 4 sieve shall not exceed the limitsspecified in Sec 1004.2.

(c) The quantity of asphalt binder introduced into the mixer shall be the quantity specified in the jobmix formula. No changes shall be made to the quantity of asphalt binder without written approval from the engineer. The quantity of asphalt binder determined by tests on the final mixture shall not vary by more than -0.3 to + 0.5 percent from the job-mix formula.

401.5.1 Sample Location. The gradations of the total aggregate will be determined from samples taken from the hot bins on batch-type plants or continuous mixing plants or from the composite cold feed belt on drum mix plants. The deleterious content of the total aggregate shall be determined from samples taken from the composite cold feed belt. When required, samples for plasticity index shall be taken from the stockpile. Aggregate samples shall be taken in accordance with AASHTO R 90. The RAP shall be sampled from the RAP feeding system on the asphalt plant. Samples for asphalt content determination may be taken at the plant.

401.5.2 Substitutions. At the option of the contractor and at no cost to the Commission, the contractor may use a Sec 401 mixture with a smaller nominal maximum size aggregate or an approved Sec 403 mixture, design level C, E, or F with the same or smaller nominal maximum size aggregate in lieu of any Sec 401 mixture. When a Sec 403 mixture is substituted, the layer thickness requirements of Sec 403 will apply. The gradation, asphalt content, deleterious, and density acceptance of the substituted mixture during production will be in accordance with Sec 401.

401.5.3 Commercial Mixture. If specified in the contract that an approved commercial mixture may be used, the contractor shall, at least seven days prior to the desired time of use, furnish a statement setting out the source and characteristics of the mixture proposed to be furnished. The statement shall include:

(a) The types and sources of aggregate, percentage range of each, and range of combined gradation.

(b) The percent and grade of asphalt binder.

(c) The mixing time and range of mixture temperature.

The plant shall be designed and operated to produce a uniform, thoroughly mixed material free from segregation. It will not be necessary for the plant to meet the requirements of Sec 404. A field laboratory will not be required. If the proposed mixture and plant are approved by the engineer, the component material and the mixture delivered will be accepted or rejected by visual inspection. The supplier shall furnish with the first truckload of each day's production, a certification that the material and mixture delivered are in conformance with the approved mixture. Upon completion of the work, a plant certification shall be furnished by the supplier for the total quantity delivered. The mixture shall be transported, placed and compacted in accordance with Sec 401.7. Without specific contract designation, an approved commercial mixture may be used in lieu of plant mix bituminous pavement or base course mixtures for work that is considered temporary construction and is to be maintained at the contractor's expense. Temporary construction will be defined as work that is to be removed prior to completion of the contract.

401.5.4 Moisture Content. The bituminous mixture, when sampled and tested in accordance with AASHTO T 329, shall contain no more than 0.5 percent moisture by weight of the mixture.

401.5.5 Contamination. The bituminous mixture shall not be contaminated with deleterious agents such as unburned fuel, objectionable fuel residue or any other material not inherent in the job mix formula.

401.6 Field Laboratory. The contractor shall provide a Type 3 field laboratory in accordance with Sec 601. The contractor may use the equipment provided in the Type 3 laboratory as long as adequate space is provided for the engineer's work.

401.7 Construction Requirements.

401.7.1 Weather Limitations. No mixture shall be placed on any wet or frozen surface. No mixture shall be placed when either the air temperature or the temperature of the surface on which the mixture is to be placed is below 40 F. Temperatures shall be obtained in accordance with MoDOT Test Method TM 20.

401.7.2 Bituminous Mixing Plants. Bituminous mixing plants and preparation of material and mixtures shall be in accordance with Sec 404.

401.7.3 Subgrade or Surface Preparation. The subgrade upon which the bituminous mixture is to be placed shall be prepared in accordance with Sec 209 and primed as specified in the contract in accordance with Sec 408, as applicable. All material requirements of a tacked surface shall be in accordance with Sec 407.

401.7.3.1 Base Widening. For base widening work, the bottom of the trench shall be compacted until further consolidation is not visually evident, by use of a trench roller having a weight of no less than 300

psi of width of rear roller, or by mechanical tampers or other methods approved by the engineer. Suitable excavated material may be used in shouldering operations. On the outside of curves, the design depth of trench at the beginning of the superelevation transition shall be varied gradually to the minimum depth at the end of the superelevation transition. Slight transitioning of the width of the base widening will be necessary to permit the indicated angle of repose or shear angle outside of the ultimate edge of surface. The bottom of the trench shall in no case be less than 3 inches below the surface of the existing pavement. All surplus excavated material shall be disposed of by the contractor in areas to be secured by the contractor beyond the right of way limits. An acceptable written agreement with the property owner on whose property the material is placed shall be submitted to the engineer.

401.7.3.2 **Application of Prime or Tack.** Application of prime or tack shall be in accordance with Sec 403.12.

401.7.4 **Hauling Equipment.** Trucks used for hauling bituminous mixtures shall be in accordance with Sec 404.

401.7.5 **Spreading.** The base course, tacked or primed surface, or preceding course or layer shall be cleaned of all dirt, packed soil or any other foreign matter prior to spreading the bituminous mixture. The mixture shall be spread in the number of layers and in the quantity required to obtain the compacted thickness and cross section shown on the plans. When placing multiple layers with varying thicknesses, the thicker layer shall be placed first.

401.7.5.1 **Irregularities.** The mixture shall be spread without tearing the surface and struck off such that the surface is smooth and true to cross section, free from all irregularities, and of uniform density throughout. Care shall be used in handling the mixture to avoid segregation. Areas of segregated mixture shall be removed and replaced with a suitable mixture at the contractor's expense. The outside edge alignment shall be uniform.

Irregularities shall be corrected by adding or removing mixture before compacting. In situations where there is a dispute in the existence of segregation, the area in question will be tested in accordance with MoDOT Test Method TM 75. Mixture production shall immediately cease if either criteria of MoDOT Test Method TM 75 fail. Segregated mixtures shall be removed and replaced to the limits determined by the engineer.

401.7.5.2 **Leveling Course.** If required by the contract, a leveling course consisting of a layer of variable thickness shall be spread to the desired grade and cross section to eliminate irregularities in the existing surface. Spot-leveling operations over small areas, with feather-edging at high points and ends of spot areas, may be required prior to placing the leveling course. Rigid control of the placement thickness of the leveling course will be required. The mixture shall be practically free from segregation.

401.7.5.3 **Base Widening.** The specified total thickness of base widening shall be completed to the adjacent traveled way elevation as shown on the plans. Additional thickness of base widening may be placed as required prior to coldmilling, at the contractor's expense, and shall subsequently be coldmilled to the same elevation as the traveled way, if conducive to expedite operations. On base-widening work, a succeeding layer of bituminous mixture may be placed the same day as the previous layer, if it can be shown that the desired results are being obtained. On small areas, and on areas that are inaccessible to mechanical spreading and finishing equipment, the mixture may be spread and finished by hand methods if permitted by the engineer. At least one lane of the existing pavement and the adjacent shoulder shall be kept open to traffic at all times during construction, except for short intervals when the movement of the contractor's equipment will seriously hinder the flow of traffic. Intervals during which the contractor will be allowed to halt traffic shall be as designated by the engineer. The contractor shall not open more trenches ahead of the first layer of the base widening than is necessary for placing that layer in one half a day's operations. The first layer of the base widening shall not be placed for a greater distance ahead of the second layer than is necessary for placing the second layer in one half a day's operations. The second layer shall not be placed for a greater distance ahead of the final layer than is necessary for placing the final layer in one day's operation. Any changes in these lengths shall be made only with written permission from the engineer.

401.7.5.4 **Edge Differential.** For roadways constructed under traffic, no pavement edge differential shall be left in place for more than seven days, unless approved by the engineer.

401.7.6 **Joints.** The minimum density of all traveled way pavement within 8 inches of an unconfined longitudinal joint, shall be no less than 2.0 percent below the specified density. The cores taken to evaluate this area shall be centered 6 inches from the unconfined longitudinal joint near the centerline, and centered 12 inches from the unconfined longitudinal joint near the shoulder. If no deficient cores are found in the first 25 percent of production, the established rolling procedure may be used, at the direction of the engineer, in lieu of density tests provided no changes in the material, typical location or temperatures are made. Pay adjustments due to unconfined longitudinal joint density shall apply to the full width of the lane paved. Adjustments due to joint density shall apply to the day's production from which the cores are obtained. Transverse joints shall be formed by cutting back on the previous run to expose the full depth of the layer. When a transverse vertical edge is to be left in place and opened to traffic, a temporary depth transition shall be constructed as approved by the engineer. The longitudinal joints in one layer shall offset those in the layer immediately below by approximately 6 inches. The joints in the final surface layer shall be at the lane lines of the traveled way, except that the placement width shall be adjusted such that pavement marking shall not fall on a longitudinal joint. Each side of the joint shall be flush and along true lines.

401.7.7 **Surfaced Approaches.** At locations designated in the contract or as specified by the engineer, approaches shall be primed in accordance with Sec 408 and surfaced with a plant mix bituminous mixture. The bituminous surface shall be placed as shown on the plans or as directed by the engineer. Approaches shall not be surfaced before the surface course adjacent to the entrance is completed. No direct payment will be made for any work required to condition and prepare the subgrade on the approaches.

401.7.8 **Compaction.** The compacted mixture shall have a minimum density of 92 percent of the theoretical maximum specific gravity. Density will be determined by the direct transmission nuclear method in accordance with MoDOT Test Method TM 41 or by a specific gravity method. When the contractor elects to place a lift of mixture greater than six times the nominal maximum aggregate size, cores shall be cut in half and the density of each half determined separately. In lieu of density requirements, mixtures used for wedging, transitions, existing shoulder overlays, new shoulders constructed on a sub-grade or base that does not specify density control, temporary bypasses to be maintained at the expense of the contractor, and areas where a commercial mixture is used shall be thoroughly compacted by at least three complete coverage's over the entire area with either a pneumatic tire roller weighing no less than 10 tons, a tandem-type steel wheel roller weighing no less than 10 tons or an approved vibratory roller. Rolling shall be performed at proper time intervals on each layer and shall be continued until there is no visible evidence of further consolidation.

401.8 Quality Control. The contractor shall maintain equipment and qualified personnel to perform QC field inspection, sampling and testing in accordance with applicable portions of Sec 403. A QC Plan will not be required. A proposed third party for dispute resolution shall be included with the mix design submittal.

401.8.1 **Mixture Testing.** The contractor shall randomly test the mixture within the following frequencies. The gradation and the asphalt content shall be determined at least once every 1,000 tons of production or a minimum of once per day. Deleterious content shall be determined once per 5,000 tons unless quality concerns dictate more frequent testing as directed by the engineer. Gradation and asphalt content of RAP shall be determined once every 10,000 tons of production. If RAP is used and AASHTO T 308 is used to determine the asphalt content, the binder ignition oven shall be calibrated in accordance with MoDOT Test Method TM 77. At the engineer's discretion, testing may be waived when production does not exceed 200 tons per day. The contractor shall certify the proper proportions of a previously proven mixture were used.

401.8.2 **Failing Test.** If a, deleterious content, or asphalt content test result falls outside of the specification tolerances, a review or adjustment of the plant settings and production shall be made and another sample shall be immediately taken. If the second test falls outside of the specification tolerances, production shall be immediately ceased until the mixture can be brought back into specification. If a gradation test falls between the Tolerance and Action Limits, adjustments to plant shall be made and another gradation shall be taken immediately. Plant production for the following day shall not resume until the mixture is brought back into specification when the final gradation for the day is not within tolerance. If a gradation

test falls outside the Action Limit, production shall cease until the mixture is brought back into specification.

401.8.3 **Retained Samples.** One half of the contractor's sample for gradation, deleterious content, and asphalt content and all cores shall be retained for the engineer. The contractor shall retain the samples for 7 days after testing has been completed and the results accepted by the engineer.

401.8.4 **Pavement Testing.**During construction, the engineer will designate as many tests as necessary to ensure that the course is being constructed of proper thickness, composition and density. Density of the roadway shall be determined by one core obtained by the contractor at a random location selected by the engineer for every 500 tons of production. The cores from each day's production will be averaged to determine acceptance. A joint density core shall be taken from the same transverse cross section as the mat core and alternate sides. The maximum theoretical density shown on the job mix formula shall be used for this determination. Minimum 4inch diameter cores, shall be taken the full depth of the layer to be tested. Cores tested by AASHTO T 166 shall be in accordance with Sec 403.19.3.1.3. The contractor shall restore the surface from which samples have been taken immediately with the mixture under production or with a cold patch mixture acceptable to the engineer.

401.8.5 **Density Adjustment.** Payment for mixture placed at or below the required minimum density will be adjusted as follows:

Field Density Percent of Maximum Theoretical Density	**Percent of Contract Unit Price**[a]
91.5 or above	100%
91.0 to 91.4, inclusive	97%
90.5 to 90.9, inclusive	94%
90.0 to 90.4, inclusive	90%
89.5 to 89.9, inclusive	80%
Below 89.5	Remove and Replace

[a]When adjustments are necessary, the lower percent of the contract unit price of either the pavement or joint density adjustment will apply.

401.9 **Quality Assurance.**Acceptance tests for gradation, deleterious content and asphalt content will be performed by the engineer at a minimum rate of one independent sample per 4 QC samples. A favorable comparison will be considered when a QA test is within the specification tolerances. An acceptance test for plasticity index will be performed at a minimum rate of one per project by the engineer on an independent sample taken during production. Initial testing will be performed the first week of production. When the plasticity index on an individual aggregate fraction is more than two percentage points above the value shown on the approved mix design, moisture susceptibility testing shall be required in accordance with Sec 401.4.5. At least once for every five days of production, a split of the contractor's sample will be tested. If the results of the split sample are not within five percent on all sieves above the No. 200, two percent on the No. 200, within the specification ranges on the deleterious content, and within 0.5 percent on the asphalt content from the contractor's results, another split sample will be taken jointly with the contractor and tested. If the second test results do not compare within the specification tolerances, production shall cease until the discrepancy is resolved. If the second test results compare within the above tolerances, production may continue. The engineer will retain one half of the plasticity index test and moisture susceptibility test for 7 days after testing is complete. Results of QA testing will be furnished to the contractor within 24 hours of obtaining the sample, with the exception of moisture susceptibility testing.

401.10 **Surface Smoothness.** The finish of the pavement surface shall be substantially free from waves or irregularities and shall be true to the established crown and grade. The pavement shall be thoroughly tested for smoothness by profiling or straightedging in accordance with Sec 610.

401.11 **Defective Mixture.** Any mixture showing an excess of bituminous material or that becomes loose and broken, mixed with dirt, or is in any way defective, shall be removed and replaced with a satisfactory mixture, which shall be immediately compacted to conform to the surrounding area.

401.12 **Pavement Marking.** If the contractor's work has obliterated existing pavement marking on resurfacing projects open to through traffic, the pavement marking shall be replaced at the contractor's expense in accordance with Sec 620.

401.13 **Method of Measurement.** Measurement will be in accordance with Sec 403.

401.14 **Basis of Payment.** The accepted quantities of plant mix bituminous pavement and base course will be paid for at the contract unit price for each of the pay items included in the contract. Payment for obtaining and delivering samples of compacted mixture from the base and replacement of the surface will be made per sample at the fixed contract unit price specified in Sec 109. No direct payment will be made for QC cores, excavating the trench for base widening, or for hauling and disposing of excess excavation material.

SECTION 408
PRIME COAT

408.1 Description. This work shall consist of preparing and treating an existing surface with bituminous material in accordance with these specifications, as shown on the plans or as directed by the engineer.
408.2 Material. The type and grade of bituminous material will be specified in the contract. Liquid asphalt may be changed one grade by the engineer during construction at no change in the contract unit price. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Type RC and MC Liquid Asphalts	1015
Emulsified Asphalt	1015

408.3 Equipment. Equipment shall be in accordance with Sec 407.
408.4 Construction Requirements.

408.4.1 Preparation of Surface. The surface to be primed shall be shaped to the required grade and cross section, shall be free from all ruts, corrugations, segregated material or other irregularities, and shall be uniformly compacted by rolling. The surface shall be firm and slightly damp when primer is applied. Delays in priming may necessitate reprocessing or reshaping to provide a smooth compacted surface.
408.4.2 Application. Bituminous material shall be applied to the width of the section to be primed by means of a pressure distributor in a uniform, continuous spread. The application rate shall be as specified in the contract, or as revised by the engineer between 0.2 and 0.5 gallon per square yard. The primer shall be heated at the time of application in accordance with the limits provided in Sec 1015.
408.4.2.1 There shall be no overlapping of bituminous material. Pools of primer material remaining on the surface after the application shall be removed. As soon as the bituminous material has been absorbed by the surface and will not track, traffic may be routed onto the treated traveled way. Any damage caused to the prime coat due to the contractor's equipment or decision to allow traffic on the roadway too soon shall be primed again at the contractor's expense.
408.4.2.2 The primer shall be properly cured and the primed surface shall be cleaned of all dirt and surplus sand before the next course is placed.
408.5 Method of Measurement. Bituminous material will be measured to the nearest gallon and adjusted for temperature correction in accordance with Sec 1015.
408.6 Basis of Payment. The accepted quantities of prime coat will be paid for at the contract unit price for each of the pay items included in the contract. No direct payment will be made for furnishing or applying any water required for dampening the surface to be primed.

SECTION 1015
BITUMINOUS MATERIAL

1015.1 Scope. This specification covers bituminous material to be used in highway construction.
1015.2 Approval of Source. The contractor shall obtain approval of the source of bituminous material from the engineer before any shipments to the work site are made.
1015.3 Sampling, Testing and Acceptance Procedures .The supplier shall certify that the bituminous material complies with the specification requirements.
1015.3.1 Certification. The supplier shall furnish the truck driver a copy of the bill of lading, manifest or truck ticket to be available to MoDOT at the destination prior to unloading. The engineer at the source shall be furnished a copy. The bill of lading, manifest or truck ticket shall provide the following information regarding the shipment: type and grade of material, chemical additives, such as polyphosphoric acid (PPA), used in modification, specific gravity at 60 F, net gallons, consignee, truck number, identification number, weight of truck before and after loading, destination, date loaded, name and location of the source, and a certification statement. The certification statement shall be signed by an authorized representative of the supplier and shall be substantially as follows:
"This certifies that the bituminous material in this shipment is in accordance with MoDOT specifications for the grade specified and the weights (masses) shown hereon were obtained on MoDOT approved scales and are correct within the specified scale requirements."
1015.3.2 Sampling. The engineer will at random observe the sampling and testing of truck shipments and tanks, and will select representative samples of the material being supplied for testing in the field or in the Central Laboratory. When test results certified by the supplier are not representative of the material being shipped, the source approval will be withdrawn. A source may be reinstated when proof is furnished that the deficiency has been corrected and adequate controls are in effect to guarantee delivery of material meeting specifications. Sampling and test methods for asphalt shall be as follows:

Property	Method	RC	MC	PG
Sampling	AASHTO T 40	X	X	X
Water	AASHTO T 55	X	X	X
Flash Point (Tag Open Cup)	AASHTO T 79	X	X	
Flash Point (Cleveland Open Cup)	AASHTO T 48			X
Viscosity, Centistokes	AASHTO T 201	X	X	
Distillation	AASHTO T 78	X	X	
Penetration	AASHTO T 49	X	X	
Ductility	AASHTO T 51	X	X	
Solubility in Trichloroethylene	AASHTO T 44	X	X	X
Ash in Bituminous Material	AASHTO T 111			
Viscosity (Rotational)	ASTM D 4402			X

Dynamic Shear	AASHTO 315			X
Rolling Thin Film Oven Test	AASHTO T 240			X
Pressure Aging Test	AASHTO R28			X
Creep Stiffness	AASHTO T 313			X
Direct Tension	AASHTO T 314			

1015.3.3 Sampling Equipment. The supplier shall furnish the required sampling equipment and shall sample the contents of the truck under the direction of the engineer. The supplier shall keep all sampling equipment clean and in good condition. Sampling devices on truck transports will be approved provided an adequately insulated valve is used with a pipe or nipple inserted a suitable distance into the tank.

1015.3.4 Truck Log. Each truck transport shall carry a log showing types of material and the dates hauled with respect to previous shipments, or the supplier shall furnish to the engineer such information with respect to the previous load.

1015.3.5 Intermediate Storage. Intermediate storage tanks for storage and transfer of material between the refinery or terminal and the point of acceptance shall be equipped for sealing and shall be reserved exclusively for MoDOT work. Use of any material from unsealed tanks will be subject to delay until material can be sampled, tested and approved.

1015.3.6 Other Transportation. At sources from which liquid bituminous material is being accepted by certification, the applicable requirements of the foregoing sections shall be followed for shipments of material in transportation units other than trucks. The certification and all information regarding each shipment shall be furnished to the engineer at the source.

1015.3.7 Railroad Shipments. For railroad shipments from refineries where inspection is not maintained by MoDOT, the supplier shall sample each car load at the source and submit the sample promptly to the Central Laboratory. A bill of lading or identification sheet shall accompany each sample and contain the following information: car number, type and grade of material, chemical additives, such as PPA, used in modification, quantity represented, including gross gallons, temperature and net gallons at 60 F, destination of shipment, project number and consignee. A certification statement as specified in Sec 1015.3.1 shall accompany each sample. Approval of the source may be withdrawn if samples submitted are not representative of the material shipped in the car.

1015.4 Proportioning and Blending Bituminous Material Constituents. All material shall be properly proportioned and thoroughly blended in suitable tanks prior to delivery to transportation equipment, or material may be proportioned and blended by use of automatic proportioning equipment. All automatic-proportioning blenders shall meet the approval of the engineer and shall be equipped with precision instruments, including electrically interlocked motors and automatic meters.

1015.5 Application Temperatures for Bituminous Material.

Bituminous Material	**Temperature, Degrees Fahrenheit**			
	Spraying		**Mixing**	
	Min	**Max**	**Min**	**Max**
Asphalt Binder				
PG 46-28	260	325	----	----
All Other Grades	285	350	275	350
Liquid Asphalt RC-MC				
Grade				
30	70	150	50	110

70	100	180	90	140
250	150	220	130	170
800	180	260	170	210
3000	210	290	200	240
Asphalt Emulsions				
RS-1	120	140	----	----
RS-2	125	185	----	----
SS-1	120	160	70	160
SS-1h	120	160	70	160
SS-1vh	160	180	140	160
CRS-1	125	185	----	----
CRS-2	125	185	----	----
CSS-1	120	160	70	160
CSS-1h	120	160	70	160
EA-90P	130	180	----	----
CRS-2P	130	180	----	----
CHFRS-2P	130	180	----	----

[a] The minimum mixing temperature shall be lowered to 200 when a warm mix technology, as approved by the engineer, is used.

1015.5.1 Application temperatures of other grades of emulsions shall be as specified in the contract.
1015.5.2 The spraying temperature for non-modified PG 46-28 asphalt binder shall be 260 - 325 F, and for all other higher temperature non-modified performance grades, the spraying temperature shall be 285 - 350 F. The mixing and compaction temperatures for performance graded asphalt binder shall be determined by rotational viscosity testing as defined in ASTM D 4402.
1015.5.3 When material to be applied by pressure distributor is, due to refining or blending procedures, delivered at a temperature above the specified limits, the material may be applied at the higher temperature provided satisfactory application can be obtained at the specified rate and provided sufficient precaution is exercised with respect to the fire hazard.
1015.6 Measurement of Bituminous Material. Field weight or field volumetric determinations of the material actually incorporated into the work will be used for measurement of the quantity of bituminous material for payment. The volume of material supplied from intermediate storage tanks will be determined from the net weight of the material. The net weight will be determined from the gross weight of the loaded transport vehicle used to deliver the material to the project less the empty transport vehicle weight. The volume correction methods specified below will be used for determining the volume of bituminous material. Scales for determining the weight of bituminous material shall be in accordance with Sec 310.
1015.6.1 Liquid Bituminous Material and Asphalt Binder - Volumetric Determination. Measurement of the material will be based on the volume at 60 F. The volume correction factors of ASTM D 4311, Table 2, will be used for converting the material from the volume at the observed temperature to the volume at 60 F. The volume of uncalibrated distributors and tank trucks will be determined from the net weight of the material. The net weight will be determined from the gross weight of the loaded delivery vehicle less the empty delivery vehicle weight. For computing the volume in gallons from weight, the following formula will be used:

$$G = \frac{W}{SG \times 8.328}$$

where:
G = Volume in gallons at 60 F.
W = Weight of material in pounds.
SG = Specific Gravity of material at 60 F.

1015.6.2 Emulsified Asphalt. Measurement of the material will be based on the volume at 60 F using a coefficient of expansion of 0.0003 per degree F for converting the material from the volume at the observed temperature to the volume at 60 F.

SECTION 1015.10 PERFORMANCE GRADED ASPHALT BINDER.

1015.10.1 General. Performance graded asphalt binder shall be an asphalt-based binder produced from petroleum residue either with or without the addition of non-particulate organic modifiers, except Re-refined Engine Oil Bottoms (REOB) and Vacuum Tower Asphalt Extenders (VTAE) shall not be used as modifiers. The grade shall be as specified in the contract.

1015.10.2 Basis of Acceptance. Suppliers furnishing performance graded asphalt binders to MoDOT projects by certification shall be in accordance with AASHTO R 26, except as noted herein. To become pre-qualified to furnish material, a written request shall be sent to Construction and Materials, along with a copy of the supplier's QC plan. Split samples may be required. Changes in formulation, base stock or methods of manufacture of qualified performance graded binders shall be noted and may require requalification.

1015.10.2.1 Quality Control Plan Requirements. The QC plan shall be in accordance with AASHTO R 26 with the following exceptions and modifications:

(a) The plan shall be written to cover multiple terminals or shipping facilities, in addition to theprimary manufacturing facility, provided specific requirements for each location are clearly stated.

(b) The plan shall state the lot size used to designate the frequency of QC and specification compliancetesting for each performance grade to be supplied. The lot size will depend upon the method of manufacture and may be designated on a tank basis, or on a time basis in the case of binders that are blended into trucks or tanks or that are continually blended into "live" tanks.

(c) For terminals or manufacturing facilities, the minimum reduced frequency of testing for QC orspecification compliance shall be one series of tests every two weeks for "live" tanks or blenders and one series of tests every four weeks for "static" tanks that have had no material added between testing, per lot per grade of binder shipped.

(d) Quality Control testing may be used to determine that binders being shipped from terminals ormanufacturing facilities have not been contaminated, provided that such testing is shown to be of sufficient accuracy to detect contamination and to assure that material meets required specifications. Surrogate tests may be used for QC testing of non-modified performance graded binders.

(e) Terminals or shipping facilities that blend performance graded binders from different sources, thatblend to produce a different performance grade, or that blend to modify the properties of an existing performance grade shall perform complete AASHTO M 320 specification compliance testing.

(f) The shipping facility shall document that each transport vessel was inspected prior to loading andwas found to be acceptable for the material being shipped. The inspection shall be documented by a statement on the bill of lading or truck ticket, or by maintaining a record of transport vessel inspections at the shipping facility, which shall be available for review by MoDOT.

1015.10.2.2 Quality Control Plan Test Data. The facility shall retain test data of specification compliance and QC testing for five years. At a minimum, the name of the facility, the dates of testing activity, results of individual specification compliance and QC tests identified by blender or tank number, and the mean, minimum and maximum test result for each specification compliance and QC test performed shall be readily available to MoDOT upon request.

1015.10.2.3 Approval of Laboratories. The supplier's primary testing laboratory shall be approved by MoDOT. The approval process will include split sample testing, and may include an on-site visit by department personnel. The primary testing laboratory shall be regularly inspected by the AASHTO Materials Reference Laboratory (AMRL). Any satellite testing laboratory operated by a supplier shall be inspected at the same frequency by the supplier's primary AMRL inspected laboratory staff, and a copy of the inspection report shall be forwarded to MoDOT.

1015.10.2.4 Failure to Comply. Failure to fulfill any of these requirements may result in disqualification of the performance graded binder supplier. If a primary manufacturing facility is disqualified, all terminals shipping performance graded binder manufactured at the primary facility and who are not performing AASHTO M 320 specification compliance testing will automatically be disqualified. In cases of dispute, test results obtained by MoDOT will be considered final.

1015.10.3 Characteristics. Performance graded asphalt binder shall be in accordance with AASHTO M 320 for the grade specified, except as follows. AASHTO T 111, Inorganic Matter or Ash in Bituminous Materials, may be substituted for AASHTO T 44, Solubility of Bituminous Materials, at the specification value indicated prior to the addition of ground tire rubber (GTR.) All blends containing GTR shall include 4.5 percent transpolyoctenamer rubber (TOR) by weight of the GTR. The direct tension test will be waived. The following additional requirements will apply:

Binder Characteristics		
Absolute Temperature Spread Between Upper and Lower Temperature for PG Binder Grade[a]	**Elastic Recovery[b], Percent, Minimum, AASHTO T 301**	**Separation Test[c], Percent Difference, Maximum, ASTM D 5976**
86 C	-	-
92 C	55	10
98 C	65	10
104 C	75	10

[a]Temperature Spread = Upper PG Temperature minus Lower PG Temperature. [b]Elastic recovery test to be performed on the residue from the Rolling Thin Film Oven Test at 25 C and 10 cm elongation.

[c]Separation test to be performed in accordance with ASTM D 5976, except test upper and lower portions as original binder for G* value according to AASHTO T 315 except for GTR binders that require continuous agitation.

1015.10.3.1 In lieu of AASHTO M 320, AASHTO M 332 may be substituted eliminating the elastic recovery requirement, except for use with Sec 413.30, Ultrathin Bonded Asphalt Wearing Surface. The equivalent grading of PG 64-22 is as follows: Grade S for PG 64-22, Grade H for PG 70-22 and Grade V for PG 76-22. Specialty grades will be tested at the grade temperature for the desired characteristics, i.e. PG 58-28 for RAS mixtures.

1015.10.4 Characteristics for GTR. Ground tire rubber shall be ambient ground, free of wire or other contaminating materials and not contain more than 0.1 percent fabric. Cryogenically ground rubber may be used by demonstrating that the GTR is satisfactorily suspended during all phases of production and storage. The gradation of the GTR shall be as follows:

Ground Tire Rubber	
Sieve Size	**Percent Passing by Weight**
No. 8	100
No. 16	100-96
No. 30	100-90
No. 50	20 min.

1015.10.4.1 Modification Process. The percentage by weight of binder shall be included with each lot of material. Ground tire rubber modified asphalt binder shall be tested and certified in accordance with Sec 1015.10.2 and may be incorporated by any of the following methods:

1015.10.4.1.1 Blending at HMA Plant. All sampling and testing shall be performed in accordance the requirements for terminal blending including high and low temperature testing.

1015.10.4.1.2 Terminal Blending. Blending and certification shall be in accordance with Sec 1015.

1015.10.5 Storage. Performance graded asphalt binder shall be furnished as a uniform mixture shipped directly to the project site from the asphalt binder supplier's permanent plant address or intermediate storage facility, suitable for direct use. Asphalt binder shall be capable of being stored at the project site without separation or settling. Automatic blending will be allowed at the terminal. Intermediate blending of asphalt binder and additives will not be

allowed at the project site, unless the asphalt binder is sampled at a point in the operation which captures the final blended binder with all additives incorporated.

SECTION 1015.20 LIQUID BITUMINOUS MATERIAL.

1015.20.1 Basis of Acceptance. Suppliers electing to furnish liquid bituminous material to MoDOT projects by QC/QA certification shall furnish material in accordance with Sec 1015.20.2. To become pre-qualified to furnish material, a written request shall be submitted to Construction and Materials, along with a copy of the supplier's QC plan. For source approval for any supplier of liquid bituminous material, split samples and an on-site laboratory inspection may be required. A manufacturer may forgo a formal QC plan and elect to perform full compliance testing, and certify each batch of material. If a manufacturer elects to forgo a formal QC Plan, all truck shipments shall be loaded from approved storage tanks that have been sampled, tested and certified by the supplier. If a manufacturer so elects, and automatic blending equipment is used, blender material will be approved for use provided the finished product is in accordance with this specification. At least one complete specification compliance test shall be conducted every two weeks on each grade of material furnished for MoDOT work from the blender. A certified copy of the test results shall be furnished to the engineer. For all liquid bituminous material, AASHTO T 111, Inorganic Matter or Ash in Bituminous Materials, may be substituted for AASHTO T 44, Solubility of Bituminous Materials, at the specification value indicated.

1015.20.2 Quality Control Plan Requirements. The QC plan shall be in accordance with the following:

(a) The plan may be written to cover multiple terminals, shipping facilities, blending or manufacturing-facilities.

(b) The plan shall state the location, organization and responsible personnel for each facility, includingthe physical address and telephone contact information. In general, following the guidelines in AASHTO R 26 will be acceptable.

(c) The plan shall state the minimum testing frequency for all material supplied. At a minimum, eachgrade of material supplied to MoDOT shall have complete specification compliance testing conducted monthly. Polymer modified material shall have complete specification compliance testing conducted every two weeks. The manufacturer’s internal QC testing frequency shall be approved by MoDOT prior to implementation. The manufacturer shall perform sufficient tests and at a frequency to ensure specification compliant material is being supplied to MoDOT at all times. For emulsified asphalt, QC testing on each batch, at a minimum, shall consist of viscosity, sieve test, determination of residue by either distillation or evaporation and an identifier test, if applicable, for that particular grade, either cement mixing, particle charge or demusibility. The manufacturer may elect to perform additional QC tests. For cutback material, QC testing shall be a minimum of the viscosity on a daily basis when material is being shipped to MoDOT work.

(d) In the event of a failing sample, the manufacturer shall follow the steps outlined in AASHTO R 26,Sec. 9.2. If a sample fails to comply with any specification requirement at the Central Laboratory, the manufacturer may only ship new material of that grade after full specification compliance testing. After the manufacturer has certified through specification compliance testing that three consecutive batches are in accordance with the material specification, the manufacturer may return to the testing frequency outlined in the QC/QA plan. If a second sample of the same grade from the same facility fails to comply with any specification requirement within the same calendar year, approval of that facility to supply that grade under QC/QA may be withdrawn. If approval for a grade is withdrawn, that material may only be supplied to MoDOT work after full certification compliance testing has been performed at the Central Laboratory. Re-approval to supply under the supplier’s QC/QA Plan will occur only after three consecutive batches meet specifications after testing at the Central Laboratory. Failure of multiple grades from a single facility tested at the Central Laboratory may result in that facility being removed from approval to supply material to MoDOT. Reinstatement will occur only after all materials in question have been tested at the Central Laboratory and have met all specifications, and documentation from the supplier outlining the reason for the failures and what corrective measures have been taken are to the satisfaction of MoDOT.

(e) The shipping facility shall document that each transport vessel was inspected prior to loading andwas found to be acceptable for the material shipped. The inspection shall be documented by a statement on the bill of lading or truck ticket, or by maintaining a record of transport vessel inspections at the shipping facility, which shall be available for review by MoDOT.

The results of QC/QA testing shall be retained by the supplier for a period of three years. A report containing all test results for any material shall be available to MoDOT upon request.

1015.20.3 Type RC Liquid Asphalt. Type RC liquid asphalt shall be produced by fluxing an asphaltic base with suitable petroleum distillates. The material shall show no separation or curdling prior to use and shall not foam when heated to the application temperature. The material shall be in accordance with AASHTO M 81, invoking Note 3 using penetration in lieu of viscosity for the grade specified in the contract.

1015.20.4 Type MC Liquid Asphalt. Type MC liquid asphalt shall be produced by fluxing an asphaltic base with suitable petroleum distillates. The material shall show no separation or curdling prior to use and shall not foam when heated to the application temperature. The material shall be in accordance with AASHTO M 82, invoking Note 4 using penetration in lieu of viscosity for the grade specified in the contract.

1015.20.5 Emulsified Asphalt. Non-polymer emulsified asphalt shall be in accordance with AASHTO M 140 or AASHTO M 208, for the type and grade specified in the contract.

1015.20.5.1 Polymer Modified Asphalt Emulsion - Seal Coat. Bituminous material for polymer modified asphalt shall be in accordance with the following:

Polymer Modified Asphalt Emulsion				
Test[a]	**CRS-2P**		**EA-90P**	
	Min	**Max**	**Min**	**Max**
Viscosity, SSF @ 50 C	100	400	100	400
Storage Stability Test[b], 24 hour, percent	----	1	----	1
Classification Test	Pass	----	----	----
Particle Charge Test	Positive	----	----	----
Sieve Test,percent	----	0.3	----	0.3
Demulsibility, 0.02 N $CaC1_2$, percent	----	----	30	----
Distillation:				
Oil distillate by volume of emulsion, percent	----	3	----	3
Residue from distillation[c] , percent	65	----	65	----
Tests on Residue from Distillation:				
Penetration,25 C, 100 g, 5 sec	100	200	100	200
Ductility, 4 C, 5 cm/minute, cm	30	----	25	----
Ash[d], percent	----	1	----	1
Float Test at 60 C, sec	----	----	1200	----
Elastic Recovery[e], percent	58	----	58	----

[a]All tests shall be performed in accordance with AASHTO T 59 except as noted.

[b]In addition to AASHTO T 59, upon examination of the test cylinder, and after standing undisturbed for 24 hours, the surface shall show no appreciable white, milky colored substance and shall be a homogeneous brown color throughout.

[c]AASHTO T 59 shall be modified to maintain a 399 F ± 10 F maximum temperature for 15 minutes.

[d]Percent ash shall be determined in accordance with AASHTO T 111, *Ash in Bituminous Material*. [e]Elastic recovery shall be determined as follows. Condition the ductilometer and samples to be treated at 50 F. Prepare the brass plate, mold and briquet specimen in accordance with AASHTO T 51. Keep the specimen at the specified test temperature of 50 F for 85 to 95 minutes. Immediately after conditioning, place the specimen in the ductilometer and proceed to elongate the sample to 20 cm at a rate of pull of 5 cm/min. After the 20 cm elongation has been reached, stop the ductilometer and hold the sample in the elongated position for 5 minutes. After 5 minutes, clip the sample approximately in half by means of scissors or other suitable

cutting devices. Let the sample remain in the ductilometer in an undisturbed condition for one hour. At the end of this time period, retract the half sample specimen until the two broken ends touch. At this point note the elongation (x) in cm. Calculate the percent recovery by the following formula:

$$\% \text{ Recovery} = \frac{20 - X}{20} \times 100$$

Polymer Modified Asphalt Emulsion		
Test[a]	**CHFRS-2P**	
	Min.	**Max.**
Viscosity, SFS @ 50 C	100	400
Storage Stability Test, 24 hour, percent	---	1.0
Demulsibility, 35 ml 0.8% dioctyl sodium sulfosuccinate, percent	60	---
Sieve Test, percent	---	0.10
Particle Charge Test	Positive	
Distillation[b] Oil Distillate, by volume of emulsion, percent Residue from distillation, percent	--- 65	0.5 ---
Tests on Residue from Distillation:		
Polymer content, weight, percent (solids based) Softening Point, C Float test at 60 C, s Penetration, 25 C, 100 g, 5 s Viscosity @ 60 C, Poise Solubility in Trichloroethylene, percent Elastic Recovery[c] @ 10 C , percent	3.0 54 1800 80 1300 95 65	 --- --- 130 --- --- ---

[a]All tests shall be performed in accordance with AASHTO T-59 except as noted. [b]AASHTO T59 shall be modified to maintain a 177 ± 5 C maximum temperature to be held for 20 minutes. Complete the total distillation in 60 ± 5 minutes from the first application of heat. [c]Elastic recovery shall be determined as follows. Condition the ductilometer and samples to be treated at 10 C. Prepare the brass plate, mold, and briquet specimen in accordance with AASHTO T 51. Keep the specimen at the specified test temperature of 10 C for 85 to 95 minutes. Immediately after conditioning, place the specimen in the ductilometer and proceed to elongate the sample to 20 cm at a rate of pull of 5 cm/min. After the 20 cm elongation has been reached, stop the ductilometer and hold the sample in the elongated position for 5 minutes. After the 5 minutes, clip the sample approximately in half by means of scissors or other suitable cutting devices. Let the sample remain in the ductilometer in an undisturbed condition for one hour. At the end of this time period, retract the half sample specimen until the two broken ends touch. At this point note the elongation recovery (X) in cm. Calculate the percent recovery by the following formula:

$$\% \text{ Recovery} = \frac{20 - X}{20} \times 100$$

1015.20.5.1.1 Polymer Modified Asphalt Emulsion - Tack Coat. Bituminous material for polymer modified asphalt shall be in accordance with the following:

Slow Setting Polymer Modified Asphalt Emulsion[a]					
		SS-1HP		CSS-1HP	
Test on Emulsion	Method	Min	Max	Min	Max
Viscosity, Saybolt Furol @ 25°C (77°F), s	AASHTO T 59	20	100	20	100
Particle Charge Test		Negative		Positive	
Storage Stability Test[b], 24 hr, percent	AASHTO T 59	--	1	--	1
Sieve Test, percent	AASHTO T 59	--	0.50	--	0.50
Residue by Distillation[c], percent	AASHTO T 59	57		57	
Oil Distillate by Distillation, percent	AASHTO T 59	--	--	--	--
Test on Residue from Distillation					
Penetration 25°C, 100 g, 5 s	AASHTO T 49	40	90	40	90
Elastic Recovery[d], 20 cm, 5 cm/min, 60 min, %	AASHTO T 301	30	--	30	--
Solubility in Trichloroethylene[e], %	AASHTO T 44	97.5	--	97.5	--

[a] The emulsified asphalt shall be in accordance with Sec 1015.20.5 of the 2011 Missouri Standard Specifications for Highway Construction, except as indicated above, and shall be modified with a styrene-butadiene diblock or triblock copolymer or a styrene butadiene rubber.

[b] In addition to AASHTO T 59, upon examination of the test cylinder, and afterstanding undisturbed for 24 hours, the surface shall show no appreciable white, milky colored substance and shall be homogeneous brown color throughout. The storage stability test may be waved provided the asphalt emulsion storage tank at the project site has adequate provisions for circulating the entire contents of the tank, provided satisfactory field results are obtained.

[c] AASHTO T 59 shall be modified to use a lower distillation temperature of 177° C(350° F). [d] AASHTO T 301 shall be modified to allow the residue to be obtained from distillation as long as the distillation temperature is modified as stated above. The test on residue shall be conducted at a temperature of 10° C (50° F).

[e] In lieu of performing AASHTO T 44, AASHTO T 111, Ash in Bituminous Material, may be performed with a maximum allowable percent ash of 1.0 percent.

1015.20.5.2 Asphalt Emulsion for Micro-Surfacing. Bituminous material for micro-surfacing shall be a polymer modified asphalt emulsion, grade CSS-lh, in accordance with the following table. The bituminous material shall show no separation after mixing. A minimum of 3.0 percent polymer content, by mass, of an approved polymer shall be milled into the asphalt emulsion at the time of manufacture of the emulsion. The emulsion shall be sampled in accordance with AASHTO T 40.

Micro-Surfacing Emulsion (MSE-1)			
	Min.	**Max.**	**Test Method**
Viscosity, Saybolt Furol at 77 F, s	20	100	AASHTO T 59
Storage stability test, 24 hr,	- -	1a	AASHTO T

percent			59
Particle charge test positive[b]			AASHTO T 59
Sieve test, percent	- -	0.50	AASHTO T 59
Residue, percent	62	- -	AASHTO T 59
Tests on Residue from Distillation	**Min.**	**Max.**	**Test Method**
Penetration, 77 F, 100 g, 5 s,	40	90	AASHTO T49
Ductility, 25 C, 5cm/min, cm,	40	- -	AASHTO T 51
Solubility in Trichloroethylene, %	97.50	- -	AASHTO T 44

[a]The storage stability test may be waived provided the asphalt emulsion storage tank at the project site has adequate provisions for circulating the entire contents of the tank, and provided satisfactory field results are obtained.

[b]If the particle charge test is inconclusive, material having a maximum pH value of 6.7 will be acceptable.

1015.20.5.3 Scrub Seal Emulsion. Scrub seal emulsion shall be smooth and homogeneous, polymer modified, shall contain an asphalt rejuvenator and shall be in accordance with the following:

Scrub Seal Emulsion (SSE-1)			
	Min.	**Max.**	**Test Method**
Saybolt Furol Viscosity, SFS @ 77 F	30	100	AASHTO T 59
Storage Stability Test[a] , 24 hr., %	--	1a	AASHTO T 59
Demulsibility, 35 ml of 0.02N, $CACl_2$, %	--	60	AASHTO T 59
Sieve Test[b], percent	--	0.3	AASHTO T 59
Residue by Distillation[(c)] @ 401 ± 10 F, %	60	--	AASHTO T 59
Oil Distillate by Volume, percent	--	3	AASHTO T 59
Tests on Residue from Distillation	**Min.**	**Max.**	**Test Method**
Penetration @ 77 F, 5 s, 100 g, dmm	100	300	AASHTO T 49
Float Test @ 140 F, s	1200	--	AASHTO T 50
Ash, percent	--	1	AASHTO T 111
Elastic Recovery, 10 C, 200 mm elongation, 60 min.	30	--	ASTM D

recovery, percent			5976
Saturates[d], percent	- -	20	ASTM D 4124

[a]Upon examination of the test cylinder after standing undisturbed for 24 hours, the surface shall show no white, milky colored substance and shall be a homogeneous brown color throughout. [b]A percentage of 0.30 will be acceptable for samples taken at the point of use or shipped to the Central Laboratory for testing.
[c]ASTM D 244 shall be modified to include a 205 ± 5 C maximum temperature to be held for 15 minutes.
[d]ASTM D 4124 shall be modified to use Alumina, CG - 20 Grade, available from Aluminum Company of America, Pittsburgh, PA.

1015.20.5.4 Hard Penetration Asphalt Emulsions (SS-1vh). The hard penetration asphalt emulsions shall be in accordance with the following:

Emulsion Properties of Hard Penetration Asphalt Emulsions (SS-1vh)			
Test on Emulsion	**Method**	**Min.**	**Max.**
Viscosity, Saybolt Furol @ 25º C (77º F), s	AASHTO T 59	20	100
Storage Stability Test[a], 24 hr., percent	AASHTO T 59	--	1.0
Sieve Test, percent	AASHTO T 59	--	0.30
Residue by Distillation, percent	AASHTO T 59	50	--
Oil Distillate by Distillation, percent	AASHTO T 59	--	1
Tests on Residue from Distillation	**Method**	**Min.**	**Max.**
Softening Point, º F	AASHTO T 53	149	200
Penetration 25º C (77º F), 100 g, 5 s	AASHTO T 49	--	40
G* / sin delta @ 76º C – 10 rad/sec, kPa	AASHTO T 315	1.0	--
Solubility in Trichloroethylene[b], %	AASHTO T 44	97.5	--

[a]In addition to AASHTO T 59, upon examination of the test cylinder, and after standing undisturbed for 24 hours, the surface shall show no appreciable white, milky colored substance and shall be homogeneous brown color throughout. The storage stability test may be waved provided the asphalt emulsion storage tank at the project site has adequate provisions for circulating the entire contents of the tank, provided satisfactory field results are obtained.
[b]In lieu of performing AASHTO T 44, AASHTO T 111, Ash in Bituminous Material, may be performed with a maximum allowable percent ash of 1.0 percent.

1015.20.6 Ultrathin Bonded Wearing Surface. Bituminous material for ultrathin bonded wearing surface shall be in accordance with the following.

1015.20.6.1 Asphalt Binder. The asphalt binder shall be in accordance with Sec 1015.10, and specifically as follows:

Tests	**Method**	**Min.**	**Max.**
Separation Test, %	AASHTO PP-5		10

Elastic Recovery Test, %	ASTM D 6084	65	

1015.20.6.2 Polymer Modified Emulsion Membrane. The anionic or cationic emulsion shall be polymer modified and shall be in accordance with one of the following:

Anionic Polymer Modified Emulsion Membrane (PEM-1)				
Tests on Emulsion		**Method**	**Min.**	**Max.**
Viscosity, Saybolt Furol @122°F, s		AASHTO T 59	25	125
Storage Stability Test[a], 24 h, percent		AASHTO T 59		1
Sieve Test[b], percent		AASHTO T 59		0.3
Residue by Distillation[c], percent		AASHTO T 59	63	
Oil Distillate by Distillation, percent		AASHTO T 59		2
Demulsibilty, %	35 ml, 0.02 N $CaCl_2$	AASHTO T 59	60	
Tests on Residue From Distillation				
Penetration		AASHTO T 49	90	150
Elastic Recovery, percent		AASHTO T 301	60	

Cationic Polymer Modified Emulsion Membrane (CPEM-1)				
Tests on Emulsion		**Method**	**Min.**	**Max.**
Viscosity, Saybolt Furol @122°F, s		AASHTO T 59	25	125
Storage Stability Test[a], 24 h, percent		AASHTO T 59		1
Sieve Test[b], percent		AASHTO T 59		0.3
Residue by Distillation[c], percent		AASHTO T 59	63	
Oil Distillate by Distillation, percent		AASHTO T 59		2
Demulsibility, %	35 ml, 0.8% dioctyl sodium sulfosuccinate	AASHTO T 59	60	
Tests on Residue From Distillation				
Penetration		AASHTO T 49	90	150
Elastic Recovery, %		AASHTO T 301	60	

[a]After standing undisturbed for 24 hours, the surface shall show no white, milky colored substance, but shall be a smooth homogeneous color throughout.
[b]The sieve test will be waived if successful application of the material has been achieved in the field.
[c]AASHTO T 59 shall be modified to include a 400 F ± 10 F maximum temperature to be held for a period of 15 minutes.

END OF SECTION 321216

SECTION 321313 - CONCRETE SITE WORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior Portland cement concrete (PCC) pavement and appurtenances for the following:

1. Driveways and Roadways
2. Parking lots
3. Curbs and Gutters.
4. Sidewalks
5. Exterior Structures

1.2 SUBMITTALS

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

B. Design Mixtures: For each concrete pavement mixture.

C. Pavement Jointing Plan

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

PART - 2 PRODUCTS

2.1 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

C. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed, epoxy coated.

D. Plain Steel Wire: ASTM A 82, as drawn.

E. Deformed-Steel Wire: ASTM A 496.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

2.2 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:

1. Portland Cement: ASTM C 150, Type I or IL

a. Fly Ash: ASTM C 618, Class C or F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Coarse aggregate, uniformly graded. Provide aggregates from a single source.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: ASTM C 494/C 494M, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

F. Classes of concrete:

Uses	Strength (28 days)	*Cement Content (min)
Driveways and Roadways, Parking lots, Curbs and Gutters, Sidewalks, Exterior Structures and General Concrete	4,000 psi	570 - lbs/Cu Yd

*Fly Ash may be substituted in accordance with Sec. 2.2 J.

G. Consistency shall be such that the mixture can be worked into all parts of the forms and around the reinforcing steel of the structure, without segregation of the materials or the appearance of free water on the surface of the concrete. Unless otherwise stated, the slump measured in accordance with ASTM C143 shall be within the following limits.

1. Floors, walks, and slabs 2" to 4"
2. Forms 9" wide or over 2" to 4"
3. Forms less than 9" wide 3" to 5"

H. All concrete be air entrained, containing between 4% and 7% entrained air, after mixing is complete and just prior to placement.

I. Pumped concrete shall comply with ACI 304 and these specifications.

J. Fly Ash shall not be used after October 15 and before April 1. The amount of fly ash shall not exceed 20% of cementitious material and the replacement ratio (fly ash to cement replaced) shall be a minimum of 1.5:1.

2.3 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

2.4 CONCRETE PROTECTION

A. All placed concrete pavements, sidewalk and curb and gutters shall have a penetrating siloxane or silane-based sealer. The sealer product shall be non-yellowing compound that forms a breathable internal membrane that combats freeze/thaw damage, reduce scaling and spalling, impart water repellence, and restrict moisture absorption, deicing chemicals and salts, acid rain deterioration, alkali attack, corrosion of reinforcing steel, and UV damage.

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 45 minutes. The Architect/Engineer shall approve the paint manufacturer.

1. Color: Yellow for Parking Strips and Accessibility Parking stripes and hatching. White for all other symbols, words, and arrows.

2.6 DETECTABLE WARNING PANELS (not applicable)

A. Detectable Warnings.

1. Detectable Warnings shall consist of a surface of truncated domes meeting the requirements of the ADAAG and the details show on the plans. The installation shall be an integral part of the walking surface and only the domes shall project above the walking surface. The panel shall be available in standard colors to allow a contrasting appearance. Panel color shall be throughout the entire thickness. The panels shall carry a minimum five (5) year manufacturer's warranty.

2. The material, equipment and installation procedures used shall be according to the manufacturer's specifications.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

PART - 3 EXECUTION

3.1 SUBGRADE PREPARATION

A. Subgrade preparation shall be in accordance with Section 3.6 of 312300 Excavation and Fill of these specifications.

B. Geotextile Fabric, Geogrid and Aggregate Base shall be in accordance with Section 321123 Aggregate Base Courses of these specifications.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

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

B. Epoxy coated bars will not be required.

3.4 JOINTS

A. General: Joints in sidewalks and driveways shall be by tooling while the concrete is plastic. Sawed joint may be allowed in pavements and curbs. All sidewalks, driveways and pavements shall be edged. Deformed steel tie bars in Longitudinal Construction Joints shall be placed by drilling and epoxy setting when adjacent slabs are to be constructed separately. Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Sawed contraction joints for a depth equal to at least one-fourth of the concrete thickness. Sidewalk joints shall be tooled and not sawed.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces. Tool joints on all sidewalks and in locations indicated on the Drawings.

F. Contractor shall submit a jointing plan for approval by owner’s representative prior to placing any concrete pavement.

3.5 CONCRETE PLACEMENT AND FINISHING

A. Moisten subbase to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Strike Off, Consolidation and Finishing: The pavement may be placed utilizing an approved vibrating screed or other approved strike-off and consolidating machine that provides a surface that is uniform texture, true to grade and cross section and free from porous areas. Additional consolidation with handheld or machine vibrators in front of strike off may be necessary if adequate consolidation is not being achieved. Longitudinal hand bull floating with a float having a min. width of 5 ft for non-vehicular slabs and a min. width of 10 ft for vehicular use slabs will be required. Floats or darbies shall be used at all edges as necessary to provide a uniform surface plane.

E. General: Do not add water to concrete surfaces during finishing operations.

F. Exterior Finish:

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

G. Interior (smooth) Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish floating to a trowel smooth surface.

H. Apply surface treatments, if any, per manufacturer’s recommendations.

3.6 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these methods.

3.7 CONCRETE PROTECTION

A. Apply penetrating permanent concrete protection treatment to all concrete pavements, sidewalk and curb and gutters at the time and rates as required by the manufacturer.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 3/16 inch.
4. Joint Spacing: Max 2 times slab thickness (inches) times 24.
5. Contraction Joint Depth: 1/3 slab thickness, no minus.
6. Joint Width: Plus 1/8 inch, no minus.

B. Curb tolerances:

1. Finished curb surfaces including curb top, face and gutter line shall not vary more than a ¼" from the testing edge of a 10 foot straightedge. Permissible deficiencies in section thickness will be up to a ¼".

3.9 PAVEMENT MARKING

A. Allow concrete pavement to cure for 28 days and be dry before starting pavement marking.

B. Sweep and clean surface to eliminate loose material and dust. Remove any oil or grease.

C. Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 16 mils.

D. Paint shall not be applied at air temperatures below 40 degrees F.

3.10 WHEEL STOPS

A. Securely attach wheel stops into pavement with not less than two galvanized steel dowels embedded in holes drilled or cast into wheel stops at one-quarter to one-third points. Firmly bond each dowel to wheel stop and to pavement. Securely install dowels into pavement and bond to wheel stop. Recess head of dowel beneath top of wheel stop.

3.11 SEALANT

A. The top ¼ inch of all sidewalk and pavement sawed and expansion joints (excluding tooled joints) shall be sealed with a self-leveling polyurethane horizontal sealant complying with ASTM C920, Type M, Grade P, Class 25.

3.12 FIELD QUALITY CONTROL

A. The **Contractor** shall provide testing services of a soils engineer and/or independent laboratory for this project.

B. Upon completion of each test and/or inspection, promptly distribute copies of test or inspection reports to A/E.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for the first 10 cu. yd. placed each day, plus one set for each additional 50 cu. yd. placed.

2. Slump: As noted in Section 2.2 G - ASTM C 143/C 143M; one test at point of placement for each composite sample of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: Required 6% (-2%, +1%) - ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample of each concrete mixture.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test per truck when air temperature is 35 deg F and below and when 85 deg F and above.

5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample of each concrete mixture.

6. Compression Test Specimens: ASTM C 31/C 31M.
   a. Cast and laboratory cure one set of five (5) 4" x 8" cylinder specimens for each composite sample.
   b. Cast and field cure one additional cylinder specimen for each composite sample for cold or hot weather concrete.

7. Compressive-Strength Tests: ASTM C 39/C 39M;
   a. Test one of five laboratory-cured specimens at 7 days and one set of three specimens at 28 days. The fifth specimen will be a hold to serve as a spare if specimens do not reach their design strengths.
   b. A compressive-strength test shall be the average compressive strength from a set of two or three specimens obtained from same composite sample and tested at age indicated.

3.13 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 323113 -CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Chain-Link Fences: **Industrial**

1.2 SUBMITTALS

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

B. Shop Drawings: Show locations, components, materials, dimensions, sizes, weights, and finishes of components. Include plans, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Height indicated on Drawings. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: **Metallic** wire with a diameter of **0.148 inch**.

a. Mesh Size **2 inches**
b. Metallic (Zinc) Coating: ASTM A 392, Type II.
c. Metallic (Zinc) Coating: ASTM A 392, Type II.
d. Zn-5-Al-MM Aluminum-Mischmetal Alloy Coating: ASTM F 1345, Type III.

e. Polymer Coating: ASTM D 668, Class 2b over metallic-coated steel wire.

1) Color: Brown, complying with ASTM F 934

2. Selvage: **Knuckled at both selvages**.

2.2 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:

1. Group: **IA, round steel pipe, Schedule 40**.
2. Fence Height: **4 feet**
3. Strength Requirement: **Heavy** industrial according to ASTM F 1043.
4. Coating for Steel Framing:

a. Polymer coating over metallic coating.

2.3 TENSION WIRE

A. General: Provide horizontal tension wire at **bottom** of fence fabric.

B. Metallic-Coated Steel Wire: 0.177-inch - diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824.

1. Metallic Coating: Type III, Zn-5-Al-MM alloy.

2.4 FITTINGS

A. General: Comply with ASTM F 626.

B. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.

2.5 CAST-IN-PLACE CONCRETE

1. Concrete shall be in accordance with Section 321313 Concrete Paving of these specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

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

C. Post Setting: Set posts **in concrete** or with **mechanical anchors on concrete pavements** at indicated spacing into firm, undisturbed soil.

1. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.

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

E. Line Posts: Space line posts uniformly at **10 feet maximum** o.c.

F. Post Bracing and Intermediate Rails: Install according to ASTM F 567. Install braces at end and gate posts and at both sides of corner and pull posts.

G. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing.

H. Top Rail: Install according to ASTM F 567.

I. Chain-Link Fabric: Apply fabric to **side facing campsites and cabin sites**. Leave **1 inch** between finish grade or surface and bottom selvage, unless otherwise indicated.

J. Tie Wires: Attach wire per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.

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

END OF SECTION 323113

SECTION 323224 - MODULAR BLOCK RETAINING WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. Work shall consist of furnishing and installing a modular block retaining wall, aggregate base and fill, and constructed to the lines and grades designated on the drawings.

B. Due to the wide variance of size, shape, weight and other properties of the retaining wall units, the manufacturer shall submit a wall design and details of construction for the location shown on the plans.

1.2 SUBMITTALS

A. Product Data: for each type of product indicated

B. Shop Drawings: including engineer's seal

PART 2 - PRODUCTS

2.1 CONCRETE WALL UNITS

A. Concrete wall units shall comply with ASTM C90 or C145 and have a minimum 28 day compressive strength of 3000 psi.

B. Exterior face shall be textured. Units shall have angled sides and capable of attaining concave and convex curves.

C. Units shall be interlocked with non-corrosive pins or clips, or integral lips.

D. Color to be selected by the Owner.

E. Acceptable Manufacturers for Concrete Wall Units:

1. Versa-Lok Retaining Wall units as manufactured by Versa-Lok Retaining Wall Systems, North St. Paul, MN (612)835-5309.
2. Allan Block retaining wall units as manufactured by Allan Block Corporation, Bloomington, MN 55437 (612)835-5309.
3. Keystone retaining wall units as manufactured by Keystone Retaining Wall Systems, Inc., Minneapolis, MN 55435, (612)897-1040.

F. Material for footing shall consist of compacted crushed stone meeting Illinois Department of Transportation (IDOT) Standard Specifications for Coarse Aggregate, CA-6, A minimum of 6 inches of compacted base is required.

G. Fill for units and a minimum of 12 inch drainage layer behind the wall shall consist of 3/8" to 3/4" gravel or crushed stone. No more than 5% shall pass the No. 200 sieve. Cap backfill with soil material.

PART 3 - EXECUTION

3.1 GENERAL

A. Follow Manufacturer's directions and recommendations for installation of the units and as described as follows:

1. Foundation soil shall be excavated to the depth and width recommended by the manufacturer for the area and type of soil anticipated. Over-excavate areas not meeting satisfactory bearing capacity and place compacted aggregate fill.
2. The foundation material is silty clay. Bearing capacity of this material is assumed to be 2,000 pounds per square foot.
3. Material shall be compacted so as to provide a level hard surface on which to place the first course of units. Compact with mechanical plate compactors to 95 percent of Standard Proctor.
4. Footing shall be prepared to insure complete contact of retaining wall unit with base. Gaps shall not be allowed. The units shall be checked for level and alignment.
5. Units are placed side by side for full length of wall alignment.
6. Sweep all excess material from top of units and install next course. Insure all voids between units are filled.
7. Lay up each course insuring that pins or clips, if required, are properly installed. Pull unit forward as much as possible and backfill as the course is completed. Repeat procedure to the extent of wall height.
8. Install cap units for top row of wall. Cap units for straight walls shall have non-angled sides. Epoxy cap units to wall per manufacturer's recommendations.
9. Only hand-operated compaction equipment shall be allowed within 3 feet of the wall surfaces.

END OF SECTION 323223

SECTION 329219 - SEEDING

PART - 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. This part of the Specification includes all labor, materials, equipment and supervision required for Seeding.
2. This section includes the specifications for seedbed preparation; fertilization; seeding; and mulching.

1.2 SUBMITTALS

A. Manufacturers or vendor's certified analysis of fertilizer.

B. Seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentages by weight, and percentages of purity, germination, and weed seed for each grass seed species.

C. Planting Schedule: Proposed seeding schedule, indicating dates for seeding work during normal seasons. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.
   1. Normal seasons for this work are as follows:
      a. Spring: March 1 - May 31.
      b. Fall: August 10 - September 30.

D. Furnish detailed written recommended maintenance program to the Owner with a copy to the Owner’s Representative, prior to final inspection of the seeding.

1.3 QUALITY ASSURANCE

A. Subcontract seeding to a single firm specializing in seeding as specified.

B. Source Quality Control:

1. Ship seeding materials with certificates of inspection required by governing authorities.
2. Comply with regulations applicable to seeding materials.
3. Do not make substitutions. If specified material is not obtainable, submit proof of non-availability to Owner’s Representative, together with proposal for use of equivalent material.
4. Analysis and Standards: Package standard products with manufacturers certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.

1.4 DELIVERY, STORAGE, AND HANDLING:

A. If seed is mixed prior to delivery on site, it shall be tagged showing a guaranteed statement of composition of mixture and percentage of purity and germination of each variety.

B. If seed is to be mixed at the site, it shall be delivered in original containers bearing producers certification of germination and purity.

C. Tags shall show producers or dealers Missouri Permit Number and date of testing; test date shall be no more than 90 days previous to time of use.

D. Fertilizers shall conform to State of Missouri laws and regulations. If delivered in bulk, bills of lading or other labels shall be furnished to the Landscape Architect or labels indicating analysis and weight information from each container shall be preserved and furnished to the Owner's Representative within twenty-four (24) hours of application.

E. Handling of materials as recommended by manufacturer.

F. Store all packaged materials off ground and protect from moisture and rodents.

G. Storage of all materials in locations designated and approved by Owner's Representative.

1.5 JOB CONDITIONS

A. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required.

B. Grade Stakes: Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

C. Protect existing irrigation system, structures, utilities, sidewalks, pavements, and other facilities during seeding operations. Repair any damage at no cost to the Owner.

1.6 SEQUENCING & SCHEDULING

A. Planting Time: Proceed with, and complete seeding as rapidly as portions of site become available, working within seasonal limitations for each kind of seed required.

B. Chronological procedure for seeding is to remove any existing vegetation, disc, fertilize, prepare the seedbed, seed, and then mulch.

C. Schedule seeding work to occur as roadway work progresses. Identify areas ready for seeding and obtain approval of Landscape Architect to proceed. As areas of seeding are completed, proceed in accordance with paragraph 3.06 INSPECTION AND ACCEPTANCE.

1.7 SPECIAL PROJECT WARRANTY

A. Newly seeded lawns shall be warranted through the lawn maintenance period and until final acceptance.

PART - 2 PRODUCTS

2.1 FERTILIZER

A. Grade: Commercial grade conforming to current requirements of the Missouri Department of Agriculture, uniform in composition, liquid or dry and free flowing.

B. Formulation: 20:10:10, or plant food ratio of 1:4:2.

2.2 SEEDING MATERIALS

A. Grass Seed: Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America.

B. Seed Mix: Commercial mix consisting of the following grass species:

Species	% of Mix by Weight	Germ
Turf-Type Tall Fescue (No KY31)	50%	90%
Chewing Red Fescue	30%	90%
Perennial Ryegrass	10%	90%
Annual Rye	10%	90%
TOTAL MIX	100%	90%

C. Each seed mix bag shall bear supplier's "blue tag" certification.

2.3 STRAW MULCH

A. If Hydro seeding is not performed, provide clean, weed free threshed straw of wheat, rye, or oats. Straw harvested after killing frost or during dormant periods as well as discolored, weathered, rotted, brittle, moldy, or caked materials is unacceptable.

B. Fifty percent (50%) of fiber of each straw bale shall be ten inches (10") or longer.

PART - 3 EXECUTION

3.1 EQUIPMENT

A. Cultipacker: Use a pull-type cultipacker with individual rollers or wheels. The cultipacker must produce a corrugated surface on the area being compacted. Operate the cultipacker separately from all other operations, and do not attach the cultipacker to the seeder or disk, unless combined cultipacker seeder is manufactured for such us is utilized.

B. Disk: When preparing a seedbed on ground having heavy vegetation, use a disk with cutaway blades. Use weights or other provisions to obtain proper cutting depth.

C. Drop Seeder: Use one piece of equipment containing pulverizer rollers in front of the seed tubes, ground driven seed meters, maximum seed tube spacing of 3 inches delivering seed between the pulverizer rollers and packer wheels, and packer wheels that press and firmly pack seed into the soil.

D. Endgate Cyclone Seeders: Endgate cyclone seeders must be suitably mounted. Movement must be provided by mechanical means. The seed drops through an adjustable flow regulator onto a rotating, power driven, horizontal disk or fan.

E. Field Tiller: Tiller designed for the preparation of the seedbed as specified.

F. Gravity Seeders: Gravity seeders must provide agitation of the seed, have an adjustable gate opening, and uniformly distribute seed on the prepared seedbed. Use a seed hopper equipped with baffle plates spaced no more than 2 feet apart. The baffle plates must extend from the agitator shaft to within approximately 2 inches of the top of the seed hopper. Wind guards are required to facilitate seeding when moderate wind conditions exist. Place wind guards in front or in back (or both) of the seed outlet and extend them to near the ground line.

G. Hydraulic Seeder: Use hydraulic seeding equipment with a pump rated at no less than 100 gallons per minute. Inoculant, seed, and fertilizer may be applied in a single operation. The equipment must have a suitable working pressure and a nozzle adapted to the type of work. Supply tanks must have a means of agitation. Calibrate tanks and provide them with a calibration stick or other approved device to indicate the volume used or remaining in the tank.

H. Mowers: Shall be rotary, flail, disk, or sickle type. Do not use mowers that bunch or windrow the mowed material.

I. Mulch Anchoring Equipment: Equipment designed to anchor straw or hay mulch into soil by means of dull blades or disks. It shall have flat blades or disks, may have cutaway edges and must be spaced at approximately 8 inch intervals. The mulch anchoring equipment must be pulled by mechanical means and have sufficient weight to crimp the straw.

J. Native Grass Seed Drill: Use a native grass seed drill designed to provide uniform distribution of native grass and wildflower seeds. Provide separate seed boxes to apply both small seeds as well as fluffy bearded seeds. If a no-till attachment is specified, use an attachment of the same manufacturer as the drill.

K. Rotary Tiller: Equipment with rotary-type blades designed for the preparation of seedbed as specified.

L. Slit Seeder: Use a gas, diesel or electric powered mechanical slit seeder that is capable of cutting vertical grooves a maximum of 1/4 inch deep into the soil with a maximum horizontal blade spacing of 3 inches, deposits metered seed directly after the formation of the vertical grooves, and contains packer wheels that press and firmly pack seed into the soil.

M. Straw Mulching Machine: Use a machine to uniformly apply mulch material over the desired area without excessive pulverization. Excessive pulverization is the general absence of straw longer than 6 inches after distribution.

3.2 SEEDBED PREPARATION

A. Limit preparation of seedbed to areas that will be seeded immediately upon completion.

B. Work areas accessible to field equipment to a depth of no less than 3 inches. Use mechanical rotary tillage equipment for the preparation of seedbed on earth shoulders, urban or raised medians, and rest areas. Prepare by hand areas inaccessible to field machinery, to a depth of no less than 2 inches. Where weed growth has developed extensively, they may be disked into the ground. If weed growth develops sufficiently to interfere with proper seedbed preparation, mow the weeds and remove them from the project at no additional cost to the Owner.

C. Use crawler type or dual-wheeled tractors for seedbed preparation. Operate equipment in a manner to minimize displacement of soil and disturbance of the design grading. Harrow ridging in excess of 4 inches due to operation of tillage equipment prior to rolling with the cultipacker. Roll the area with no less than one pass of the cultipacker prior to seeding.

D. Shape and fine grade to remove rills or gullies, water pockets, undesirable vegetation, and irregularities to provide a smooth, firm, and even surface true to grade and cross- section. Prepare to a fine texture and without soil lumps. Till parallel to the contours.

E. Smooth the seedbed with a cultivator-type tillage tool having a rake bar or a rock rake. Pick up and remove all debris, such as rocks, stones, concrete larger than 2 inches (1/2 inch maximum for lawn seeding), or roots and other objectionable material that will interfere with the seeding operation. A spring tooth cultivator may be used in lieu of a rock picker. Remove the rock by hand after each use of the cultivator; repeat the process until the soil is relatively free of rock.

F. Choose equipment to minimize soil compaction. Operate equipment in a manner to minimize displacement of soil and disturbance of the design grading. Roll the area with at least one pass of the cultipacker. Remove ruts that develop during the sequence of operations before subsequent operations are performed. This must be completed just prior to seeding.

3.3 FERTILIZATION

A. Apply fertilizer immediately prior to seedbed preparation. Incorporate the fertilizer into the top 2 to 3 inches of topsoil during the seedbed preparation. Equipment that results in ruts or excessive compaction will not be allowed.

B. Do not apply fertilizer with native grass, wildflower, or wetland seeding.

3.4 CONVENTIONAL SEEDING

A. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.

B. Use methods and procedures consistent with equipment manufacturer’s recommendations; however, do not operate ground-driven equipment at speeds greater than 10 mph.

C. On all areas accessible to machinery, sow seed with a gravity seeder, endgate cyclone seeder, or seed drill. Each application of seed shall overlap the previous application by one-half (1/2) the application width to insure double coverage.

D. On areas inaccessible to field machinery, the use of hand-operated cyclone seeders will be allowed, but no other hand-seeding methods will be accepted.

E. All seeded areas will have one pass with a roller or cultipacker to firm the soil.

F. Sow seed mix at the rate of 8-10 lbs. per 1000 sq. ft.

3.5 HYDRAULIC SEEDING

A. Order of Operations:

1. Seedbed Preparation
2. Seed application, fertilizing and mulching
3.

B. Seedbed Preparation: Follow seedbed preparation for conventional seeding.

C. Seed Application, Fertilizing and Mulching:

1. Application Process:

   a. Combination: Place all material, seed, fertilizer, mulch, and tackifier (if applicable) in hydraulic mulching equipment specifically manufactured for hydraulic seeding.
   b. Separate: At the Contractor's option and at no additional cost to the Owner, the hydraulic seeding, fertilizing, and mulching may be undertaken separately. If operations are undertaken separately, complete fertilizing and mulching application within 24 hours of completing seeding work. Do not separate the applications if inclement weather is forecasted within 24 hours of the scheduled application period.

2. Ensure the hydraulic equipment, pump, and application process do not damage or crack seeds.
3. Mix materials with fresh potable water using a combination of both recirculation through the equipment's pump, and mechanical agitation to form a homogeneous slurry.
4. Apply mixture within 1 hour after seed and fertilizer are placed in the hydraulic seeder.
5. If necessary, dampen dry, dusty soil, to prevent balling of the material during application.
6. Apply the slurry evenly over all specified areas at component material rates specified.
   a. Wood Cellulose Mulch:
      1) Mulch: Minimum 3,000 lb./acre dry weight.
      2) Tackifier: Minimum 50 lb./acre.
   b. Bonded Fiber Matrix: Minimum 3,000 lb./acre dry weight.
   c. Mechanically bonded Fiber Matrix: Minimum 3,000 lb./acre dry weight.

7. Provide documentation to ensure final application rate.

3.6 MULCHING

A. Protect seeded areas against erosion by spreading specified mulch after completion of seeding operations.

B. Spread uniformly to form a continuous blanket and apply at a rate of one and one half (1 1/2) tons per acre.

C. Anchor mulch by crimping into the soil a minimum depth of two inches (2").

D. Provide and install additional erosion control materials where shown on the drawings.

3.7 WATERING

A. Provide water, equipment, transportation, water tanker, hoses, and sprinklers.

B. Use enough water to keep the soil and mulch moist to a depth of 1 inch and ensure growth of the seed. For turfgrass seeding areas, sufficiently water to keep the soil moist for a minimum of 21 days. If natural rainfall is adequate to keep the soil and mulch moist, artificial watering may not be needed.

3.8 RE-SEEDING

A. When all work related to seeding, fertilizing, and/or mulching has been completed on an area, and is washed out or damaged, re-seed, fertilize, and/or mulch the area as necessary at no additional cost to the Owner.

B. The contractor shall be responsible for maintaining erosion control throughout construction.

3.9 CLEANUP AND PROTECTION

A. All work related to clean up throughout the project and upon completion is the responsibility of the Contractor, at no additional cost to the Owner.

B. Restore to proposed grade, reseed, and remulch all eroded and/or washed out areas which develop prior to acceptance of seed.

C. During seeding work, keep pavements clean and work area in an orderly condition.

D. Remove all excess materials, debris, and equipment upon completion of work.

E. Repair any damage resulting from seeding operations.

F. Upon completion of job, clean-up all debris, caused by work, and excess material and leave area within contract limits in a neat and clean condition. Remove hydraulic slurry and other excess debris related to seeding operations from buildings, landscaping, mulch, pavement, signs, sign posts, and any other areas not specified for application, at the end of each day.

3.10 ACCEPTANCE AND WARRANTY

A. Guarantee in writing that all work has been completed as specified and provide the date that all activities were completed. Upon completion of the work and fulfillment of the requirements of this Section, notify the Owner’s Representative in writing that the work is ready for final inspection.

B. Request a definite date for final inspection.

C. Notify the Owner’s Representative five (5) days prior to the requested final inspection date.

D. Acceptance will occur, provided seeded areas are in a live, healthy, growing, and well-established condition without eroded areas, bare spots, weeds, undesirable grasses, disease, or insects. Any areas having less than 90% coverage will not be accepted.

E. Projects will be accepted no sooner than 60 days from the date that all activities were completed.

F. Reseed and maintain all seeded lawn areas which do not meet the requirements of this Section at the time of final inspection. Reseeded areas will be accepted no sooner than 60 days from the date that reseeding occurred.

G. Replacement work shall be as specified for original seeding.

H. Replacement work shall be reinspected before acceptance.

END OF SECTION 329219

SECTION 330513 - MANHOLES AND STRUCTURES

PART 1 - GENERAL

1.1 SUBMITTALS

A. Product Data: Submit manhole covers, component construction, features, configuration, and dimensions.

1.2 REFERENCES

A. ASTM A48 - Gray Iron Castings.

B. ASTM A536 - Ductile Iron Castings.

C. ASTM C478 - Precast Reinforced Concrete Manhole Sections.

D. ASTM C497 - Test Method for Concrete Pipe, Manhole Sections, or Tile.

1.3 DESIGN REQUIREMENTS

A. Equivalent strength shall be based on structural design of reinforced concrete as outlined in ACI 318.

B. Design of lifting devices for precast structures shall conform to ASTM C 913.

C. Design of joints for precast structures shall conform to ASTM C 913. Joints shall be designed for leakage not to exceed 0.025 gallons per hour per foot of joint at 3 feet of head.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.

1.5 DELIVERY, STORAGE AND HANDLING

A. Comply with product storage and handling requirements within these specifications.

B. Comply with precast concrete manufacturer’s instructions for unloading, storing and moving precast manholes and drainage structures.

C. Store precast concrete manholes and drainage structures to prevent damage to the Owner’s property or other public or private property, and any property so damaged shall be repaired at the Contractor’s expense.

D. Clearly mark each precast structure by indentation or waterproof paint to indicate the date of manufacture, manufacturer and identifying symbols and/or numbers shown on the Contract Drawings to indicate its intended use.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: ACI 530.

PART 2 - PRODUCTS

2.1 MANHOLES, FRAMES, AND COVERS

A. Manufacturers:

1. Neenah Foundry Co.
2. East Jordan Iron Works, Inc.
3. Castings, Inc.

B. Manhole Sections: Reinforced precast concrete in accordance with ASTM C478 with Butyl Joint Sealant in accordance with ASTM C990, AASHTO M198.

2.2 COMPONENTS

A. Lid and Frame: ASTM A48, Class 35B Cast iron construction, machined flat bearing surface, removable lid, heavy duty load rating.

B. Manhole Steps: Plastic coated steel equal to MA-1.

2.3 CONFIGURATION

A. Shaft Construction: Concentric with eccentric cone top section; lipped male/female joints.

B. Shape: Cylindrical.

C. Clear Inside Dimensions: 48 inch diameter or as scheduled on the drawings.

D. Design Depth: As indicated.

E. Clear Lid Opening: As indicated.

F. Pipe Entry: Provide openings as indicated.

G. Steps: 12 inches wide, 16 inches on center vertically, set into manhole wall. As indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Comply with the provisions of Section 013100- Coordination

B. Verify items provided by other sections of Work are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into Work.

D. Verify excavation for manholes is correct.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipe or required by other sections.

B. Do not install structures under site conditions known to result in loads heavier than that for which the structure was designed.

C. Inspect precast concrete structures immediately prior to placement in the excavation to verify that they are internally clean and free from damage. Remove damaged units from the construction site and replaced, at no additional cost to the Owner.

3.3 INSTALLATION

A. Excavation and Backfill:

1. Excavate for manholes and drainage structures in accordance with Section 312333 Trenching and Backfilling in the location and to depth shown. Provide clearance around the sidewalls of the structure as required for construction.
2. If groundwater is encountered, prevent accumulation of water in excavations. Place manholes or drainage structures in a dry trench.
3. Where the possibility exists of a watertight structure becoming buoyant in a flooded excavation, take necessary steps to avoid flotation of the structure.

B. Place manhole sections plumb and level.

C. Manholes and drainage structures shall be supported at proper grade and alignment on crushed stone bedding or other support system, as shown on the Contract Drawings.

D. Backfill excavations for manholes and drainage structures in accordance with Section 312333 Trenching and Backfilling.

E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

F. Set cover frames and covers level without tipping, to correct elevations.

G. Coordinate with other sections of Work to provide correct size, shape, and location.

3.4 PRECAST CONCRETE MANHOLE AND DRAINAGE STRUCTURE INSTALLATION

A. To ensure safety, lift precast structures at the lifting points designated by the manufacturer.

B. When lowering manholes and drainage structures into the excavations and joining pipe to the units, take precautions to ensure that the interior of the pipeline and structure remains clean.

C. Set precast structures so that they firmly and fully bear on compacted crushed stone bedding or on other support system shown on the Contract Drawings.

D. Assemble multi-section structures by lowering each section into the excavation. Lower, set level, and firmly position the base section before placing additional sections.

E. Ensure joint integrity by removing all foreign materials from joint surfaces and verifying that sealing materials are placed properly. Avoid misalignment by using guide devices affixed to the lower section.

F. Joint sealing materials shall be installed at the site. Use preformed butyl rubber rope sealant.

G. Verify that manholes and drainage structures installed satisfy required alignment and grade.

H. Remove knockouts or cut structure to receive piping so as not to create openings more than that required to receive pipe. Fill annular space with mortar.

I. Cut pipe to finish flush with interior of structure.

J. Shape inverts through manhole as shown on the Contract Drawings.

3.5 CASTINGS INSTALLATION

A. Set frames on butyl rope sealant for sanitary manholes. Also seal between any precast rings installed.

B. Set frame and cover 2 inches above finished grade for manholes and other structures with covers located within unpaved areas to allow the area to be graded away from the cover beginning 1 inch below the top surface of the frame.

3.6 FIELD QUALITY CONTROL

A. Field tests will be used to evaluate and approve concrete.

B. Vertical Adjustment of Existing Manhole and Drainage Structures:

1. Where required, adjust the top elevation of existing manholes and drainage structures to suit finished grades shown on the Contract Drawings.
2. Reset existing frames, grates and covers, carefully removed, cleaned of all mortar fragments, to the required elevation in accordance with the requirements specified for installation of castings.

END OF SECTION 330513

SECTION 331100 - SITE WATER DISTRIBUTION

PART - 1 GENERAL

1.1 SUMMARY

A. All work shall be in accordance with standards of the Missouri Department of Natural Resources for Community Water Supplies, Part 8, Current Edition.

1.2 SUBMITTALS

A. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

PART - 2 PRODUCTS

2.1 WATER PIPE MATERIALS

A. Polyvinyl Chloride (PVC) IPS Pressure Pipe:
   1. Minimum Wall Thickness:
      a. 2 and 3 inch size: SDR 17
   2. Joint Type: Use push-on joint type, except as otherwise specified in the contract documents or as authorized by the Engineer.
      a. Push-on: According to ASTM D3139 and ASTM F477.
      b. Integral Restrained Joint: PVC pipe with restraining system manufactured integrally into pipe end.
      c. Mechanical Restrained Joint: Ductile iron mechanical device designed for joint restraint of PVC pipe complying with the requirements of ASTM F 1674.
   3. Markings on Pipe:
      a. Name of manufacturer.
      b. Size and class.
      c. Spigot insertion depth gauge.
      d. National Sanitation Foundation (NSF) seal.

B. HDPE Pressure Pipe:
   1. Material Designation Code: PE4710 and Comply with AWWA C906 with ductile iron pipe equivalent outside diameters.
   2. Minimum Thickness Class:
      a. 2-inch size: DR 9
   3. Joint Type: Fusible
   4. Provide pipe extruded with plain ends square to the pipe, free of any bevel or chamfer, and without bells or gaskets of any kind

C. Ductile Iron Pipe (DIP) (Not Applicable):
   1. Minimum Thickness Class:

a. 4 inch through 24 inch sizes: Special thickness Class 52 according to AWWA C151.
b. Cement-mortar Lined: According to AWWA C104 with asphalt seal coat.
c. External Coating: Asphalt according to AWWA C151.

2. Joint Type: Use push-on type, unless otherwise specified in the contract documents or as authorized by the Engineer.
a. Push-on: According to AWWA C111.
b. Mechanical: According to AWWA C111.
c. Restrained, Buried: Pipe manufacturer's standard field removable system.
d. Restrained, in Structures: Restraining gland, flanged or grooved.
e. Flanged: According to AWWA C111.
f. Grooved: According to AWWA C606.
g. Gaskets: According to AWWA C111.

3. Markings on Pipe:
a. Name of manufacturer.
b. Size and class.
c. Spigot insertion depth gauge.

D. Bolts for Water Main and Fittings
1. Tee-bolts and Hexagonal Nuts for Mechanical Joints (Use corrosion resistant bolts):
2. High-strength, low-alloy steel manufactured according to AWWA C111.
3. Provide ceramic-filled, baked-on, fluorocarbon resin coating for bolts and nuts.
4. Include factory-applied lubricant that produces low coefficient of friction for ease of installation.

E. Water Service Piping
1. Materials (as allowed by Jurisdiction or specified in contract documents):
a. Copper Pipe:
1) Comply with ASTM B 88.
2) Wall Thickness: Type K.
b. PVC Pipe (Not Applicable):
1) ASTM D 1785, Schedule 80 or ASTM D 2241, SDR 21. Provide solvent weld joints for all pipes.
c. Polyethylene Pipe:
1) Class 200, according to AWWA C901.
d. PEX-A pipe:
1) ASTM F 876 and F877
2) Fittings: F1807 brass or stainless steel insert fittings with copper crimp rings

2.2 FITTINGS

1. For DIP and PVC Pipe: Comply with AWWA C110 (ductile iron or gray iron) or AWWA C153 (ductile iron).
a. Joint Type:
1) For pipe sizes 16 inches and less, use mechanical joint complying with AWWA C111.
2) For pipe sizes greater than 16 inches, use restrained mechanical joint system.
3) Provide follower gland using breakaway torque bolts to engage thrust restraint.

a) Minimum pressure rating same as connecting pipe. For fittings between dissimilar pipes, the minimum pressure rating is the lesser of the two pipes.
b) Suitable for buried service.
c) Joint restraint system to be field installable, field removable, and re-installable.

4) Use of alternate restraint systems must be approved by the Engineer.

b. Lined: Cement mortar lined according to AWWA C104 with asphalt coating.
c. Wall Thickness: Comply with AWWA C153.
d. Gaskets: Comply with AWWA C111.

2. Flange Adapter:
   a. Body: Ductile iron complying with ASTM A 536.
   b. End Rings (Follower Rings): Ductile iron complying with ASTM A 536.
   c. Gaskets: New rubber compounded for water service and resistant to permanent set.
   d. Bolts and Nuts: High strength, low alloy corrosion resistant steel or carbon steel bolts complying with ASTM A 307.
3. Pipe Coupling:
   a. Center Sleeve (Center Ring): Steel pipe or tubing complying with ASTM A 53 or ASTM A 512, or formed carbon steel with a minimum yield of 30,000 psi.
   b. End Ring (Follower Ring): Ductile iron complying with ASTM A 536, or steel meeting or exceeding the requirements of ASTM A 576, grade 1010-1020.
   c. Gaskets: New rubber compounded for water service and resistant to permanent set.
   d. Bolts and Nuts: High strength, low alloy corrosion resistant steel.

2.3 VALVES

A. General
   1. The opening direction is counterclockwise as viewed from the top, unless otherwise specified in the contract documents or as directed by the Jurisdiction.

B. Gate Valves:
   1. Standards: Comply with AWWA C509 (gray iron or ductile iron) or AWWA C515 (ductile iron) and NSF 61.
   2. Manufacturers: Mueller, Ford, Clow or approved equal.
   3. Stem Seals: Double O-rings permanently lubricated between seals. Lubricant certified for use in potable water.
   4. External Bolts and Hex Nuts: Stainless steel according to ASTM A 240, Type 304.

C. Tapping Valve Assemblies:
   1. Tapping Valve: Gate valve complying with AWWA C509 or AWWA C515.
   2. Saddle, Mueller S-13000 series, Ford S912 series, PowerSeal 3403 series or approved equal:
      a. Brass or bronze according to ASTM B62 or ASTM B98.
      b. Working pressure 150 psi minimum.
      c. Must fully surround pipe.

2.4 STOPS

A. Corporation Stops:
   1. AWWA C800 (Mueller “CC”) threaded inlet,

2. Acceptable Materials: Mueller B-25008N, Ford FB Ballcorp type, AY McDonald 74701BQ, or Approved Equal.

B. Curb Stops:
1. Size per Plan - Inlet and Outlet flared copper.
2. Acceptable Material: Mueller H-15209N, AY McDonald 74713Q, Ford B44-xxxHST-Q-NL style, or Approved Equal.

2.5 BOXES AND LIDS

A. Curb Boxes:
1. Cast Iron construction, extension type with one piece lid, stationary shut off rod, and arch type box.
2. Acceptable Materials: Mueller H-10314 Series, AY McDonald 5604A series, Ford EA1-series, or Approved Equal.

B. Valve Boxes:
1. Cast Iron construction, Two section screw type with availability to add extensions to increase lengths adequate to bring up to finished grade, Inside diameter of 5 1/4", Covers with "WATER" cast into the lid, Factory Finish: Asphalt coating
2. Acceptable Materials: Tyler Model 564S, SIP Industries Series 6000, Castings Incorporated 6850 Series, or Approved Equal.

2.6 CONCRETE THRUST BLOCKS

1. Concrete shall be in accordance with Section 311313 Concrete Site Work of these specifications.
2. Comply with the contract documents for dimensions and installation of thrust blocks.

2.7 TRACER WIRE

1. Water Pire in Open Cut:
    a. Solid Single Copper Conductor:
        1) Size: #12 AWG
        2) Insulation Material: Linear low-density polyethylene (LLDPE) installation suitable for direct burial applications
        3) Insulation Thickness: 0.030 inches, minimum
        4) Insulation Color: Blue
        5) Tensile Strength: 150 pounds, minimum
        6) Operating Voltage: Rated for 30 volts
2. Directional Drilling/Boring:
        1) Bimetallic Copper Clad Steel Conductor:
            a) Size: #12 AWG
            b) Operating Voltage: Rated for 30 volts
            c) Copper Cladding: 3% of conductor diameter, minimum
            d) Insulation Material: High density, high molecular weight polyethylene
            e) Insulation Thickness: 0.045 inches, minimum
            f) Insulation Color: Blue
            g) Tensile Strength: 1,100 pounds, minimum

2.8 WALL FAUCET ASSEMBLY

A. Material: Wall Faucet
   1. Outlet Nozzle: ¾″ Brass Male Hose Nozzle
   2. Acceptable Material (from State Standard):
      a. Nibco #QT63X with Apollo #38304AS (Grainger #6KK07) 3/4" vacuum breaker
      b. Approved Equal.

PART - 3 EXECUTION

3.1 PREPARATION AND LAYOUT

A. Before starting excavation, establish location and extent of underground utilities occurring in the work area. Utilities shown on the plans indicate the best knowledge of the Owner with regard to general location and nature of the facilities in the area. They are shown for the convenience of the Contractor and shall not relieve the Contractor of the responsibility to properly investigate and protect the utilities. The Contractor shall remain responsible for damages to existing utilities whether indicated on the plans or not.

B. The Contractor shall notify the Missouri One Call (811) service and the Owner or his/her onsite representative 48 hours prior to start of work.

C. Field Conditions: Verify location and elevation of existing facilities were connections are to be made.

3.2 GENERAL

A. Do not use deformed, defective, gouged, or otherwise damaged pipes or fittings.

B. Keep trench free of water. Clean pipe interior prior to placement in the trench.

C. Install pipe with fittings and valves to the lines and grades specified in the contract documents.

D. Clean joint surfaces thoroughly and apply lubricant approved for use with potable water and recommended by the manufacturer.

E. Push pipe joint to the indication line on the spigot end of the pipe before making any joint deflections.

F. Limit joint deflections to one degree less than pipe manufacturer’s recommended maximum limit.

G. Tighten bolts in a joint evenly around the pipe.

H. Set tops of valve boxes to finished grade, unless otherwise directed by the Engineer.

I. Check the working order of all valves by opening and closing through entire range. Before opening the valves, check with the Jurisdiction on operating requirements.

J. Keep exposed pipe ends closed with rodent-proof end gates at all times when pipe installation is not occurring.

K. Close the ends of the installed pipe with watertight plugs during nights and non-working days.

L. Do not allow any water from the new pipeline to enter the existing distribution system piping until testing and disinfection are successfully completed.

3.3 INSTALLATION

A. Excavation and backfilling for water lines and appurtenances, shall comply with governing Federal State laws and municipal Ordinances as may be necessary to protect life, property, or the work. In any event, the minimum protection shall conform to the rules and regulations of the Occupational Safety and Health Act (OSHA) Standards for Construction.

B. Line and Grade:
   1. Reference points and bench marks for controlling lines and grades are shown on the Drawings. All additional horizontal and vertical measurements that will be required to complete the work, in addition to the controlling lines and grades, shall be the responsibility of the Contractor.

C. Depth of Cover:
   1. All water pipe shall be laid with a minimum of four (4.0) feet of cover over the top of the pipe.

D. Trenched Water Pipe:
   1. Excavate trench and place pipe bedding and backfill material as specified in Section 312333 Trenching and Backfilling.
   2. Provide uniform bearing along the full length of the pipe barrel. Provide bell holes.
   3. Cut the pipe perpendicular to the pipe barrel. Deburr and bevel cut spigot end of the pipe barrel to match factory bevel. Re-mark the insertion line.
   4. When connecting to shallow-depth bells, such as on some cast iron fittings or valves, cut the spigot end square to remove factory bevel. Deburr the end and form a partial bevel on the end.

E. Water Service Stub:
   1. Install water service pipe, corporations, stops, and stop boxes according to local Jurisdiction requirements.
   2. Install 1 inch and smaller corporation valves tapped at 45 degrees above horizontal at a minimum distance of 18 inches from pipe bell or other corporation. Install 1 1/2 inch and 2 inch corporation valves tapped horizontal a minimum distance of 24 inches from pipe bell or other corporation.

F. Tracer Wire:
   1. Install with all buried water main piping per specified details.
   2. Begin and terminate the system at all connections to existing mains.
   3. Install wire continuously along the lower quadrant of the pipe. Do not install wire along the bottom of the pipe. Attach wire to the pipe at the midpoint of each pipe length; use 2 inch wide, 10 mil thickness polyethylene pressure sensitive tape.
   4. Install splices only as authorized by the Engineer. Allow the Engineer to inspect all below grade splices of tracer wire prior to placing the backfill material.
   5. Install ground rods adjacent to connections to existing piping and at locations specified in the contract documents or as directed by the Engineer.
   6. Bring two wires to the surface at each fire hydrant location and terminate with a tracer wire station.

7. Final inspection of the tracer system will be conducted at the completion of the project and prior to acceptance by the owner. Verify the electrical continuity of the system. Repair discontinuities.

G. Water Main and Sewer Pipe Separation:
   1. Horizontal and Vertical Separation of Gravity Sewers from Water Mains shall be in accordance with MoDNR Specifications.

3.4 TESTING AND DISINFECTION

A. Upon completion of the new water main installation a Waterline Pressure Test Report shall be performed for each waterline installed. The pressure and leakage tests shall be in accordance with the latest edition of AWWA Standards and manuals.

B. Disinfecting: The pipe and appurtenances shall be disinfected in in accordance with the latest edition of AWWA Standards and manuals and as approved by the MO DDNR:

1. The Contractor shall take and deliver bacteriological samples to a certified lab for analysis. Cost for sampling and analysis required, will be at the expense of the Contractor.
2. All testing, filling, flushing, and disinfections of new water main are to be conducted in accordance with the latest edition of AWWA Standards and manuals.

a. All manpower, materials and equipment are to be provided by the contractor.
b. The State Parks must be notified a minimum of 2 working days prior to the work being performed so as to assign and schedule with the Parks.

3. Sterilizing of the completed lines shall be done in accordance with AWWA C651 and in a manner approved by the Missouri Department of Natural Resources.
4. Prior to chlorination, the main shall be flushed as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after the pressure tests are made. After flushing, all valves shall be carefully inspected to see that the entire operating mechanism is in good condition.
5. Following sterilization, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water throughout its length shall, upon test, be proved comparable to the quality of water served the public from the existing water supply system and approved by the Owner. This quality of water delivered by the new main should continue for a period of at least two full days as demonstrated by laboratory examination of samples taken from a tap located and installed in such a way as to prevent outside contamination. Samples shall not be taken from an unsterilized hose or from a fire hydrant. The Contractor shall perform or cause to perform all testing.
6. Should the initial treatment fail to result in the condition specified in the preceding paragraph, the sterilizing procedure shall be repeated until such results are obtained.

3.5 FIELD QUALITY CONTROL

1. The **Contractor** will provide testing services of a soils engineer and/or independent laboratory for this project. Trenching and backfilling testing shall be completed in accordance with Section 312333 “Trenching and Backfilling” of these Specifications

END OF SECTION 331110

SECTION 334100 - STORM UTILITY DRAINAGE PIPING & STRUCTURES

PART - 1 GENERAL

1.1 SUMMARY

A. Provide storm sewerage system in accordance with the plan documents and these specifications.

1.2 SUBMITTALS

A. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 PERMITS AND ENTRY UPON LANDS

A. The Owner will obtain permits and/or easements for entering upon private lands, public streets, roads and highways, railroads, etc. to the limits and lines shown on the Plans for construction purposes. The Contractor shall confine his operations to the outlined areas and shall comply with all special instructions shown on the Plans or set forth in the Contract Documents.

1.5 UTILITIES AND DRAIN TILES

A. Before starting excavation, establish location and extent of underground utilities occurring in the work area. Utilities shown on the plans indicate the best knowledge of the Owner with regard to general location and nature of the facilities in the area. They are shown for the convenience of the Contractor and shall not relieve the Contractor of the responsibility to properly investigate and protect the utilities. The Contractor shall remain responsible for damages to existing utilities whether indicated on the plans or not.

B. The Contractor shall notify the Missouri One Call 811 and the Owner or his/her site representative 48 hours prior to start of work.

C. Existing underground utilities are herein defined as consumer service connections, such as water, gas, sewer, electric, telephone, etc., and also culverts, sanitary sewers, storm sewers, combined sewers, water mains, underground power lines, gas mains and the usual appurtenances thereto.

D. An attempt is made to indicate or show accurate location of all underground utilities or drain tiles in the line of, or crossing the proposed work. In general, wherever record information was available of locations and wherever field location was possible during surveys, the approximate position of utilities and drain tiles is shown on the Plans. These are primarily for the purpose of indicating the approximate position of the underground lines with respect to the proposed sewer lines.

E. The determination of the exact location of all existing facilities, and all other pipes, services and structures, and their proper protection, support and maintenance during all construction operations is the expressed responsibility of the Contractor in the performance of this contract. Contractors are advised to secure any additional information, relative to the underground utility lines, by consulting with proper private and public officials, under whose jurisdiction the maintenance and operation of the utility lines lie, and/or by field investigations at his own expense.

F. Wherever underground utilities or drain tiles are disturbed or damaged as a result of the construction work proposed herein and such utilities can be replaced at their original locations and grades, all costs in connection with such replacement work shall be borne by the Contractor and no separate or extra payment will be made therefore.

G. Where existing underground utilities or drain tiles are in conflict with the new work, so that such utilities cannot be replaced as originally found prior to excavation, and where relocation and changes are required, then the work shall be replaced or relocated by "others" at no cost to the Contractor. The Contractor shall so coordinate his work as to allow a reasonable time for such replacement or relocation and in no event shall extra compensation be allowed for such coordination or any reasonable delay occasioned there from. Should it be found necessary or desirable by the Owner for the Contractor to perform the work of replacement or relocation, the Engineer/Architect will issue in writing a field order defining the extent of the additional work and instructing the Contractor to proceed with such construction. Compensation for such work shall be determined as set forth in the General Specifications, under "Extra, Additional, or Omitted Work - Payment."

PART - 2 PRODUCTS

2.1 PIPING MATERIALS

A. Reinforced Concrete Pipe (RCP):

1. Comply with ASTM C 76.
2. Minimum Class III per ASTM C 76
3. Use tongue and groove joints wrapped with engineering fabric, unless a rubber O-ring or profile gasket complying with ASTM C 443 is specified.

B. Polyvinyl Chloride Pipe (PVC):

1. Solid wall PVC Pipe complying with ASTM D 3034 or ASTM F 679.
2. PVC plastic meeting ASTM D 1784, Cell Classification 12454.
3. SDR 26: Minimum pipe stiffness of 115 psi (pipe 4" to 15" diameter).
4. Pipe stiffness per ASTM D 2412, 46 psi (pipe 18" to 27" diameter).

C. High Density Polyethylene Pipe (HDPE):

1. AASHTO M 294, Type S corrugated exterior and smooth interior.
    a. Pipe does not have to meet the AASHTO M 294 Section 6 - Materials: Requiring pipe and fittings be made of virgin PE compounds. A percentage of recycled material may be utilized. All remaining requirements as set forth in AASHTO M 294 shall be met or exceeded.
2. ASTM D 3350 minimum resin Cell Classification 335420 C.
3. Minimum pipe stiffness at 5% deflection according to ASTM D 2412.
4. Integral bell and spigot joints with elastomeric seals complying with ASTM F 477.
5. Maximum 5% deflection of the average inside diameter by testing after installation by pulling 9 arm deflection mandrel, complying with applicable ASTM Standards, through sewer by hand.

D. Corrugated Metal Pipe (CMP):

1. AASHTO M 36, Type I.
2. Zinc coating complying with AASHTO M 218.
3. Corrugated steel circular section with annular or helical corrugations.
4. Gauge of pipe to be a minimum of 14.
5. Coupling bands with annular or helical corrugations to match pipe ends.

E. Pipe Drains, Underdrains and French Drains:

1. Comply with planned details for the type, class, and size of pipe drains

2.2 MANHOLES, INLETS AND DRAINAGE STRUCTURES

A. Manholes, Inlets, and Drainage Structure:

1. Manholes materials shall be per Section 330513 Manholes and Structures in of these specifications and details in the Drawings. Pipe stubs when specified for future connections shall consist of a one-foot section of belled pipe of the specified diameter inserted in a watertight connection and an airtight plug.

B. PVC Drainage Structure:

1. Nyloplast
2. Neenah
3. East Jordan
4. Approved Equal Product

C. Cast in Place Concrete:

1. Concrete: Use 4000 psi concrete per Section 321313 Concrete Site Work.

D. Non-Shrink Grout

1. Mortar used for grout shall consist of one part Type I Portland cement and three parts sand, by volume, mixed with sufficient water to form a grout of proper consistency.

E. Granular Foundation:

1. Granular foundation material shall be gravel or crushed stone sized primarily within a 1” to maximum 3” range. Quality shall consist of sound durable aggregate particles reasonably free of objectionable deleterious materials.

F. Bedding, Haunching and Backfill:

1. Bedding, Hauching and Backfill material as specified in Section 312333 Trenching and Backfilling.

G. Select Granular Backfill:

1. Select granular backfill shall be a Type 5 Aggregate as specified in Section 321123 Aggregate Base Course, except the quality may be Grade D and up to 15% fines passing the #200 sieve will be allowed.

2.3 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping to building's storm building drains as shown on the Drawings.

B. Make connections to existing piping and underground manholes.

1. New connection

a. Use commercially manufactured wye fittings for piping branch connections with sizing as show in the plans.

2. Connection to Existing Storm Sewer

a. Use commercially manufactured wye or insertable tee fittings to the existing piping. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of 4000 psi concrete, or install insertable tee per manufacturer’s recommendations.

PART - 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

B. Field Measurements - Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.2 INSTALLATION

A. Excavation and backfilling for sewers, collection lines, manholes, structures and appurtenances, shall comply with governing Federal, State laws and municipal Ordinances as may be necessary to protect life property or the Work. In any event, the minimum protection shall conform to the

rules and regulations of the Occupational Safety and Health Act (OSHA) Standards for Construction.

B. Connections of dissimilar types of pipe when joined outside of a manhole or other structure shall be joined with suitable adapters, such as:

1. Fernco Flexible Coupling, Fernco, Inc. (Davison, Michigan).
2. Flexi-Seal Coupling, Mission Rubber Co. (Corona, California)
3. MarMac DP Couplers
4. Approved equal.

C. Foundations and Bedding:

1. All sewer pipe shall be laid on an aggregate bedding, having a minimum thickness of 4 inches below the pipe and extending to the midpoint of the pipe as shown on the Drawings.
2. Compaction requirements for foundation, bedding and haunching shall be based upon the material utilized in accordance with the Section 312333 “Trenching and Backfilling” of these Specifications.

D. Gravity Storm Sewer Installation:

1. Clean pipe interior and joints prior to installation. Keep pipe clean during construction.
2. Begin at the lowest point in the line. Lay groove or bell end pointing upstream unless otherwise specified.
3. Use a saw to cut ends of pipe flush with inside wall of manholes and structures. Do not use hammer or other means to break pipe.
4. Provide manholes as specified in the contract documents.
5. Clean joint surfaces to remove soil or foreign material prior to jointing pipe. Assemble joints according to pipe manufacturer’s recommendations. Use equipment that does not apply damaging forces to pipe joints.
6. Install cap, plug, or bulkhead at exposed ends of pipe upon completion of construction or whenever pipe installation is not in progress.

E. Backfilling Trenches:

1. Compaction requirements for trench backfill shall be based upon the material utilized in accordance with the Section 312333 “Trenching and Backfilling” of these Specifications and as shown on the plans.
2. After sewers are laid and bedded in an open cut, the trench shall be backfilled to the planned ground surfaces. Unless otherwise permitted by the regulatory authority, not more than three hundred (300) feet of completed pipe shall be left without backfill.
3. In all backfill types, trench shields, sheeted sections and bracing shall in no case be withdrawn before the trench is sufficiently filled to prevent personal injury, or collapse of trench walls, banks, road surfaces, adjacent utility structures, sidewalks or other property, public or private.
4. When PVC pipe is utilized, select granular initial backfill at least twelve (12) inches above the top of the pipe shall be placed utilizing the same type of material used for haunching.

F. Sewer Pipe and Water Main Separation:

1. Horizontal and Vertical Separation of Gravity Sewers from Water Mains shall be in accordance with Missouri DNR Specification.

3.3 FIELD QUALITY CONTROL

A. The **Contractor** will provide testing services of a soils engineer and/or independent laboratory for this project. Trenching and backfilling testing shall be completed in accordance with Section 312333 “Trenching and Backfilling” of these Specifications

END OF SECTION 334100

SECTION 334101 - SANITARY SEWERAGE SYSTEM

PART - 1 GENERAL

1.1 SUMMARY

A. Provide sanitary sewerage system in accordance with the plan documents and these specifications.

1.2 SUBMITTALS

A. Product data: Within 15 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

1.3 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 PERMITS AND ENTRY UPON LANDS

A. The Owner will obtain permits and/or easements for entering upon private lands, public streets, roads and highways, railroads, etc. to the limits and lines shown on the Plans for construction purposes. The Contractor shall confine his operations to the outlined areas and shall comply with all special instructions shown on the Plans or set forth in the Contract Documents.

1.5 UTILITIES AND DRAIN TILES

A. Before starting excavation, establish location and extent of underground utilities occurring in the work area. Utilities shown on the plans indicate the best knowledge of the Owner with regard to general location and nature of the facilities in the area. They are shown for the convenience of the Contractor and shall not relieve the Contractor of the responsibility to properly investigate and protect the utilities. The Contractor shall remain responsible for damages to existing utilities whether indicated on the plans or not.

B. The Contractor shall notify the Missouri One Call 811 and the Owner or his/her site representative 48 hours prior to start of work.

C. Existing underground utilities are herein defined as consumer service connections, such as water, gas, sewer, electric, telephone, etc., and also culverts, sanitary sewers, storm sewers, combined sewers, water mains, underground power lines, gas mains and the usual appurtenances thereto.

D. An attempt is made to indicate or show accurate location of all underground utilities or drain tiles in the line of, or crossing the proposed work. In general, wherever record information was

available of locations and wherever field location was possible during surveys, the approximate position of utilities and drain tiles is shown on the Plans. These are primarily for the purpose of indicating the approximate position of the underground lines with respect to the proposed sewer lines.

E. The determination of the exact location of all existing facilities, and all other pipes, services and structures, and their proper protection, support and maintenance during all construction operations is the expressed responsibility of the Contractor in the performance of this contract. Contractors are advised to secure any additional information, relative to the underground utility lines, by consulting with proper private and public officials, under whose jurisdiction the maintenance and operation of the utility lines lie, and/or by field investigations at his own expense.

F. Wherever underground utilities or drain tiles are disturbed or damaged as a result of the construction work proposed herein and such utilities can be replaced at their original locations and grades, all costs in connection with such replacement work shall be borne by the Contractor and no separate or extra payment will be made therefore.

G. Where existing underground utilities or drain tiles are in conflict with the new work, so that such utilities cannot be replaced as originally found prior to excavation, and where relocation and changes are required, then the work shall be replaced or relocated by "others" at no cost to the Contractor. The Contractor shall so coordinate his work as to allow a reasonable time for such replacement or relocation and in no event shall extra compensation be allowed for such coordination or any reasonable delay occasioned there from. Should it be found necessary or desirable by the Owner for the Contractor to perform the work of replacement or relocation, the Engineer/Architect will issue in writing a field order defining the extent of the additional work and instructing the Contractor to proceed with such construction. Compensation for such work shall be determined as set forth in the General Specifications, under "Extra, Additional, or Omitted Work - Payment."

1.6 TREES, SHRUBBERY, STRUCTURES AND ABOVE GROUND UTILITIES

A. All trees, shrubbery, utility poles and the like in the line of work shall be protected and preserved except as shown on the Plans, unless permission of the Owner and approval of the Engineer/Architect are obtained for their removal. Construction operations may require hand trenching and tunneling under and adjacent to trees and poles, which are to be preserved.

B. Private and/or public walls, steps, walks, drives, roads, roadbeds, fences or other structures except trees in the line of work shall be replaced to as good a condition as prior to the start of excavation.

C. All grassed surface areas shall be replaced to a condition equal to that found prior to the start of work.

D. Erosion control measures shall be installed in accordance with Section 312513 Erosion Control of these Specifications.

E. Existing structures and markers such as inlet castings, fire hydrants, highway and street signs, valve boxes, etc., that may be disturbed during the progress of the work, shall be cleaned and reset in their original position in such a manner as may be required by the Engineer/Architect.

PART - 2 PRODUCTS

2.1 PIPE MATERIALS FOR SEWERS

A. Sewer pipe shall comply with provisions of these specifications for the type, class, strength, coatings and linings of the pipe as shown on the Plans and as described herein:

1. HDPE Pipe (Fusible) 2” TO 12” diameter:

    a. Material Designation Code: PE4710 and Comply with AWWA C906 with ductile iron pipe equivalent outside diameters.
    b. Minimum Wall Thickness: **DR 9**
    c. Provide pipe extruded with plain ends square to the pipe, free of any bevel or chamfer, and without bells or gaskets of any kind

2. Polyvinyl Chloride (PVC) Pipe 4" to 15" diameter:

    a. Dimensions of pipe and fittings shall conform to ASTM D3034.
    b. Minimum acceptable Standard Dimension Ratio (SDR) shall be 26.

        1) SDR 26: Minimum pipe stiffness of 115 psi.

    c. PVC plastic meeting ASTM D 1784, Cell Classification 12454 or 12364.

3. Polyvinyl Chloride (PVC) Pipe for trenchless installation:

    a. Dimensions of pipe and fittings shall conform to ASTM D3034.
    b. Minimum acceptable Standard Dimension Ratio (SDR) shall be 26.

        1) SDR 26: Minimum pipe stiffness of 115 psi.

    c. PVC plastic meeting ASTM D 1784, Cell Classification 12454 or 12364
    d. Integral Restrained Joint: AWWA C900 pipe with restraining system manufactured integrally into pipe end.

4. Polyvinyl Chloride Pipe (PVC) 18” to 27” diameter:

    a. Dimensions of pipe and fittings shall comply with ASTM F 679.
    b. Pipe stiffness per ASTM D 2412, 46 psi.
    c. PVC plastic meeting ASTM D 1784, Cell Classification 12454 or 12364.

B. Joints:

1. PVC Pipe joints for ASTM 3034 and ASTM 679 pipe shall be flexible elastomeric seals per ASTM D 3212 and ASTM F 477 or solvent welded joints per ASTM D 2855 for 4" and 6" only.

2. HDPE butt fusion fittings shall have a manufacturing standard of ASTM D3261. Molded and fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans. Fabricated fittings are to be manufactured using Data Loggers. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the Quality Control records. All fittings shall be suitable for use as pressure conduits, have nominal burst values of three and one-half times the Working Pressure Rating (WPR) of the fitting.

C. Manholes:

1. Manholes materials shall be per Section 330513 Manholes and Structures in of these specifications and details in the Drawings. Pipe stubs when specified for future connections shall consist of a one-foot section of belled pipe of the specified diameter inserted in a watertight connection and an airtight plug.

D. Cast in Place Concrete:

1. Concrete shall be in accordance with Section 311313 Concrete Site Work of these specifications

E. Non-Shrink Grout

1. Mortar used for grout shall consist of one part Type I Portland cement and three parts sand, by volume, mixed with sufficient water to form a grout of proper consistency.

F. Granular Foundation:

1. Granular foundation material shall be gravel or crushed stone sized primarily within a 1" to maximum 3" range. Quality shall consist of sound durable aggregate particles reasonably free of objectionable deleterious materials.

G. Bedding, Haunching and Backfill :

1. Bedding, Haunching and Backfill material as specified in Section 312333 Trenching and Backfilling.

H. Select Granular Backfill:

1. Select granular backfill shall be a Type 5 Aggregate as specified in Section 321123 Aggregate Base Course, except the quality may be Grade D and up to 15% fines passing the #200 sieve will be allowed.

2.2 CONNECTIONS

A. Connect nonpressure, gravity-flow sewage piping to building's as shown on the Drawings.

B. Make connections to existing piping and underground manholes.

1. New connection

a. Use commercially manufactured wye fittings for piping branch connections with sizing as show in the plans.

2. Connection to Existing Sanitary Sewer

a. Use commercially manufactured wye or insertable tee fittings to the existing piping. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete complying with Class B1 concrete, or install insertable tee per manufacturer's recommendations.

PART - 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

B. Field Measurements - Make necessary measurements in the field to assure precise fit of items in accordance with the approved design.

3.2 INSTALLATION

A. Excavation and backfilling for sewers, collection lines, manholes, structures and appurtenances, shall comply with governing Federal, State laws and municipal Ordinances as may be necessary to protect life property or the Work. In any event, the minimum protection shall conform to the rules and regulations of the Occupational Safety and Health Act (OSHA) Standards for Construction.

B. Connections to Existing Manholes shall be completed in Standard Specifications, and details in the Drawings.

C. Connections of dissimilar types of pipe when joined outside of a manhole or other structure shall be joined with suitable adapters, such as:

1. Fernco Flexible Coupling, Fernco, Inc. (Davison, Michigan).
2. Flexi-Seal Coupling, Mission Rubber Co. (Corona, California)
3. MarMac DP Couplers
4. Approved equal.

D. Foundations and Bedding:

1. All sewer pipe shall be laid on an aggregate bedding, having a minimum thickness of 4 inches below the pipe and extending to the mid point of the pipe as shown on the Drawings.
2. Compaction requirements for foundation, bedding and haunching shall be based upon the material utilized in accordance with the Section 312333 “Trenching and Backfilling” of these Specifications.

E. Gravity Sewer Installation:

1. Install watertight plug to prevent water from entering the existing sewer system.
2. Clean pipe interior and joints prior to installation. Keep pipe clean during construction.
3. Begin at the lowest point in the line. Lay groove or bell end pointing upstream unless otherwise specified.
4. Use a saw to cut ends of pipe flush with inside wall of manholes and structures. Do not use hammer or other means to break pipe.
5. Provide manholes as specified in the contract documents.
6. Clean joint surfaces to remove soil or foreign material prior to jointing pipe. Assemble joints according to pipe manufacturer’s recommendations. Use equipment that does not apply damaging forces to pipe joints.
7. Install cap, plug, or bulkhead at exposed ends of pipe upon completion of construction or whenever pipe installation is not in progress.

F. Tees and Laterals:

1. Unless otherwise specified, tees and laterals shall be of the same type and strength material as the main sewer pipe.
2. Lateral pipes and connecting tees or saddles shall be six-inch unless otherwise specified and shall be installed at locations shown on the Plans.
3. Sewer laterals shall be installed at right angles to the sewer main. Trenching and backfilling laterals shall comply with the same requirements as the main sewer pipe it joins. Open ends of laterals or tees shall be closed with air tight plugs which can readily be removed at a later date without breaking the lateral pipe or tee, if required.
4. The Contractor shall be responsible for installing laterals to the depth shown on the Plans.
5. Contractor shall locate tees and ends of laterals by field measurements from manholes and main sewer and submit a record of locations to the Engineer.

G. Backfilling Trenches:

1. Compaction requirements for trench backfill shall be based upon the material utilized in accordance with the Section 312333 "Trenching and Backfilling" of these Specifications and as shown on the plans.
2. After sewers are laid and bedded in an open cut, the trench shall be backfilled to the planned ground surfaces. Unless otherwise permitted by the regulatory authority, not more than three hundred (300) feet of completed pipe shall be left without backfill.
3. In all backfill types, trench shields, sheeted sections and bracing shall in no case be withdrawn before the trench is sufficiently filled to prevent personal injury, or collapse of trench walls, banks, road surfaces, adjacent utility structures, sidewalks or other property, public or private.
4. When PVC pipe is utilized, select granular initial backfill at least twelve (12) inches above the top of the pipe shall be placed utilizing the same type of material used for haunching.

H. Trenchless installation:

1. Select a method of installation that is appropriate for the soil conditions anticipated and will 1) allow the pipe to be installed to the desired line and grade within the specified tolerances; 2) prevent heaving or settlement of the ground surface or damage to nearby facilities; and 3) prevent damage to the carrier pipe and any lining materials within the carrier pipe.

2. Installation Methods:

    a. Auger Boring: A method that utilizes a rotating cutting head to form the bore hole and a series of rotating augers inside a casing pipe to remove the spoil.
    b. Directional Drilling: A method for installing pipe from a surface-launched drilling rig. A pilot bore is formed and then enlarged by back reaming and removing the spoil material. The pipe is then pulled in place.
    c. Open-ended Pipe Ramming: A method that involves driving a steel casing pipe with a percussive hammer. The front end of the casing pipe is open-ended. Spoils are removed from the pipe.
    d. Pipe Jacking: A method in which pipe is pushed into the ground with hydraulic jacks while soil is simultaneously excavated. Excavation is normally completed with a tunnel boring machine.
    e. Microtunneling: A method of pipe jacking using a remote controlled tunnel boring machine.
    f. Utility Tunneling: A method of forming large diameter tunnels. As excavation takes place at the front of the tunnel, a liner is constructed to temporarily support the tunnel. Upon completion of the tunnel, the pipe is pushed in place.
    g. Other: Other methods may be allowed with the Engineer's approval.

3. Line and Grade:

a. Install pipe at line and grade that will allow the carrier pipe to be installed at its true starting elevation and grade within the specified maximum alignment deviation of the pipe centerline.
b. When no deviation tolerances are specified in the contract documents, apply the following maximum deviations to the carrier pipe.

1) Gravity Pipe:

a) 1.0 foot per 100 feet;
b) 0.2 feet up to 100 feet an additional +/- 0.1 foot per 100 feet thereafter. Backfall in pipe is not allowed.

2) Pressurized Pipe:

a) Horizontally: ± 2.0 feet
b) Vertically: ± 1.0 foot. Maintain the minimum depth specified in the contract documents.

c. Greater deviation or interference with other identified facilities may be cause for rejection.

4. Deviation from Line and Grade:

a. Provided adequate clearance remains for proper installation of the carrier pipe, the Contractor will be allowed to correct deviations in grade of a casing pipe in order to achieve design grade of the carrier pipe by:

1) Pouring an invert in the casing pipe
2) Shimming the carrier pipe with casing spacers to a uniform grade.
3) Installations deviating from the specified tolerances that cannot be adjusted to conform to the specified tolerances may be rejected by the Engineer. If nonconforming installation is not rejected, provide all additional fittings, manholes, or appurtenances needed to accommodate horizontal or vertical misalignment, at no additional cost to the Jurisdiction.
4) Abandon rejected installation and place special fill materials, at no additional cost to the Jurisdiction. Replace abandoned installations, including all additional fittings, manholes, or appurtenances required to replace rejected installations.

5. Un-cased Carrier Pipe Installation:

a. Install pipe by approved methods.
b. Use a jacking collar, timbers, and other means as necessary to protect the driven end of the pipe from damage.
c. Do not exceed the compressive or tensile strength capacity of the pipe during pushing or pulling operations.
d. Fully support bore hole at all times to prevent collapse. Insert pipe as soil is removed, or support bore with drilling fluid.
e. Fill space between the inside of the bore hole and the outside of the pipe with special fill material if the space is greater than 1 inch.

6. Pit Restoration

a. Remove installation equipment and unused materials from the launching and receiving pits.

b. When the carrier pipe extends beyond the limits of trenchless installation and into the bore pit, place bedding and backfill material according to Section 312333
c. Place suitable backfill material in the pit. Apply the testing requirements of Section 312333.
d. Restore the site to original condition or better.

I. Cleaning Inspection and Testing:

1. The following tests and inspection of sanitary sewers as specified in MO DNR Specifications shall be performed:
2. Exfiltration of air under pressure:

a. After the construction of the sewer mains, manholes and laterals, onto the sanitary system, the municipality shall perform a low pressure air test. Personnel will perform the air test from manhole to manhole.
b. Air leakage test results shall not be less than the time per inch of pipe diameter per length of sewer pipe as specified in ASTM F1417 – 11a (2015) Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air.
c. If the section of sewer fails to pass the test, it shall be the Contractor's responsibility to locate the problems and make the necessary repairs.
d. Following the successful passage of a low pressure air test, the Owner will assume responsibility for the operation and maintenance of the sewers with the exception of settlement of the sewer trenches.

3. For flexible themoplastic pipe, a deflection test with maximum 5% deflection of the average inside diameter by testing after installation by pulling 9 arm deflection mandrel, complying with applicable ASTM Standards, through sewer by hand.
4. Manholes shall be air tested for leakage by the Contractor in accordance with ASTM C1244-93, Standard Test Method for Concrete Sewer Manholes by the Negative Pressure (Vacuum) Test or most recent approved.
5. Manhole preparation:

a. Plug all lift holes.
b. Temporarily plug all pipes entering the sewer manhole, taking care to securely brace the pipes and plugs to prevent them from being drawn into the sewer manhole.

6. Test procedure:

a. The test head shall be placed at the top of the manhole in accordance with the manufacturer’s recommendations.
b. A vacuum of 10 in. Hg shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 in. Hg.
c. The manhole shall pass if the time for the vacuum reading to drop from 10 in. Hg to 9 in. Hg meets or exceeds the values indicated in Table 1 of ASTM Designation C 1244 (see below).
d.

TABLE 1 from ASTM Designation: C 1244
Minimum Test Times for Various Manhole Diameters in Seconds

Depth (ft)	Diameter, in.								
	30	33	36	42	48	54	60	66	72
	Time, in seconds								

8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	39	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

e. If the manhole fails the test, the Contractor shall make necessary repairs and retest the manhole. Repairs must be repeated until the manhole passes the test.

f. If manhole joint sealants are pulled out during the vacuum test, the manhole must be disassembled and the joint sealants replaced.

g. Manholes will also be subject to visual inspection with all visual leaks being repaired.

J. Sewer Pipe and Water Main Separation:

1. Horizontal and Vertical Separation of Gravity Sewers from Water Mains shall be in accordance with Missouri DNR Specification.

3.3 FIELD QUALITY CONTROL

A. The **Contractor** will provide testing services of a soils engineer and/or independent laboratory for this project. Trenching and backfilling testing shall be completed in accordance with Section 312333 “Trenching and Backfilling” of these Specifications

END OF SECTION 334101