New Campground
Missouri State Fairgrounds
Sedalia, Missouri

DESIGNED BY: George Butler Associates, Inc.
9801 Renner Blvd
Lenexa, KS  66219 9745

DATE ISSUED: 8/22/2019
PROJECT NO.: F1901-01

FOR:  State of Missouri
Office of Administration
Division of Facilities Management,
Design and Construction
SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: F1901-01

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:

Civil Engineer

Electrical Engineer
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**The following documents may be found on MissouriBUYS at https://missouribuys.mo.gov/**

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### APPENDIX B

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SECTION 000115 – LIST OF DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

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

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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. New Campground
      Missouri State Fairgrounds
      Sedalia, Missouri
      Project No.: F1901-01

3.0 BIDS WILL BE RECEIVED:
   A. Until: 1:30 PM, Thursday, October 17, 2019
   B. Place: Only electronic bids on MissouriBUYS shall be accepted: https://missouribuys.mo.gov. Bidder must be registered to bid.

4.0 DESCRIPTION:
   A. Scope: The project consists of adding 137 new campsites, including power and sanitary hookups at each site, gravel roads, grading, and landscaping.
   B. Estimate: $1,242,000.00 to $1,708,000.00
   C. MBE/WBE/SDVE Goals: MBE 10.00%, WBE 10.00%, & SDVE 3.00%. NOTE: Only MBE/WBE firms certified by a State of Missouri public entity as of the date of bid opening, or SDVE(s) meeting the requirements of Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE participation goals for this project.

5.0 PRE-BID MEETING:
   A. Place/Time: 10:00 AM; Thursday, October 3, 2019; Missouri State Fairgrounds, 2503 W 16th St, Sedalia, MO.
   B. Access to State of Missouri property requires presentation of a photo ID by all persons

6.0 HOW TO GET PLANS & SPECIFICATIONS:

   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.

   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.

   Information for upcoming bids is available on the Division’s web site -- http://oa.mo.gov/facilities

   Plans, specifications and bidders lists are available on-line for bidders reference on American Document Solutions website – https://www.adsplanroom.net

7.0 POINT OF CONTACT:
   A. Designer: George Butler Associates, Inc., Brian Steiner, AIA, phone # 913/577-8834, fax # 913/577-8264
   B. Project Manager: Jared Cook, phone # 573-690-6733, fax # 573-751-7277

8.0 GENERAL INFORMATION:
   A. The State reserves the right to reject any and all bids and to waive all informalities in bids. No bid may be withdrawn for a period of 20 working days subsequent to the specified bid opening time. The contractor shall pay not less than the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed, as determined by the Missouri Department of Labor and Industrial Relations and as set out in the detailed plans and specifications.

   Bid results will be available by the close of business the day following bid opening on the Division of Facilities Management, Design and Construction’s website – https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans
1.0 - SPECIAL NOTICE TO BIDDERS

A. If awarded a contract, the Bidder’s employees, and the employees of all subcontractors, who perform the work on the project, will be required to undergo a fingerprint background check and obtain a State of Missouri identification badge prior to beginning work on site. The Bidder should review the information regarding this requirement in Section 013513 – Site Security and Health Requirements prior to submitting a bid.

2.0 - BID DOCUMENTS

A. The number of sets obtainable by any one (1) party may be limited in accordance with available supply.

B. For the convenience of contractors, sub-contractors and suppliers, copies of construction documents are on file at the office of the Director, Division of Facilities Management, Design and Construction and on the Division’s web site - http://oa.mo.gov/facilities/project-management.

3.0 - BIDDERS' OBLIGATIONS

A. Bidders must carefully examine the entire site of the work and shall make all reasonable and necessary investigations to inform themselves thoroughly as to the facilities available as well as to all the difficulties involved in the completion of all work in accordance with the specifications and the plans. Bidders are also required to examine all maps, plans and data mentioned in the specifications. No plea of ignorance concerning observable existing conditions or difficulties that may be encountered in the execution of the work under this contract will be accepted as an excuse for any failure or omission on the part of the contractor to fulfill in every detail all of the requirements of the contract, nor accepted as a basis for any claims for extra compensation.

B. Under no circumstances will contractors give their plans and specifications to another contractor. Any bid received from a contractor whose name does not appear on the list of plan holders will be subject to rejection.

4.0 - INTERPRETATIONS

A. No bidder shall be entitled to rely on oral interpretations as to the meaning of the plans and specifications or the acceptability of alternate products, materials, form or type of construction. Every request for interpretation shall be made in writing and submitted with all supporting documents not less than five (5) working days before opening of bids. Every interpretation made to a bidder will be in the form of an addendum and will be sent as promptly as is practicable to all persons to whom plans and specifications have been issued. All such addenda shall become part of the contract documents.

B. Approval for an “acceptable substitution” issued in the form of an addendum as per Paragraph 4A above, and as per Article 3.1 of the General Conditions; ACCEPTABLE SUBSTITUTIONS shall constitute approval for use in the project of the product.

C. An “acceptable substitution” requested after the award of bid shall be approved if proven to the satisfaction of the Owner and the Designer as per Article 3.1, that the product is acceptable in design, strength, durability, usefulness, and convenience for the purpose intended. Approval of the substitution after award is at the sole discretion of the Owner.

D. A request for “Acceptable Substitutions” shall be made on the Section 006325 Substitution Request Form. The request shall be sent directly to the project Designer. A copy of said request should also be mailed to the Owner, Division of Facilities Management, Design and Construction, Post Office Box 809, Jefferson City, Missouri 65102.

5.0 - BIDS AND BIDDING PROCEDURE

A. Bidders shall submit all submission forms and accompanying documents listed in SECTION 004113 – BID FORM, Article 5.0, ATTACHMENTS TO BID by the stated time or their bid will be rejected for being non-responsive.

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

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

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

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

B. All bids shall be submitted without additional terms and conditions, modification or reservation on the bid forms with each space properly filled. Bids not on these forms will be rejected.

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

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

6.0 - SIGNING OF BIDS

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

B. Bids from a partnership or joint venture shall require only one signature of a partner, an officer of the joint venture authorized to bind the venture or an attorney-in-fact. If the bid is signed by an officer of a joint venture or an attorney-in-fact, a document evidencing the individual's authority to execute contracts should be included with the bid form.

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

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

A. It is the bidder’s sole responsibility to assure receipt by Owner of bid submittals by the date and time specified in the Invitation for Bid.

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

C. No Contractor shall stipulate in his bid any conditions not contained in the specifications or standard bid form contained in the contract documents. To do so may subject the Contractor’s bid to rejection.
D. Bidders prices shall include all city, state and federal sales, excise and similar taxes which may be lawfully assessed in connection with his performance of work and purchase of materials to be incorporated in the work. THIS PROJECT IS NOT TAX EXEMPT.

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

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

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

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

B. The Bidder shall modify his or her original bid by submitting a revised bid on MissouriBUYS.

9.0 - AWARD OF CONTRACT

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

B. The Owner reserves the right to let other contracts in connection with the work, including but not by way of limitation, contracts for the furnishing and installation of furniture, equipment, machines, appliances and other apparatus.

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

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

E. No bid shall be considered binding upon the Owner until the written contract has been properly executed, a satisfactory bond has been furnished, evidence of required insurance coverage, submittal of executed Section 004541, Affidavit of Work Authorization form, documentation evidencing enrollment and participation in a federal work authorization program has been received and an affirmative action plan submitted. Failure to execute and return the contract and associated documents within the prescribed period of time shall be treated, at the option of the Owner, as a breach of bidder's obligation and the Owner shall be under no further obligation to bidder.

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

G. Any successful bidder which is a corporation organized in a state other than Missouri shall furnish to the Owner, attached to the Bid Form, a properly certified copy of its current Certificate of Authority to do business in the State of Missouri, such certificate to remain on file with the Owner. No contract will be awarded by the Owner unless such certificate is furnished by the bidder.

H. Any successful bidder which is a corporation organized in the State of Missouri shall furnish at its own cost to the Owner, if requested, a Certificate of Good Standing issued by the Secretary of State, such certificate to remain on file with the Owner.

I. Transient employers subject to Sections 285.230 and 285.234, RSMo, (out-of-state employers who temporarily transact any business in the State of Missouri) may be required to file a bond with the Missouri Department of Revenue. No contract will be awarded by the Owner unless the successful bidder certifies that he has complied with all applicable provisions of Section 285.230-234.

J. Sections 285.525 and 285.530, RSMo, require business entities to enroll and participate in a federal work authorization program in order to be eligible to receive award of any state contract in excess of $5,000. Bidders should submit with their bid an Affidavit of Work Authorization (Section 004541) along with appropriate documentation evidencing such enrollment and participation. Section-004541, Affidavit of Work Authorization is located at – http://oa.mo.gov/facilities/vendor-links/contractor-forms.
Information regarding a Memorandum of Understanding which is one form of appropriate documentation located at [https://www.uscis.gov/e-verify/](https://www.uscis.gov/e-verify/). Submittal of this form and appropriate documentation is required before the award of any contract. In addition the contractor shall be responsible for compliance of these requirements by all subcontractors and suppliers at any tier associated with this contract.

10.0 – SERVICE-DISABLED VETERANS

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

B. The State of Missouri has a goal of awarding three percent of all construction projects to service-disabled veterans. Furthermore, service-disabled veteran businesses doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places of business shall receive a three-point bonus preference in the contract award evaluation process. The bonus preference will be calculated and applied by reducing any service-disabled veteran business’s bid amount(s) by three percent of the lowest bid amount(s). This reduction is for evaluation purposes only, and will have no impact on the actual amount(s) of the bid or the amount(s) of any contract awarded.

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

11.0 - CONTRACT SECURITY

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

12.0 - LIST OF SUBCONTRACTORS

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

13.0 - WORKING DAYS

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

1.0 DEFINITIONS


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

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


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


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

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

2.0 MBE/WBE/SDVE PROGRAM REQUIREMENTS

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

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

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

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

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

e. A bidder may count towards the MBE/WBE/SDVE goals that portion of the total dollar value
granted to a certified joint venture equal to the percentage of the ownership and control of the MBE,
WBE, or SDVE partner in the joint venture.

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

a. The bidder shall submit with his bid the information requested in the MBE/WBE/SDVE
Compliance Evaluation Form for every MBE, WBE, or SDVE subcontractor or material supplier the
bidder intends to use on the contract work.

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

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

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

4. Waiver of MBE/WBE/SDVE Participation:

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

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

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

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

MBE/WBE/SDVE forms may be accessed at https://oa.mo.gov/facilities/vendor-links/contractor-forms. It is the bidder’s sole responsibility to assure receipt by Owner of bid submittals by the date and time specified in the “Invitation for Bid.”

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

3.0 CONTRACTOR REQUIREMENTS

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

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

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

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

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

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

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

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

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

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

https://oa.mo.gov/sites/default/files/sdvelisting.pdf

https://www.vip.vetbiz.va.gov
THIS AGREEMENT, made (DATE) by and between:

Contractor Name and Address
hereinafter called the "Contractor,"

and the State of Missouri, hereinafter called the "Owner", represented by the Office of Administration, Division of Facilities Management, Design and Construction, on behalf of the Department of Agriculture, Missouri State Fair.

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:

<table>
<thead>
<tr>
<th>Project Name:</th>
<th>New Campground</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Missouri State Fairgrounds</td>
</tr>
<tr>
<td></td>
<td>Sedalia, Missouri</td>
</tr>
</tbody>
</table>

Project Number: F1901-01

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 completion date is April 30, 2020. 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: $  

TOTAL CONTRACT AMOUNT: ($CONTRACT AMOUNT)

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

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

ARTICLE 6. MINORITY/WOMEN/SERVICE DISABLED VETERAN BUSINESS ENTERPRISE PARTICIPATION
The Contractor has been granted a waiver of the 10% MBE and 10% WBE and 3% SDVE participation goals. The Contractor agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows: (OR)

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

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

Total $  

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

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

ARTICLE 7. CONTRACT DOCUMENTS
Contract documents shall consist of the following component parts:

1. Division 0, with executed forms
2. Division 1
3. Executed Construction Contract Form
4. The Drawings
5. The Technical Specifications
6. Addenda
7. Contractor's Proposal as accepted by the Owner
By signature below, the parties hereby execute this contract document.

**APPROVED:**

Mark Hill, P.E., Acting Director  
Division of Facilities Management, Design and Construction  
Contractor’s Authorized Signature  

DELETE IF PRIVATE OR PARTNERSHIP  

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

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

AFFIDAVIT FOR AFFIRMATIVE ACTION

**NAME**

First being duly sworn on oath states: that

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

**NAME**

a  ☐ sole proprietorship  ☐ partnership

☐ limited liability company (LLC)

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

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

**PROJECT TITLE**

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

**PRINT NAME & SIGNATURE**

**DATE**

**NOTARY INFORMATION**

<table>
<thead>
<tr>
<th>NOTARY PUBLIC EMBOSSE SEAL</th>
<th>STATE OF</th>
<th>COUNTY (OR CITY OF ST. LOUIS)</th>
<th>USE RUBBER STAMP IN CLEAR AREA BELOW</th>
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<tbody>
<tr>
<td>SUBSCRIBED AND SWORN BEFORE ME, THIS</td>
<td>DAY OF</td>
<td>YEAR</td>
<td>MY COMMISSION EXPIRES</td>
</tr>
<tr>
<td>NOTARY PUBLIC SIGNATURE</td>
<td>NOTARY PUBLIC NAME (TYPED OR PRINTED)</td>
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MO 300-1401 (05/18)  
FILE/Construction Contract

SECTION 005414 – AFFIDAVIT FOR AFFIRMATIVE ACTION  05/18  
Page 1 of 1
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; 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
## Product Substitution Request

### 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

#### Quality Comparison

<table>
<thead>
<tr>
<th>Specified Product</th>
<th>Substitution Request</th>
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<tbody>
<tr>
<td><strong>Name, Brand</strong></td>
<td></td>
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<tr>
<td><strong>Catalog No.</strong></td>
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<tr>
<td><strong>Manufacturer</strong></td>
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<tr>
<td><strong>Vendor</strong></td>
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#### Previous Installations

<table>
<thead>
<tr>
<th>Project</th>
<th>Architect/Engineer</th>
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<td>Location</td>
<td>Date Installed</td>
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#### Significant Variations from Specified Product

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**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.

**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.
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
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<th>ITEM OF WORK</th>
<th>TOTAL AMOUNT OF SUBCONTRACT</th>
<th>$ AMOUNT &amp; % COMPLETE (PAID-TO-DATE)</th>
<th>CONSULTANT/SUBCONSULTANT OR CONTRACTOR/SUBCONTRACTOR/SUPPLIER NAME, ADDRESS, CONTACT, AND PHONE NUMBER</th>
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THE PERCENTAGE AND DOLLAR AMOUNT OF THIS PROJECT THAT ARE TO BE MBE/WBE/SDVE AS INDICATED IN THE ORIGINAL CONTRACT: % and $ .
Before me, the undersigned Notary Public, in and for the County of __________________________

State of __________________________ personally came and appeared __________________________

(NAME)

(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__
GENERAL CONDITIONS

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   1.6. Patents and Royalties
   1.7. Preference for American and Missouri Products and Services
   1.8. Communications
   1.9. Separate Contracts and Cooperation
   1.10. Assignment of Contract
   1.11. Indemnification
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   7.2. For Cause
   7.3. For Convenience
A. These General Conditions apply to each section of these specifications. The Contractor is subject to the provisions contained herein.

B. The General Conditions are intended to define the relationship of the Owner, the Designer and the Contractor thereby establishing certain rules and provisions governing the operation and performance of the work so that the work may be performed in a safe, orderly, expeditious and workmanlike manner.

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

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

1. "COMMISSIONER": The Commissioner of the Office of Administration.


3. "CONSTRUCTION REPRESENTATIVE:" Whenever the term "Construction Representative" is used, it shall mean the Owner’s Representative at the work site.

4. "CONTRACTOR": Party or parties who have entered into a contract with the Owner to furnish work under these specifications and drawings.

5. "DESIGNER": When the term "Designer" is used herein, it shall refer to the Architect, Engineer, or Consultant of Record specified and defined in Paragraph 2.0 of the Supplemental Conditions, or his duly authorized representative. The Designer may be either a consultant or state employee.

6. "DIRECTOR": Whenever the term "Director" is used, it shall mean the Director of the Division of Facilities Management, Design and Construction or his Designee, representing the Office of Administration, State of Missouri. The Director is the agent of the Owner.


8. “INCIDENTAL JOB BURDENS”: Shall mean those expenses relating to the cost of work, incurred either in the home office or on the job-site, which are necessary in the course of doing business but are incidental to the job. Such costs include office supplies and equipment, postage, courier services, telephone expenses including long distance, water and ice and other similar expenses.

9. "JOINT VENTURE": An association of two (2) or more businesses to carry out a single business enterprise for profit for which purpose they combine their property, capital, efforts, skills and knowledge.

10. "OWNER": Whenever the term “Owner” is used, it shall mean the State of Missouri.

11. “PROJECT”: Wherever the term “Project” is used, it shall mean the work required to be completed by the construction contract.


13. "SUBCONTRACTOR": Party or parties who contract under, or for the performance of part or this entire Contract between the Owner and Contractor. The subcontract may or may not be direct with the Contractor.

14. "WORK": Labor, material, supplies, plant and equipment required to perform and complete the service agreed to by the Contractor in a safe, expeditious, orderly and workmanlike manner so that the project shall be complete and finished in the best manner known to each respective trade.


ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

A. In case of discrepancy between drawings and specifications, specifications shall govern. Should discrepancies in architectural drawings, structural drawings and mechanical drawings occur, architectural drawings shall govern and, in case of
conflict between structural and mechanical drawings, structural drawings shall govern.

B. Specifications are separated into titled divisions for convenience of reference only and to facilitate letting of contracts and subcontracts. The Contractor is responsible for establishing the scope of work for subcontractors, which may cross titled divisions. Neither the Owner nor Designer will establish limits and jurisdiction of subcontracts.

C. Figured dimensions take precedence over scaled measurements and details over smaller scale general drawings. In the event of conflict between any of the documents contained within the contract, the documents shall take precedence and be controlling in the following sequence: addenda, supplementary general conditions, general conditions, division 1 specifications, technical division specifications, drawings, bid form and instructions to bidders.

D. Anything shown on drawings and not mentioned in these specifications or vice versa, as well as any incidental work which is obviously necessary to complete the project within the limits established by the drawings and specifications, although not shown on or described therein, shall be performed by the Contractor at no additional cost as a part of his contract.

E. Upon encountering conditions differing materially from those indicated in the contract documents, the Contractor shall promptly notify the Designer and Construction Representative in writing before such conditions are disturbed. The Designer shall promptly investigate said conditions and report to the Owner, with a recommended course of action. If conditions do materially differ and cause an increase or decrease in contract cost or time required for completion of any portion of the work, a contract change will be initiated as outlined in Article 4 of these General Conditions.

E. Only work included in the contract documents is authorized, and the Contractor shall do no work other than that described therein or in accordance with appropriately authorized and approved contract changes.

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

A. Since the Owner is the State of Missouri, municipal or political subdivisions, zoning ordinances, construction codes (other than licensing of trades), and other like ordinances are not applicable to construction on Owner’s property, and Contractor will not be required to submit drawings and specifications to any municipal or political subdivision, authority, obtain construction permits or any other licenses (other than licensing of trades) or permits from or submit to inspections by any municipality or political subdivision relating to the construction for this project. All permits or licenses required by municipality or political subdivision for operation on property not belonging to Owner shall be obtained by and paid for by Contractor. Each Contractor shall comply with all applicable laws, ordinances, rules and regulations that pertain to the work of this contract.

B. Contractors, subcontractors and their employees engaged in the businesses of electrical, mechanical, plumbing, carpentry, sprinkler system work, and other construction related trades shall be licensed to perform such work by the municipal or political subdivision where the project is located, if such licensure is required by local code. Local codes shall dictate the level (master, journeyman, and apprentice) and the number, type and ratio of licensed tradesmen required for this project within the jurisdiction of such municipal or political subdivision.

C. Equipment and controls manufacturers and their authorized service and installation technicians that do not maintain an office within the jurisdiction of the municipal or political subdivision but are a listed or specified contractor or subcontractor on this project are exempt from Paragraph 1.3 B above.

D. The Contractor shall post a copy of the wage determination issued for the project and included as a part of the contract documents, in a prominent and easily accessible location at the site of construction for the duration of the project.

E. Any contractor or subcontractor to such contractor at any tier signing a contract to work on this project shall provide a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the Department of Labor and Industrial Relations which is at least as stringent as an approved OSHA program. The contractor shall forfeit as a penalty to the public body on whose behalf the contract is made or awarded, two thousand five hundred dollars plus one hundred dollars for each employee employed by the contractor or subcontractor, for each calendar day, or portion thereof, such employee is employed without the required training.

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

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

1. Against recipients of service on the basis of race, color, religion, national origin, sex, disability or age.

2. Against any employee or applicant, for employment on the basis of race, color, religion, national origin, sex or otherwise qualified disability status.

3. Against any applicant for employment or employee on the basis of age, where such applicant or employee is between ages 40 and 70 and where such Contractor employs at least 20 persons.

4. Against any applicant for employment or employee on the basis of that person’s status as a disabled or Vietnam-era veteran.

The Contractor and his Subcontractors will take affirmative action to insure applicants for employment and employees are treated equally without regard to race, color, religion, national origin, sex, disability, or age. Such action shall include, but not be limited to, the following:

1. Employment, upgrading, demotion and transfer; recruitment or recruitment advertising; and selection for training, including apprenticeship.

The Contractor and his Subcontractors will give written notice of their commitments under this clause to any labor union with which they have bargaining or other agreements.

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

1. A written policy statement committing the total organization to affirmative action and assigning management responsibilities and procedures for evaluation and dissemination;

2. The identification of a person designated to handle affirmative action;

3. The establishment of non-discriminatory selection standards, objective measures to analyze recruitment, an upward mobility system, a wage and salary structure, and standards applicable to lay-off, recall, discharge, demotion and discipline;

4. The exclusion of discrimination from all collective bargaining agreements; and

5. Performance of an internal audit of the reporting system to monitor execution and to provide for future planning.

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

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

ARTICLE 1.5 - ANTI-KICKBACK

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

ARTICLE 1.6 - PATENTS AND ROYALTIES

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

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

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

A. By virtue of statutory authority a preference will be given to Missouri labor and to products of mines, forests and quarries of the state of Missouri when they are found in marketable quantities in the state, and all such materials shall be of the best quality and suitable character that can be obtained at reasonable market prices, all as provided for in Section 8.280, Missouri Revised Statutes and Cumulative Supplements.

B. Furthermore, pursuant to Section 34.076 Missouri Revised Statutes and Cumulative Supplements, a preference shall be given to those persons doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less. In addition, in order for a non-domiciliary bidder to be successful, his bid must be that same percentage lower than a domiciliary Missouri bidder's bid, as would be required for a Missouri bidder to successfully bid in the non-domiciliary state.

C. In accordance with the Missouri Domestic Products Procurement Act Section 34.350 RSMo and Cumulative Supplements any manufactured goods or commodities used or supplied in the performance of this contract or any subcontract thereto shall be manufactured, assembled or produced in the United States, unless the specified products are not manufactured, assembled or produced in the United States in sufficient quantities to meet the agency's requirements or cannot be manufactured, assembled or produced in the United States within the necessary time in sufficient quantities to meet the contract requirements, or if obtaining the specified products manufactured, assembled or produced in the United States would increase the cost of this contract for purchase of the product by more than ten percent.

ARTICLE 1.8 - COMMUNICATIONS

A. All notices, requests, instructions, approvals and claims must be in writing and shall be delivered to the Designer and copied to the Construction Representative for the project except as required by Article 1.12 Disputes and Disagreements, or as otherwise specified by the Owner in writing as stated in Section 012600. Any such notice shall be deemed to have been given as of the time of actual receipt.

B. The Contractor shall attend on-site progress and coordination meetings, as scheduled by the Construction Representative, no less than once a month.

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

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

A. The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs.

B. The Contractor shall consult the drawings for all other contractors in connection with this work. Any work conflicting with the above shall be brought to the attention of the Owner’s Representative before the work is performed. If the Contractor fails to do this, and constructs any work which interferes with the work of another contractor, the Contractor shall remove any part so conflicting and rebuild same, as directed by the Owner’s Representative at no additional cost to the Owner.

C. Each contractor shall be required to coordinate his work with other contractors so as to afford others reasonable opportunity for execution of their work. No contractor shall delay any other contractor by neglecting to perform contract work at the proper time. If any contractor causes delay to another, they shall be liable directly to that contractor for such delay in addition to any liquidated damages which might be due the Owner.

D. Should the Contractor or project associated subcontractors refuse to cooperate with the instructions and reasonable requests of other Contractors or other subcontractors in the overall
coordinating of the work, the Owner may take such appropriate action and issue directions, as required, to avoid unnecessary and unwarranted delays.

E. Each Contractor shall be responsible for damage done to Owner's or other Contractor's property by him/her or workers in his employ through their fault or negligence.

F. Should a Contractor sustain any damage through any act or omission of any other Contractor having a contract with the Owner, the Contractor so damaged shall have no claim or cause of action against the Owner for such damage, but shall have a claim or cause of action against the other Contractor to recover any and all damages sustained by reason of the acts or omissions of such Contractor. The phrase "acts or omissions" as used in this section shall be defined to include, but not be limited to, any unreasonable delay on the part of any such contractors.

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

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

ARTICLE 1.11 - INDEMNIFICATION

A. Contractor agrees to indemnify and save harmless Owner and its respective commissioners, officers, officials, agents, consultants and employees and Designer, their agents, servants and employees, from and against any and all liability for damage arising from injuries to persons or damage to property occasioned by any acts or omissions of Contractor, any subcontractors, agents, servants or employees, including any and all expense, legal or otherwise, which may be incurred by Owner or Designer, its agents, servants or employees, in defense of any claim, action or suit.

B. The obligations of the Contractor under this paragraph shall not extend to the liability of the Designer, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, contract changes, design or specifications, or (2) giving of or the failure to give directions or instructions by the Designer, his agents or employees as required by this contract documents provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

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

ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES

A. The Owner shall give all orders and directions contemplated under this contract relative to the execution of the work. During progress of work the Owner will be represented at the project site by the Construction Representative and/or Designer, whose responsibilities are to see that this contract is properly fulfilled.

B. The Owner shall at all times have access to the work whenever it is in preparation or progress. The Contractors shall provide proper facilities for such access and for inspection and supervision.

C. All materials and workmanship used in the work shall be subject to the inspection of the Designer and Construction Representative, and any work which is deemed defective shall be removed, rebuilt or made good immediately upon notice. The cost of such correction shall be borne by the Contractor. Contractor shall not be entitled to an extension of the contract completion date in order to remedy defective work. All rejected materials shall be immediately removed from the site of the work.

D. If the Contractor fails to proceed at once with the correction of rejected defective materials or workmanship, the Owner may, by separate contract or otherwise, have the defects remedied or rejected. Materials removed from the site and charge the cost of the same against any monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.

E. Failure or neglect on the part of Owner to observe faulty work, or work done which is not in accordance with the drawings and specifications shall not relieve the Contractor from responsibility
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

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 from which shall appear within a period of one (1) year from the date of substantial completion unless a longer period is otherwise specified or a differing guaranty period has been established in the substantial completion certificate. The Owner will give notice of observed defects with reasonable promptness.

3. In case of default on the part of the Contractor in fulfilling this part of this contract, the Owner may correct the work or repair the damage and the cost and expense incurred in such event shall be paid by or recoverable from the Contractor or surety.

4. The work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's guaranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

B. Extended Warranty

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

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

A. Immediately after equipment submittals are approved and no later than ten (10) working days prior to the substantial completion inspection, the Contractor shall provide to the Designer three (3)
copies of operating instructions and service manuals, containing the following:

1. Start-up and Shut-down Procedures: Provide a step-by-step write up of all major equipment. When manufacturer’s printed start-up, trouble shooting and shut-down procedures are available; they may be incorporated into the operating manual for reference.

2. Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.

3. Equipment List: List of all major equipment as installed shall be prepared to include model number, capacities, flow rate, name place data, shop drawings and air and water balance reports.

4. Service Instructions: Provide the following information for all pieces of equipment.
   a. Recommended spare parts including catalog number and name of local supplier or factory representative.
   b. Belt sizes, types, and lengths.
   c. Wiring diagrams.

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

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

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

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

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

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

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

**ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES**

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

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

C. The Contractor shall supply sufficient labor, material, plant and equipment and pay when due any laborer, subcontractor or supplier for supplies furnished and otherwise prosecute the work with diligence to prevent work stoppage and insure completion thereof within the time specified.

D. The Contractor and each of his subcontractors shall submit to the Construction Representative, through the Designer such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.

E. The Contractor, subcontractors, and material suppliers shall upon written request, give the Owner access to all time cards, material invoices, payrolls, estimates, profit and loss statements, and all other direct or indirect costs related to this work.

F. The Contractor shall be responsible for laying out all contract work such as layout of architectural, structural, mechanical and electrical work, which shall be coordinated with layouts of subcontractors for general construction work. The Contractor is also responsible for unloading, uncrating and handling of all materials and equipment to be erected or placed by him/her, whether furnished by Contractor or others. No extra charges or compensation will be allowed as a result of failure to verify dimensions before ordering materials or fabricating items.

G. The Contractor must notify the Construction Representative at least one working day before
Contractors shall rearrange 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.

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.

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.

Unless otherwise permitted, all materials shall be new and both workmanship and materials shall be of the best quality.

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.

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.

The Contractor or subcontractors shall not overload, or permit others to overload, any part of any structure during the performance of this contract.

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.

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.

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.

The Contractor shall be responsible for protection, including weather protection, and proper maintenance of all equipment and materials.

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.

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.

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation
or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 4.

V. Before commencing work, Contractors shall confer with the Construction Representative and facility representative and review any facility rules and regulations which may affect the conduct of the work.

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

ARTICLE 3.7 -- SUBCONTRACTS
A. Subcontractor assignments as identified in the bid form shall not be changed without written approval of the Owner. The Owner will not approve changes of a listed subcontractor unless the Contractor documents, to the satisfaction of the Owner, that the subcontractor cannot or will not perform the work as specified.

B. The Contractor is fully responsible to the Owner for the acts and omissions of all subcontractors and of persons either directly or indirectly employed by them.

C. Every subcontractor shall be bound by the applicable terms and provisions of these contract documents, but no contractual relationship shall exist between any subcontractor and the Owner unless the right of the Contractor to proceed with the work is suspended or this contract is terminated as herein provided, and the Owner in writing elects to assume the subcontract.

D. The Contractor shall upon receipt of "Notice to Proceed" and prior to submission of the first payment request, notify the Designer and Construction Representative in writing of the names of any subcontractors to be used in addition to those identified in the bid form and all major material suppliers proposed for all parts of the work.

ARTICLE 4 -- CHANGES IN THE WORK
4.1 CHANGES IN THE WORK
A. The Construction Representative, without giving notice to the surety and without invalidating this contract, may order extra work or make changes by altering, adding to or deducting from the work, this contract sum being adjusted accordingly. All such work shall be executed under the conditions of the original contract. A claim for extension of time caused by any change must be adjusted at the time of ordering such change. No future request for time will be considered.

B. Each Contract Change shall include all costs required to perform the work including all labor, material, equipment, overheads and profit, delay, disruptions, or other miscellaneous expenses. No subsequent requests for additional compensation including claims for delay, disruption, or reduced efficiency as a result of each change will be considered. Values from the Schedule of Values will not be binding as a basis for additions to or deductions from the contract price.

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

1. By an acceptable fixed price proposal from the Contractor. Breakdowns shall include all takeoff sheets of each Contractor and subcontractor. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.

2. By a cost-plus-fixed-fee (time and material) basis with maximum price, total cost not to exceed said maximum. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.

3. By unit prices contained in Contractor's original bid form and incorporated in the construction contract.

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

1. The overhead and profit charge by the Contractor and all subcontractors shall be considered to include, but is not limited to: incidental job burdens, small truck (under 1 ton) expense, mileage, small hand tools, warranty costs, company benefits and general office overhead. Project supervision including field supervision and job site office expense shall be considered a part of overhead and profit unless a compensable time extension is granted.

2. The percentages for overhead and profit charged on Contract Changes shall be negotiated, and may vary according to the nature, extent, and complexity of the work
involved. However, the overhead and profit for the Contractor or subcontractor actually performing the work shall not exceed 14%. When one or more tiers of subcontractors are used, in no event shall any Contractor or subcontractor receive as overhead and profit more than 3% of the cost of the work performed by any of his subcontractors. In no case shall the total overhead and profit paid by the Owner on any Contract Changes exceed twenty percent (20%) of the cost of materials, labor and equipment (exclusive of Contractor or any Subcontractor overhead and profit) necessary to put the contract change work in place.

3. The Contractor will be allowed to add the cost of bonding and insurance to their cost of work. This bonding and insurance cost shall not exceed 2% and shall be allowed on the total cost of the added work, including overhead and profit.

4. On proposals covering both increases and decreases in the amount of this contract, the application of overhead and profit shall be on the net change in the cost of the work.

5. The percentage for overhead and profit to be credited to the Owner on Contract Changes that are solely decreases in the quantity of work or materials shall be negotiated, and may vary according to the nature, extent and complexity of the work involved, but in no case shall be less than ten percent (10%). If the percentage for overhead and profit charged for work added by Contract Changes for this contract has been negotiated to less than 10%, the negotiated rate shall then apply to credits as well.

E. No claim for an addition to this contract sum shall be valid unless authorized as aforesaid in writing by the Owner. In the event that none of the foregoing methods are agreed upon, the Owner may order the Contractor to perform work on a time and material basis. The cost of such work shall be determined by the Contractor’s actual labor and material cost to perform the work plus overhead and profit as outlined herein. The Designer and Construction Representative shall approve the Contractor’s daily time and material invoices for the work involved.

F. If the Contractor claims that any instructions involve extra cost under this contract, the Contractor shall give the Owner’s Representative written notice thereof within a reasonable time after the receipt of such instructions, and in any event before proceeding to execute the work. No such claim shall be valid unless so made and authorized by the Owner, in writing.

G. In an emergency affecting the safety of life or of the structure or of adjoining property, the Contractor, without special instruction or authorization from the Construction Representative, is hereby permitted to act at their discretion to prevent such threatened loss or injury. The Contractor shall submit a claim for compensation for such emergency work in writing to the Owner’s Representative.

ARTICLE 4.2 – CHANGES IN COMPLETION TIME

A. Extension of the number of work days stipulated in the Contract for completion of the work with compensation may be made when:

1. The contractor documents that proposed Changes in the work, as provided in Article 4.1, extends construction activities critical to contract completion date, OR

2. The Owner suspends all work for convenience of the Owner as provided in Article 7.3, OR

3. An Owner caused delay extends construction activities critical to contract completion (except as provided elsewhere in these General Conditions). The Contractor is to review the work activities yet to begin and evaluate the possibility of rescheduling the work to minimize the overall project delay.

B. Extension of the number of work days stipulated in the Contract for completion of the work without compensation may be made when:

1. Weather-related delays occur, subject to provisions for the inclusion of a specified number of "bad weather" days when provided for in Section 012100-Allowances, OR

2. Labor strikes or acts of God occur, OR

3. The work of the Contractor is delayed on account of conditions which were beyond the control of the Contractor, subcontractors or suppliers, and were not the result of their fault or negligence.

C. No time extension or compensation will be provided for delays caused by or within the control of the Contractor, subcontractors or suppliers and for concurrent delays caused by the Owner.

D. The Contractor shall notify the Owner promptly of any occurrence or conditions which in the Contractor's opinion results in a need for an extension of time. The notice shall be in writing and shall include all necessary supporting materials with details of any resultant costs and be submitted in time to permit full investigation and
evaluation of the Contractor's claim. The Owner shall promptly acknowledge the Contractor's notice and, after recommendation from the Owner's Representative and/or Designer, shall provide a decision to the Contractor. Failure on the part of the Contractor to provide such notice and to detail the costs shall constitute a waiver by the Contractor of any claim. Requests for extensions of time shall be for working days only.

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 -- CONSTRUCTION COMMENCEMENT

A. Upon receipt of the "Intent to Award" letter, the Contractor must submit the following properly executed instruments to the Owner:
   1. Contract;
   2. Performance/payment bond as described in Article 6.1;
   3. Certificates of Insurance, or the actual policies themselves, showing that the Contractor has obtained the insurance coverage required by Article 6.2.

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

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

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

ARTICLE 5.2 -- PROJECT CONSTRUCTION

A. Each Contractor shall submit for the Owner's approval, in reproducible form, a progress schedule showing the rate of progress and the order of the work proposed to carry on various phases of the project. The schedule shall be in conformance with the requirements outlined in Section 013200 – Schedules.

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

ARTICLE 5.3 -- PROJECT COMPLETION

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

1. Once the Contractor has reached what they believe is Substantial Completion, the Contractor shall notify the Designer and the Construction Representative of the following:
   a. That work is essentially complete with the exception of certain listed work items. The list shall be referred to as the "Contractor's Punch."
   b. That all Operation and Maintenance Manuals have been assembled and submitted in accordance with Article 3.5A.
   c. That the Work is ready for inspection by the Designer and Construction Representative. The Owner shall be entitled to a minimum of ten working days notice before the inspection shall be performed.

2. If the work is acceptable, the Owner shall issue a Certificate of Substantial Completion, which shall set forth the responsibilities of the Owner and the Contractor for utilities, security, maintenance, damage to the work and risk of loss. The Certificate shall also identify those remaining items of work to be
performed by the Contractor. All such work items shall be complete within 30 working days of the date of the Certificate, unless the Certificate specifies a different time. If the Contractor shall be required to perform tests that must be delayed due to climatic conditions, it is understood that such tests and affected equipment will be identified on the Certificate and shall be accomplished by the Contractor at the earliest possible date. Performance of the tests may not be required before Substantial Completion can be issued. The date of the issuance of the Certificate of Substantial Completion shall determine whether or not the work was completed within the contract time and whether or not Liquidated Damages are due.

3. If the work is not acceptable, and the Owner does not issue a Certificate of Substantial Completion, the Owner shall be entitled to charge the Contractor with the Designer’s and Owner’s costs of re-inspection, including time and travel.

B. Partial Occupancy. Contractor agrees that the Owner shall be permitted to occupy and use any completed or partially completed portions of the Project, when such occupancy and use is in the Owner’s best interest. Owner shall notify Contractor of its desire and intention to take Partial Occupancy as soon as possible but at least ten (10) working days before the Owner intends to occupy. If the Contractor believes that the portion of the work the Owner intends to occupy is not ready for occupancy, the Contractor shall notify the Owner immediately. The Designer shall inspect the work in accordance with the procedures above. If the Contractor claims increased cost of the project or delay in completion as a result of the occupancy, he shall notify the Owner immediately but in all cases before occupancy occurs.

C. Final Completion. The Project is finally complete when the Certificate of Substantial Completion has been issued and all work items identified therein as incomplete have been completed, and when all administrative items required by the contract have been completed. Final Completion entitles the Contractor to payment of the outstanding balance of the contract amount including all change orders and retainage. Within five (5) working days of the date of the Certificate of Substantial Completion, the Contractor shall identify the cost to complete any outstanding items of work. The Designer shall review the Contractor’s estimate and either approve it or provide an independent estimate for all such items. If the Contractor fails to complete the remaining items within the time specified in the Certificate, the Owner may terminate the contract and go to the surety for project completion in accordance with Article 7.2 or release the contract balance to the Contractor less 150% of the approved estimate to complete the outstanding items. Upon completion of the outstanding items, when a final cost has been established, any monies remaining shall be paid to the Contractor. Failure to complete items of work does not relieve the Contractor from the obligation to complete the administrative requirements of the contract, such as the provisions of Article 5.3 FAILURE TO COMPLETE ALL ITEMS OF WORK UNDER THE CONTRACT SHALL BE CONSIDERED A DEFAULT AND BE GROUNDS FOR CONTRACT TERMINATION AND DEBARMENT.

D. Liquidated Damages. Contractor agrees that the Owner may deduct from the contract price and retain as liquidated damages, and not as penalty or forfeiture, the sum stipulated in this contract for each work day after the Contract Completion Day on which work is not Substantially Complete. Assessment of Liquidated Damages shall not relieve the Contractor or the surety of any responsibility or obligation under the Contract. In addition, the Owner may, without prejudice to any other rights, claims, or remedies the Owner may have including the right to Liquidated Damages, charge the Contractor for all additional expenses incurred by the Owner and/or Designer as the result of the extended contract period through Final Completion. Additional Expenses shall include but not be limited to the costs of additional inspections.

E. Early Completion. The Contractor has the right to finish the work before the contract completion date; however, the Owner assumes no liability for any hindrances to the Contractor unless Owner caused delays result in a time extension to the contract completion date. The Contractor shall not be entitled to any claims for lost efficiencies or for delay if a Certificate of Substantial Completion is given on or before the Contract Completion Date.

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

A. Payments on account of this contract will be made monthly in proportion to the work which has been completed. Request for payment must be submitted on the Owner’s forms. No other pay request will be processed. Supporting breakdowns must be in the same format as Owner’s forms and must provide the same level of detail. The Designer will, within 5 working days from receipt of the contractor’s request for payment either issue a Certificate for Payment to the Owner, for such amount as the Designer determines is properly due, or notify the Contractor in writing of reasons for withholding a Certificate. The Owner shall make
payment within 30 calendar days after the "Application and Certification for Payment" has been received and certified by the Designer. The following items are to be attached to the contractor's pay request:

1. Updated construction schedule
2. Certified payrolls consisting of name, occupation and craft, number of hours worked and actual wages paid for each individual employee, of the Contractor and all subcontractors working on the project

B. The Owner shall retain 5 percent of the amount of each such payment application, except as allowed by Article 5.4, until final completion and acceptance of all work covered by this contract.

C. Each payment made to Contractor shall be on account of the total amount payable to Contractor and all material and work covered by paid partial payment shall thereupon become the sole property of Owner. This provision shall not be construed as relieving Contractor from sole responsibility for care and protection of materials and work upon which payments have been made or restoration of any damaged work or as a waiver of the right of Owner to require fulfillment of all terms of this contract.

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

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

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

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

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

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

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

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

1. Where the specifications provide for the performance by the Contractor of certain tests for the purpose of balancing and checking the air conditioning and heating equipment and the Contractor shall have furnished and installed all such equipment in accordance with the specifications, but said test cannot then be made because of climatic conditions, such test shall 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 Employer's 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 its officers, officials, agents, consultants or employees.

3. Workers' Compensation/Employer’s Liability

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

4. All Coverages

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

F. Insurer Qualifications and Acceptability

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

G. Verification of Insurance Coverage

Prior to Owner issuing a Notice to Proceed, the Contractor shall furnish the Owner with Certificate(s) of Insurance and with any applicable original endorsements evidencing the required insurance coverage. The insurance certificates and endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates and endorsements received by the Owner are subject to review and approval by the Owner. The Owner reserves the right to require certified copies of all required policies at any time. If the scope of this contract will exceed one (1) year or, if any of Contractor's applicable insurance coverage expires prior to completion of the work or services required under this contract - the Contractor will provide a renewal or replacement certificate before continuing work or services hereunder. If the Contractor fails to provide documentation of required insurance coverage, the Owner may issue a stop work order and no additional contract completion time and/or compensation shall be granted as a result thereof.
ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

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

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

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

2. In the event the Owner suspends Contractor's right to proceed with the work or terminates the contract, the Owner may demand that the Contractor's surety take over and complete the work on this contract, after the surety submits a written proposal to the Owner and receives written approval and upon the surety's failure or refusal to do so within ten (10) consecutive calendar days after demand 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: Brian Steiner, AIA
George Butler Associates, Inc.
9801 Renner Blvd
Lenexa, KS  66219 9745
Telephone:  913-577-8834; Fax:  913-577-8264
Email: bsteiiner@gbateam.com

Construction Representative: Randy Duncan
Division of Facilities Management, Design and Construction
709 Missouri Boulevard (Upper Level), Jefferson City, Missouri 65109
Telephone:  573-619-4395; Fax:  573-522-1763
Email: Randy.Duncan@oa.mo.gov

Project Manager: Jared Cook
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri  65102
Telephone:  573-690-6733; Fax:  573-751-7277
Email: Jared.Cook2@oa.mo.gov

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

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

4.0 FURNISHING CONSTRUCTION DOCUMENTS:
A. The Owner will furnish the Contractor with approximately 10 complete sets of drawings and specifications at no charge.
B. The Owner will furnish the Contractor with approximately 10 sets of explanatory or change drawings at no charge.
C. The Contractor may make copies of the documents as needed with no additional cost to the Owner.

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

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

SECTION 007300 – SUPPLEMENTARY CONDITIONS  Page 1 of 1
Annual Wage Order No. 26
Section 080
PETTIS COUNTY

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

Original Signed by
Taylor Burks, Director
Division of Labor Standards

Filed With Secretary of State: March 8, 2019

Last Date Objections May Be Filed: April 8, 2019
<table>
<thead>
<tr>
<th>OCCUPATIONAL TITLE</th>
<th>** Date of Increase</th>
<th>Basic Hourly Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos Worker</td>
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<td>Boilermaker</td>
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<tr>
<td>Cement Mason</td>
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<tr>
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<tr>
<td>Electrician Outside Lineman</td>
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<tr>
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<tr>
<td>Lineman - Tree Trimmer</td>
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<tr>
<td>Groundman</td>
<td></td>
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<td>Groundman - Tree Trimmer</td>
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<tr>
<td>Elevator Constructor</td>
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<tr>
<td>Glazier</td>
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<tr>
<td>Ironworker</td>
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<tr>
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<tr>
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<tr>
<td>Truck Control Service Driver</td>
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</tr>
</tbody>
</table>

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

**Annual Incremental Increase**

ANNUAL WAGE ORDER NO. 26
<table>
<thead>
<tr>
<th>OCCUPATIONAL TITLE</th>
<th>** Date of Increase</th>
<th>Basic Hourly Rates</th>
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<tbody>
<tr>
<td>Carpenter</td>
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<td>$20.23*</td>
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<td>Groundman</td>
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<td>Laborer</td>
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<tr>
<td>Group IV</td>
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</tbody>
</table>

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

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

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

*The Division of Labor Standards received less than 1,000 reportable hours as required by RSMo 290.257.4(b). Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center, in accordance with RSMo 290.257.2.
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 addition of new campsites located in the northwest corner of the fairground.
   1. Project Location: 2503 West 16th Street, Sedalia, Missouri 65301.
   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 August 22, 2019 were prepared for the Project by George Butler Associates, Inc.

C. The Work consists of 137 new campsites, power and sanitary hookups at each site, grading, gravel roads, and landscaping.

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

1.3 DESIGNER’S ESTIMATE OF CONSTRUCTION COSTS

A. $1,242,000 - $1,708,000

1.4 WORK UNDER OTHER CONTRACTS

A. Separate Contract: None.

1.5 FUTURE WORK

A. Future Contract: None.

1.6 WORK SEQUENCE

A. The Work will be conducted in a single phase and shall be substantially complete by April 30, 2020.

1.7 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor’s use of the premises limited only by the Owner’s right to perform work or to retain other contractors on portions of the Project.
B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.

2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner’s employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Use of the Existing Building: Not Applicable.

1.8 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.

1.9 OWNER-FURNISHED PRODUCTS (Not Applicable)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 011000
SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

B. Related Sections include the following:
   1. Division 1, Section 012100 "Allowances" for procedural requirements for handling and processing Allowances.
   2. Division 1, Section 012200 "Unit Prices" for administrative requirements for using Unit Prices.
   3. Division 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
   4. Division 0, Section 007213, Article 4.0 "Changes in the Work" for Contract Change requirements.

1.3 REQUESTS FOR INFORMATION

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

B. Responses to RFI shall be issued within ten (10) working days of receipt of the Request from the Contractor unless the Designer determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Designer, the Designer will, within five (5) working days of receipt of the request, notify the Contractor of the anticipated response time. If the Contractor submits a RFI on a time sensitive activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Designer to respond to the request provided that the Designer responds within the ten (10) working days set forth above.

C. Responses from the Designer will not change any requirement of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change to the requirements of the Contract Document, the Contractor shall give written
notice to the Designer requesting a Contract Change for the work. Failure to give such written notice within ten (10) working days, shall waive the Contractor’s right to seek additional time or cost under Article 4, “Changes in the Work” of the General Conditions.

1.4 MINOR CHANGES IN THE WORK

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

1.5 PROPOSAL REQUESTS

A. The Designer or Owner Representative will issue a detailed description of proposed Changes in the Work that may require adjustment to the Contract Amount or the Contract Time. The proposed Change Description will be issued using the “Request for Proposal” (RFP) form. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by the Designer or Owner Representative are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.

2. Within ten (10) working days after receipt of Proposal Request, submit a proposal for the cost adjustments to the Contract Amount and the Contract Time necessary to execute the Change. The Contractor shall submit his proposal on the appropriate Contract Change Detailed Breakdown form. Subcontractors may use the appropriate Contract Change Detailed Breakdown form or submit their proposal on their letterhead provided the same level of detail is included. All proposals shall include:

   a. A detailed breakdown of costs per Article 4.1 of the General Conditions.

   b. If requesting additional time per Article 4.2 of the General Conditions, include an updated Contractor's Construction Schedule that indicates the effect of the Change including, but not limited to, changes in activity duration, start and finish times, and activity relationship.

1.6 CONTRACT CHANGE PROCEDURES

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REFERENCED FORMS

A. The following forms can be found on our website at https://oa.mo.gov/facilities/vendor-links/architectengineering-forms or https://oa.mo.gov/facilities/vendor-links/contractor-forms:

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

END OF SECTION 012600
SECTION 013100 – COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Projects including, but not limited to, the following:
   1. Coordination Drawings.
   2. Administrative and supervisory personnel.
   3. Project meetings.

B. Each Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific Contractor.

C. Related Sections include the following:
   1. Division 1, Section 013200 "Schedules" for preparing and submitting Contractor's Construction Schedule.
   3. Article 5.4.H of Section 007213 "General Conditions" for coordinating Closeout of the Contract.

1.3 COORDINATION

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

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

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

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

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

1.4 SUBMITTALS

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

B. Key Personnel Names: Within 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 Contract Changes
      e. Purchases
      f. Deliveries
      g. Submittals
      h. Review of mockups
      i. Possible conflicts
      j. Compatibility problems
      k. Time schedules
      l. Weather limitations
      m. Manufacturer's written recommendations
      n. Warranty requirements
      o. Compatibility of materials
p. Acceptability of substrates
q. Temporary facilities and controls
r. Space and access limitations
s. Regulations of authorities having jurisdiction
t. Testing and inspecting requirements
u. Installation procedures
v. Coordination with other Work
w. Required performance results
x. Protection of adjacent Work
y. Protection of construction and personnel

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

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

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

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100
SECTION 013200 – SCHEDULES – CRITICAL PATH METHOD

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 CONSTRUCTION PROGRESS SCHEDULE – CRITICAL PATH METHOD (CPM)

A. This Section includes administrative and procedural requirements for the Critical Path Method (CPM) of scheduling and reporting progress of the Work.

1. Refer to the General Conditions and the Agreement for definitions and specified dates of Contract Time.

2. Due to the scheduling sensitivity of this Project and the need for the Owner to closely monitor all levels of activity, the following personnel and reporting requirements are mandatory.

B. CPM Definitions

1. Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations determine when activities can be performed and the critical path of the Project.

2. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall project duration.

3. Network Diagram: A graphic diagram of a network schedule, showing the activities and activity relationships.

4. Activity: A discrete part of a project than can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

a. Critical activities are activities on the critical path.

b. Predecessor activity is an activity that must be completed before a given activity can be started.

5. Event: An event is the starting or ending point of an activity.

6. Milestone: A key or critical point in time for reference or measurement.

7. Float or Slack Time: The measure of leeway in activity performance. Accumulative float time is not for the exclusive use or benefit of the Owner or Contractor, but is a project resource available to both parties as needed to meet contract milestones and the completion date.

a. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.

b. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned project completion date.
8. Inclement Weather: Adverse weather conditions affecting the critical path.

C. CPM Quality Assurance

1. The Owner’s Consultant shall assist in planning, evaluating, and reporting by CPM Scheduling.

2. The Contractor is responsible for developing its own schedule logic and activities with appropriate duration, restraints and relationships. All information must be acceptable and compatible with the Owner’s needs. All target, completion, and milestone dates generated must be acceptable to the Owner and meet the requirements of the Contract Documents including the Statement of Work in the Agreement.

3. The Owner reserves the right to reject any schedule or report that fails to reflect timely completion of the Project, or any intermediate milestone, or otherwise indicates unrealistic performance. Failure of the Contractor to deliver satisfactory schedules or reports to the Owner may result in temporary suspension of progress payments at the Owner’s sole discretion.

1.3 PROJECT INSPECTION

A. The Owner will designate the time for a regular monthly update inspection at which time representatives of the Owner, Designer, and Contractor will inspect the Project and agree on progress of all activities. The information so obtained may be the basis for the Contractor’s monthly schedule update.

1.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site
2. List of separate contractors at Project site
3. Approximate count of personnel at Project site
4. Equipment at Project site
5. Material deliveries
6. High and low temperatures and general weather conditions
7. Accidents
8. Meetings and significant decisions
9. Unusual events (refer to special reports)
10. Stoppages, delays, shortages, and losses
11. Meter readings and similar recordings
12. Emergency procedures
13. Orders and requests of authorities having jurisdiction
14. Change Orders received and implemented
15. Services connected and disconnected
16. Equipment or system tests and startups
17. Partial Completions and Occupancies
18. Substantial Completions authorized

PART 2 - PRODUCTS

2.1 HARDWARE – Reserved

2.2 CPM SCHEDULING SOFTWARE

A. The Contractor will use Primavera Project Planner (P6) or other approved scheduling software.

2.3 CPM SCHEDULING PERSONNEL

A. The Contractor is to designate a person who will have all scheduling responsibilities for this Work. That individual must have had previous scheduling responsibilities on similar construction projects. The Contractor shall submit the resume of the designated person for approval by Owner prior to the Notice to Proceed.

B. The Owner will designate the time and location for regular Monthly Progress Meetings. The Contractor is required to attend these Meetings. Current schedule, job progress, delays, projections, problem issues, alternatives, and applications for payment will be among the priority items addressed in detail at these meetings.

PART 3 - EXECUTION

3.1 CONSTRUCTION PROGRESS SCHEDULE – CRITICAL PATH METHOD (CPM)

A. Preliminary Schedule:

1. The Contractor's Preliminary CPM Schedule including Schedule of Values shall be submitted before the first pay application is approved. The preliminary network diagram shall outline activities for the first (60) days of construction. Include a skeleton diagram for the remainder of the Work with the preliminary diagram. This schedule will be the basis for pay applications for the first (60) days.

   a. Include each significant construction activity. Coordinate each activity in the network with other activities. Schedule each construction activity in proper sequence.

   b. Include an activity showing the contract weather allowance time – if any.

   c. Indicate completion of the Work on the date established for Substantial Completion.

   d. A tabular activity list.
e. In addition to submitting paper copies of schedule reports, updates, and plots, the Contractor shall submit all diskettes containing all required schedule information.

2. Cash Requirement Prediction: With submittal of the preliminary network diagram, include a preliminary cash requirement prediction based on indicated activities.

3. Distribution: Distribute the preliminary network diagram to parties involved in construction activities that are scheduled early, including the Designer and the Owner.

B. Schedule Submittals:

1. In preparing the CPM Schedule, the Contractor shall include procurement, submittal, approval, fabrication, and delivery activities for review and approval by the Owner.

2. Submittal and Distribution: Submit (3) copies of the initial issue of the tabulations and network for acceptance. When authorized, distribute copies to the Designer, Owner's CPM Consultant, and the Owner, separate Contractors, subcontractors, and suppliers or fabricators, and others identified by the Contractor with a need-to-know schedule responsibility.
   a. Post copies in the Project meeting rooms and temporary field offices.
   b. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in the performance of construction activities.
   c. Submit copies of each computer-produced report to the Designer.

3. Schedule Updating: Revise the Schedule within five (5) working days after each meeting or other activity, where revisions have been recognized or made. Issue the updated Schedule concurrently with the report of each project meeting.
   a. Weekly: On a weekly basis, the current detailed construction schedule (Three Week Look Ahead Schedule) shall be provided by the Contractor, at the request of the Owner. This information shall include a brief written report describing activities begun or finished, during the preceding week and a projection of all activities to be started or finished in the next three weeks.
   b. Monthly: Each month, the Contractor shall provide current, detailed construction schedule information consisting of certified tabular data and summaries, which show all changes to the schedule which have occurred since the previous submission of schedule information and indicates progress of each activity and shown completion dates. The submittal shall include major changes in scope, logic changes, activities modified since previous update, identification of any slippage, revised projections due to changes, out-of-sequence progress, and other identifiable changes.

4. In the event a revised detailed schedule is not acceptable to the Owner, the Schedule shall be revised within five (5) working days by the Contractor until it is found acceptable by the Owner.
5. The Contractor shall submit an updated schedule to CPM Consultant a minimum of five (5) working days prior to the scheduled Monthly Progress Meeting.

6. In the event that the Contractor fails to provide the required Schedules, reports, or updates noted above, in a timely manner, the Owner shall have the right to withhold all progress payments until such time as acceptable scheduling documentation is received.

7. Following each update, the Contractor shall distribute copies of the updated schedule to subcontractors, designer, and Owner.

C. Schedule Requirements:

1. Within (30) days after approval of the proposed preliminary network diagram, the Contractor shall submit draft of proposed complete network diagram for review. Upon request, include written certification that major subcontractors have reviewed and accepted the proposed schedule.

2. Within (15) days after joint review of proposed complete network diagram, submit final complete network diagram. The Owner anticipates a final base line schedule acceptable to the CPM Consultant within (90) days from Contractor's Notice to Proceed.

3. All relevant data is to be acquired and processed and reports prepared and submitted by the person designated to be responsible for the Project Schedule.

4. The scheduled logic for the Work shall be developed by the Contractor and approved by the Owner, along with established duration for each activity. Activity numbers shall be based on a reasonable, rational system for identification purposes. As a minimum, along with the activity numbers, include the building/area and type of work by trade and subcontractor company activity codes.

5. Participate in joint review and evaluation of network diagrams and analysis with Owner, Owner's CPM Consultant, and Designer at each submittal above.
   a. Following joint review of the final completion network diagram, distribute copies of the schedule to subcontractors, suppliers, designer, and Owner.

6. The detailed construction schedule submitted by the Contractor shall reflect complete sequence of construction by activity including:
   a. Procurement and delivery dates for long lead items
   b. Contractual milestone dates
   c. Dates for beginning and completion of each element of construction
   d. Disruptions and shutdowns due to other operations, facilities, functions, or testing agencies' activities
   e. Planned periods of inactivity on the project
   f. Anticipated periods of overtime or shift work
   g. Dates for installation and testing of all equipment
   h. Cleanup
i. Contract startup and closeout

7. Identify work for separate buildings or areas and other logically grouped activities.

8. The schedule is to show projected percentage of completion for each item of work as of the last day of each month. Each item of work shall be cost loaded.

9. Provide special schedules to define critical portions of the entire schedule as requested by Owner.

10. Incorporate the procurement submittal schedule.
   a. Discrete activities shall be separated by trade or other category as requested by the Owner and separate activities shall be assigned activity numbers for use and monitoring.
   b. Separate activities shall be reflected in a level of detail such that no activity shall be of greater duration than (15) days. Specific exceptions must be requested in writing.

11. Provide recovery plan to complete the project within the contract completion time as requested by Owner.

12. The schedule activities shall be cost loaded per the schedule of values and will be used as the basis for the Contractor's monthly pay applications including:
   a. Milestone and zero duration activities shall not be dollar loaded.
   b. The dollar value for each activity will be the cost including labor, materials, equipment, and pro rata contribution to overhead and profit. The Contractor shall make the sum of all activity costs equal to the total Contract sum.
   c. The Contractor shall provide a “General Conditions” activity which shall include all Contractor jobsite costs. This activity cost shall be distributed evenly for the entire duration of the Contract. The Contractor shall furnish a detailed listing to the Owner of the items and their associated costs included in this activity.
   d. Separate activities should be shown for mobilization and demobilization. These should be equal cost amounts.
   e. “Front-end” dollar loading of construction activities will not be allowed.

13. Contract Changes that extend the Contract Completion Date shall be shown as a new activity. This schedule impact shall be submitted with the Contract Change proposal showing float used and/or impact on the critical path.

14. If a Contract Change results in a compensable time extension, the daily General Condition rate defined above will be used. It will be added to the Contract Change and will be excluded from overhead and profit markup as allowed by the General Conditions.
   a. Any additional General Condition monies associated with the approved additional time will be added on a daily basis to the end of the project. The additional time granted per the contract change shall also be added to the end of the latest approved contract completion date. These additional General Condition monies shall be held by the Owner and not
paid to the Contractor until the project’s original contract time has been exceeded.

b. If the Owner grants the Contractor Substantial Completion prior to the most current Contract Completion date, then for any and all contract days remaining beyond the date of Substantial Completion, the Contractor and Owner shall share on a 50% - 50% basis, all previously approved extended daily General Conditions costs.

c. If the change warrants a reduction in contract time, for any reason, then the Owner shall deduct as part of the change 50% of the applicable pro rata share of the General Conditions monies as shown in the Schedule of Values.

D. Reporting:

1. Contractor reports shall include monthly updates, and as requested by Owner, revised network logic diagrams, and activity lists. The monthly updates may be accompanied by certificates that all data submitted is complete and current (See sample at end of this Section).

2. Contractor network diagrams shall legibly show the order and interdependence of activities, and the sequence in which the work is to be accomplished as planned by the Contractor. Networks shall be drawn on 24" by 36" or 11" by 17" sized sheets, as directed by Owner, with title, match data, and date of latest version on each sheet.

3. Tabular Activity Lists shall be provided and shall show one activity per line along with appropriate data for the purpose intended including various combinations of the following:
   a. Activity ID number
   b. Activity description
   c. Preceding and succeeding activities and descriptions
   d. Original duration (in working days)
   e. Remaining duration (in working days)
   f. Percent complete
   g. Earliest start date (by calendar date)
   h. Earliest finish date (by calendar date)
   i. Latest start date (by calendar date)
   j. Latest finish date (by calendar date)

4. Narrative: A written narrative shall be required by Owner under the following circumstances:
   a. Added, deleted, or changed activities including logic and budget changes
   b. To explain out-of-sequence progress
   c. To detail procurement/delivery problems
d. To describe recovery plans, if the Contractor fails to maintain its schedule

e. To explain any schedule item which requires clarification as directed by the Owner

3.2 SCHEDULE OF SUBMITTALS

A. Tabulation of Submittals: With submittal of the preliminary network diagram, include a tabulation by date of submittals required during the first (90) days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead-time for manufacture or fabrication.

B. Upon acceptance of the CPM 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.

C. 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

D. 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.

E. 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.

3.3 SCHEDULE OF INSPECTIONS AND TESTS

A. Upon acceptance of the CPM Construction Progress Schedule, prepare and submit within (15) working days a complete schedule of inspections, tests, and similar services required by the Contract Documents.

B. Form: The 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, Designer, and each party involved in performance of portions of the Work where inspections and tests are required.

END OF SECTION 013200
SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work including the following:
   1. Shop Drawings
   2. Product Data
   3. Samples
   4. Quality Assurance Submittals
   5. Construction Photographs
   6. Operating and Maintenance Manuals
   7. Warranties

B. Administrative Submittals: Refer to General and Supplementary Conditions other applicable Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
   1. Construction Progress Schedule including Schedule of Values
   2. Performance and Payment Bonds
   3. Insurance Certificates
   4. Applications for Payment
   5. Certified Payroll Reports
   6. Partial and Final Receipt of Payment and Release Forms
   7. Affidavit – Compliance with Prevailing Wage Law
   8. Record Drawings
   9. Notifications, Permits, etc.

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

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

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

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

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
   a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

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

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

1.4 SHOP DRAWINGS

A. Comply with the General Conditions, Article 3.2.

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

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

1. Dimensions
2. Identification of products and materials included by sheet and detail number
3. Compliance with specified standards
4. Notation of coordination requirements
5. Notation of dimensions established by field measurement
6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8½”x11” but no larger than 36”x48”.

1.5 PRODUCT DATA

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

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

1.6 SAMPLES

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

B. The Contractor shall submit full-size, fully fabricated samples, cured and finished as specified, and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.
1. The Contractor shall mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Designer’s sample including the following:
   a. Specification Section number and reference
   b. Generic description of the Sample
   c. Sample source
   d. Product name or name of the Manufacturer
   e. Compliance with recognized standards
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 electronic photographs as directed by the construction representative.
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.

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END OF SECTION 013300
SECTION 013513.28 – SITE SECURITY AND HEALTH REQUIREMENTS (State Fair)

PART 1 - GENERAL

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

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ACCESS TO THE SITE
A. The Contractor shall arrange with Facility Representatives to establish procedures for the controlled entry of workers and materials into the work areas at the Facility.

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

C. The Contractor shall provide the name and phone number of the Contractor’s employee or agent who is in charge onsite; this individual must be able to be contacted in case of emergency. The Contractor must be able to furnish names and address of all employees upon request.

D. All construction personnel shall visibly display issued identification cards.

3.2 FIRE PROTECTION, SAFETY, AND HEALTH CONTROLS
A. The Contractor shall take all necessary precautions to guard against and eliminate possible fire hazards.
   1. Onsite burning is prohibited.
   2. The Contractor shall store all flammable or hazardous materials in proper containers located outside the buildings or offsite, if possible.
3. The Contractor shall provide and maintain, in good order, during construction fire extinguishers as required by the National Fire Protection Association. In areas of flammable liquids, asphalt, or electrical hazards, 15-pound carbon dioxide or 20-pound dry chemical extinguishers shall be provided.

B. The Contractor shall not obstruct streets or walks without permission from the Owner’s Construction Representative and Facility Representatives.

C. The Contractor’s personnel shall not exceed the speed limit of 15 mph while at the Facility unless otherwise posted.

D. The Contractor shall take all necessary, reasonable measures to reduce air and water pollution by any material or equipment used during construction. The Contractor shall keep volatile wastes in covered containers, and shall not dispose of volatile wastes or oils in storm or sanitary drains.

E. The Contractor shall keep the project site neat, orderly, and in a safe condition at all times. The Contractor shall immediately remove all hazardous waste, and shall not allow rubbish to accumulate. The Contractor shall provide onsite containers for collection of rubbish and shall dispose of it at frequent intervals during the progress of the Work.

F. Fire exits, alarm systems, and sprinkler systems shall remain fully operational at all times, unless written approval is received from the Owner’s Construction Representative and the appropriate Facility Representative at least twenty-four (24) hours in advance. The Contractor shall submit a written time schedule for any proposed shutdowns.

G. For all hazardous materials brought onsite, Material Safety Data Sheets shall be on site and readily available upon request at least a day before delivery.

H. Alcoholic beverages or illegal substances shall not be brought upon the Facility premises. The Contractor’s workers shall not be under the influence of any intoxicating substances while on the Facility premises.

3.3 SECURITY CLEARANCES AND RESTRICTIONS

A. FMDC REQUIRED FINGERPRINTING FOR CRIMINAL BACKGROUND AND WARRANTS CHECK

1. All employees of the Contractor are required to submit fingerprints to the Missouri State

2. Highway Patrol to enable the Office of Administration, Division of Facilities Management, Design and Construction (FMDC) to receive state and national criminal background checks on such employees. FMDC will also check with law enforcement to determine if any of the Contractor’s employees has an outstanding warrant for his or her arrest. FMDC reserves the right to prohibit any employee of the Contractor from performing work in or on the premises of any facility owned, operated, or utilized by the State of Missouri for any reason.

3. The Contractor shall ensure all of its employees submit fingerprints to the Missouri State Highway Patrol and pay for the cost of such background checks.
The Contractor shall submit to FMDC a list of the names of the Contractor’s employees who will be fingerprinted and a signed Missouri Applicant Fingerprint Privacy Notice, Applicant Privacy Rights and Privacy Act Statement for each employee. All employees of the Contractor approved by FMDC to work at a State facility must obtain a contractor ID badge from FMDC prior to beginning work on-site, unless the Director of FMDC, at the Director’s discretion, waives the requirement for a contractor ID badge. The Contractor and its employees must comply with the process for background checks and contractor ID badges found on FMDC’s website at: https://oa.mo.gov/fmdc-contractor-id-badges

4. Pursuant to section 43.540, RSMo, FMDC participates in the Missouri Rap Back and National Rap Back programs as of August 28, 2018. This means that the Missouri State Highway Patrol, Central Records Repository, and the Federal Bureau of Investigation will retain the fingerprints submitted by each of the Contractor’s employees, and those fingerprints will be searched against other fingerprints on file, including latent fingerprints. While retained, an employee’s fingerprints may continue to be compared against other fingerprints submitted or retained by the Federal Bureau of Investigation, including latent fingerprints.

5. As part of the Missouri and National Rap Back programs, FMDC will receive notification if a new arrest is reported for an employee whose fingerprints have been submitted for FMDC after August 28, 2018. If the employee is performing work on a State contract at the time of the arrest notification, FMDC will request and receive the employee’s updated criminal history records. If the employee is no longer performing work on a State contract, FMDC will not obtain updated criminal records.

6. Pursuant to section 43.540, RSMo, the Missouri State Highway Patrol will provide the results of the employee’s background check directly to FMDC. FMDC may NOT release the results of a background check to the Contractor or provide the Contractor any information obtained from a background check, either verbally or in writing. FMDC will notify the Contractor only whether an employee is approved to work on State property.

Each employee who submits fingerprints to the Missouri State Highway Patrol has a right to obtain a copy of the results of his or her background check. The employee may challenge the accuracy and completeness of the information contained in a background check report and obtain a determination from the Missouri State Highway Patrol and/or the FBI regarding the validity of such challenge prior to FMDC making a final decision about his or her eligibility to perform work under a State contract.

7. The Contractor shall notify FMDC if an employee is terminated or resigns from employment with the Contractor. If the Contractor does not anticipate performing work on a State contract in the future, the Contractor may request that FMDC remove its employees from the Rap Back programs. However, if removed from the Rap Back programs, employees will be required to submit new fingerprints should the contractor be awarded another State contract.

8. Upon award of a Contract, the Contractor should contact FMDC to determine if its employees need to provide a new background check. If a Contractor’s
employee has previously submitted a fingerprint background check to FMDC as part of the Missouri and National Rap Back programs, the employee may not need to submit another fingerprint search for a period of three to six years, depending upon the circumstances. The Contractor understands and agrees that FMDC may require more frequent background checks without providing any explanation to the Contractor. The fact that an additional background check is requested by FMDC does not indicate that the employee has a criminal record.

3.4 DISRUPTION OF UTILITIES

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

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

END OF SECTION 013513.28
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
   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, the following:
   1. Temporary fire protection
   2. Barricades, warning signs, and lights
   3. Enclosure fence for the site
   4. Environmental protection
1.3 SUBMITTALS

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

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

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations including, but not limited to, the following:
   1. Building code requirements
   2. Health and safety regulations
   3. Utility company regulations
   4. Police, fire department, and rescue squad rules
   5. Environmental protection regulations

   1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 “National Electric Code”.

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist onsite.
PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. If acceptable to the Designer, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Lumber and Plywood:
1. For job-built temporary office, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.
2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sized and thicknesses indicated.
3. For fences and vision barriers, provide minimum 3/9” (9.5mm) thick exterior plywood.
4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8” (16mm) thick exterior plywood.

C. Paint:
1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.
2. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.
3. For interior walls of temporary offices, provide two (2) quarts interior latex-flat wall paint.

D. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of (15) or less. For temporary enclosures, provide translucent, nylon-reinforced laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

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

F. Open-Mesh Fencing: Provide 0.120” (3mm) thick, galvanized 2” (50mm) chainlink fabric fencing 6’ (2m) high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1½” (38mm) ID for line posts and 2½” (64mm) ID for corner posts.

2.2 EQUIPMENT

A. General: Provide new equipment. If acceptable to the Designer, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

B. Water Hoses: Provide ¼” (19mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100’ (30m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110 to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage rating.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixture where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

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

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

I. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.
   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

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

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

3.2 TEMPORARY UTILITY INSTALLATION

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

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

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

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

4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Designer. Neither the Owner nor Designer will accept cost or use charges as a basis of claims for Contract Change.

B. Temporary Water Service: Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

1. Sterilization: Sterilize temporary water piping prior to use.

C. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.

1. Install electric power service underground, except where overhead service must be used.

2. Power Distribution System: Install wiring overhead and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125V, AC 20ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.

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

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

E. Temporary Heating: Provide temporary heat required by construction activities for curing or drying of completed installations or for protection of installed construction from adverse effects of low temperatures or high humidity. Select safe equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

1. Heating Facilities: Except where the Owner authorizes use of the permanent system, provide vented, self-contained, LP gas or fuel-oil heaters with individual space thermostatic control.

2. Use of gasoline-burning space heaters, open flame, or salamander heating units is prohibited.
F. Temporary Telephones: Provide temporary telephone service throughout the construction period for all personnel engaged in construction activities.
   1. Telephone Lines: Provide telephone lines for the following:
      a. Where an office has more than two (2) occupants, install a telephone for each additional occupant or pair of occupants.
      b. Provide a dedicated telephone for a fax machine in the field office.
      c. Provide a separate line for the Owner’s use.
   2. At each telephone, post a list of important telephone numbers.

G. Temporary Toilets: Install self-contained toilet units. Use of pit-type privies will not be permitted. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project’s needs.
   1. Shield toilets to ensure privacy.
   2. Provide separate facilities for male and female personnel.
   3. Provide toilet tissue materials for each facility.

H. Wash Facilities: Install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a health and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.
   1. Provide paper towels or similar disposable materials for each facility.
   2. Provide covered waste containers for used material.
   3. Provide safety showers, eyewash fountains, and similar facilities for convenience, safety, and sanitation of personnel.

I. Drinking-Water Facilities: Provide containerized, tap-dispenser, bottled-water drinking-water units, including paper supply.
   1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45°F to 55°F (7°C to 13°C).

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

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.
   1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
B. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip office as follows:
   1. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table, plan rack, and a 6-shelf bookcase.

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

D. Temporary Paving: Construct and maintain temporary roads and paving to support the indicated loading adequately and to withstand exposure to traffic during the construction period. Locate temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Designer.
   1. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.
   2. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.
   3. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.

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

F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
   1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and materials drying or curing requirements to avoid dangerous conditions and effects.
   2. Where temporary wood or plywood enclosure exceeds 100SqFt (9.2SqM) in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.

G. 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.

H. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.
1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.

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

   I. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.

   J. 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. 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. 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.

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

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

       2. Provide plywood fence, 8’ (2.5m) high, framed with (4) 2”x4” (50mm x 100mm) rails, and preservative-treated wood posts spaced not more than 8’ (2.5m) apart.

   D. 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.

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

### 3.5 OPERATION, TERMINATION AND REMOVAL

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

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

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

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

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

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

2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances as required by the governing authority.

**END OF SECTION 015000**
SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General
   1. Retain all stored items in an orderly arrangement allowing maximum access, not 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 twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the jobsite.
   4. Provide adequate storage for all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the ecology.

B. Site
   1. Daily, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
2. Weekly, inspect all arrangements of materials stored onsite. Re-stack, tidy, or otherwise service all material arrangements.

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

### 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 project site.

6. Clean exposed exterior 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. Remove labels that are not permanent labels.

9. 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.

10. Wipe surfaces of electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

11. 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.

12. Leave the Project clean and ready for occupancy.

**C.** Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.
D. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.

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

END OF SECTION 017400
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Design Mixtures: For each concrete mixture.
C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

A. Material certificates.
B. Material test reports.
C. Safety Data Sheets for all products.
D. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
B. Testing Agency Qualifications: An independent agency, qualified according to ASTM C1077 and ASTM E329 for testing indicated.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete Subcontractor.
   e. Special concrete finish Subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, forms and form removal limitations, steel reinforcement installation, and concrete repair procedures.

1.6 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 306.1.
   1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
   1. ACI 301 (ACI 301M).
   2. ACI 117 (ACI 117M).

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.4 CONCRETE MATERIALS

A. Cementitious Materials:
   1. Portland Cement: ASTM C150/C150M, Type I or Type II.
   2. Fly Ash: ASTM C618, Class F or C.

B. Normal-Weight Aggregates: ASTM C33/C33M, graded.
   1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C260/C260M.

D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
   1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
   2. Retarding Admixture: ASTM C494/C494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

E. Water: ASTM C94/C94M and potable.

2.5 CURING MATERIALS

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

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

2.6 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
B. Cementitious Materials: Use fly ash, as needed to reduce the total amount of portland cement, which would otherwise be used, by not more than 25 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for floor slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.48.

2.7 CONCRETE MIXTURES

A. Normal-Weight Concrete:
   1. Minimum Compressive Strength: 4,000psi Minimum.
   2. Maximum W/C Ratio: .48
   3. Slump Limit: 4 inches maximum or up to 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture.
   4. Air Content: 6% +/- 1%.

2.8 FABRICATING REINFORCEMENT

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

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94M, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

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

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).

C. Chamfer exterior corners and edges of permanently exposed concrete.
3.2 EMBEDDED ITEM INSTALLATION

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

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in AISC 303.

3.3 STEEL REINFORCEMENT INSTALLATION

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

3.4 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).

3.5 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, or to be covered with a coating or covering material applied directly to concrete.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.6 FINISHING

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch (6 mm).

3.7 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces. If forms remain during curing period, moist cure after loosenying forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days, using water on continuous water-fog spray.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

3.8 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.
3.9 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency shall immediately report to Engineer, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Engineer, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
   a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
      1) Project name.
      2) Name of testing agency.
      3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
      4) Name of concrete manufacturer.
      5) Date and time of inspection, sampling, and field testing.
      6) Date and time of concrete placement.
      7) Location in Work of concrete represented by samples.
      8) Date and time sample was obtained.
      9) Truck and batch ticket numbers.
     10) Design compressive strength at 28 days.
     11) Concrete mixture designation, proportions, and materials.
     12) Field test results.
     13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
     14) Type of fracture and compressive break strengths at seven days and 28 days.

B. Batch Tickets: For each load delivered, submit copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

C. Inspections:

1. Verification of use of required design mixture.
2. Concrete placement, including conveying and depositing.
3. Curing procedures and maintenance of curing temperature.
4. Verification of concrete strength before removal of shores and forms from beams and slabs.
D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M:
   a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31/C31M:
   a. Cast, initial cure, and field cure one set of four standard cylinder specimens for each composite sample.

6. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

7. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

8. Additional Tests:
   a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
   b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
1) Acceptance criteria for concrete strength shall be in accordance with ACI 301, section 1.6.6.3.

9. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

10. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000
SECTION 221113 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for water service and fire mains.

1.2 ACTION SUBMITTALS

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

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.

2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.

3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with ASTM F645 for selection, design, and installation of thermoplastic water piping.

D. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

F. NSF Compliance:

1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF-pw" on piping.

2. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.
1.4 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Construction Manager no fewer than three days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Construction Manager's and Owner's written permission.

1.5 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Soft Copper Tube: ASTM B88, Type K (ASTM B88M, Type A) and ASTM B88, Type L (ASTM B88M, Type B), water tube, annealed temper.


B. Hard Copper Tube: ASTM B88, Type K (ASTM B88M, Type A) and ASTM B88, Type L (ASTM B88M, Type B), water tube, drawn temper.


C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

E. PE, Fire-Service Pipe: ASTM F714, AWWA C906, or equivalent for PE water pipe; FMG approved, with minimum thickness equivalent to FMG.
   1. Molded PE Fittings: ASTM D3350, PE resin, socket- or butt-fusion type, made to match PE pipe dimensions and class.

F. PVC, AWWA Pipe: AWWA C900, with bell end with gasket, and with spigot end.
   1. Comply with UL 1285 for fire-service mains if indicated.
   2. PVC Fabricated Fittings: AWWA C900, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
   3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
   4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
   5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
      a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.2 JOINING MATERIALS
   A. Brazing Filler Metals: AWS A5.8, BCuP Series.
   B. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.
   C. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.3 PIPING SPECIALTIES
   A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.
   B. Tubular-Sleeve Pipe Couplings:
      1. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
2.4 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Nonrising-Stem, Metal-Seated Gate Valves:
   a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.
      1) Standard: AWWA C500.
      2) Minimum Pressure Rating: 200 psig (1380 kPa).
      3) End Connections: Mechanical joint.
      4) Interior Coating: Complying with AWWA C550.

2. Nonrising-Stem, Resilient-Seated Gate Valves:
   a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig (1380 kPa).
      3) End Connections: Mechanical joint.
      4) Interior Coating: Complying with AWWA C550.

3. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:
   a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.
      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 250 psig (1725 kPa).
      3) End Connections: Push on or mechanical joint.
      4) Interior Coating: Complying with AWWA C550.

4. OS&Y, Rising-Stem, Metal-Seated Gate Valves:
   a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.
      1) Standard: AWWA C500.
      2) Minimum Pressure Rating: 200 psig (1380 kPa).
      3) End Connections: Flanged.

5. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:
   a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.
      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig (1380 kPa).
End Connections: Flanged.

B. UL/FMG, Cast-Iron Gate Valves:

1. UL/FMG, Nonrising-Stem Gate Valves:
   a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.
      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig (1207 kPa).
      3) End Connections: Flanged.

2. OS&Y, Rising-Stem Gate Valves:
   a. Description: Iron body and bonnet and bronze seating material.
      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig (1207 kPa).
      3) End Connections: Flanged.

C. Bronze Gate Valves:

1. OS&Y, Rising-Stem Gate Valves:
   a. Description: Bronze body and bonnet and bronze stem.
      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig (1207 kPa).
      3) End Connections: Threaded.

2. Nonrising-Stem Gate Valves:
   a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.
      1) Standard: MSS SP-80.

2.5 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Description: Sleeve and valve compatible with drilling machine.
   a. Standard: MSS SP-60.
   b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches (125 mm) in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.6 CORPORATION VALVES AND CURB VALVES

A. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

B. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

C. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches (75 mm) in diameter.

1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.7 WATER METERS

A. Water meters will be furnished by utility company.

2.8 CONCRETE VAULTS

A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C857 and made according to ASTM C858. Vault to conform to Utility Company Standards.
1. Ladder: ASTM A36/A36M, steel or polyethylene-encased steel steps.
2. Manhole: ASTM A48/A48M Class No. 35A minimum tensile strength, gray-iron traffic frame and cover.
   a. Dimension: 24-inch (610-mm) minimum diameter, unless otherwise indicated.
3. Manhole: ASTM A536, Grade 60-40-18, ductile-iron traffic frame and cover.
   a. Dimension: 24-inch (610-mm) minimum diameter, unless otherwise indicated.
4. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.9 **FIRE HYDRANTS**

A. **Dry-Barrel Fire Hydrants:**
   1. Description: Freestanding, with one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, 5-1/4-inch (133-mm) main valve, drain valve, and NPS 6 (DN 150) mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
      b. Pressure Rating: minimum 250 psig (1725 kPa).
   2. Description: Freestanding, with one NPS 4-1/2 (DN 115) and two NPS 2-1/2 (DN 65) outlets, 5-1/4-inch (133-mm) main valve, drain valve, and NPS 6 (DN 150) mechanical-joint inlet. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
      a. Standards: UL 246, FMG approved.
      b. Pressure Rating: minimum 250 psig (1725 kPa).
      c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
      d. Operating and Cap Nuts: Pentagon, 1-1/2 inches (38 mm) point to flat.
      e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
      f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

**PART 3 - EXECUTION**

3.1 **EARTHWORK**

A. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.
3.2 **PIPING APPLICATIONS**

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

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping shall be per plan.

F. Water Meter Box Water-Service Piping shall be same as underground water-service piping.

3.3 **VALVE APPLICATIONS**

A. General Application: Use mechanical-joint-end valves for NPS 3 (DN 80) and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 (DN 50) and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 (DN 80) and Larger: AWWA, cast-iron, nonrising-stem, resilient seated gate valves with valve box.
2. Underground Valves, NPS 4 (DN 100) and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
3. Use the following for valves in vaults and aboveground:

   a. Gate Valves, NPS 2 (DN 50) and Smaller: Bronze, [nonrising] [rising] stem.
   b. Gate Valves, NPS 3 (DN 80) and Larger: [AWWA, cast iron, OS&Y rising stem, metal seated] [AWWA, cast iron, OS&Y rising stem, resilient seated] [UL/FMG, cast iron, OS&Y rising stem].

3.4 **PIPING INSTALLATION**

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
C. Make connections larger than NPS 2 (DN 50) with tapping machine according to the following:
   1. Install tapping sleeve and tapping valve according to MSS SP-60.
   2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
   3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main.
      Remove tapping machine and connect water-service piping.
   4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem
      pointing up and with valve box.

D. Make connections NPS 2 (DN 50) and smaller with drilling machine according to the following:
   1. Install service-saddle assemblies and corporation valves in size, quantity, and
      arrangement required by utility company standards.
   2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for
      corporation valves.
   3. Use drilling machine compatible with service-saddle assemblies and corporation valves.
      Drill hole in main. Remove drilling machine and connect water-service piping.
   4. Install corporation valves into service-saddle assemblies.
   5. Install manifold for multiple taps in water main.
   6. Install curb valve in water-service piping with head pointing up and with service box.

E. Comply with NFPA 24 for fire-service-main piping materials and installation.
   1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

F. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

G. Install PE pipe according to ASTM D2774 and ASTM F645.

H. Install PVC, AWWA pipe according to ASTM F645 and AWWA M23.

I. Bury piping with depth of cover over top at least 42 inches.

J. Extend water-service piping and connect to water-supply source and building-water-piping
   systems at outside face of building wall in locations and pipe sizes indicated.
   1. Terminate water-service piping at building wall until building-water-piping systems are
      installed. Terminate piping with caps, plugs, or flanges as required for piping material.
      Make connections to building-water-piping systems when those systems are installed.

K. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

L. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for
   Plumbing Piping."

M. Install underground piping with restrained joints at horizontal and vertical changes in direction.
   Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
3.5 JOINT CONSTRUCTION

A. Make pipe joints according to the following:

4. PE Piping Insert-Fitting Joints: Use plastic insert fittings and fasteners according to fitting manufacturer's written instructions.
5. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D2774 or ASTM D3139 and pipe manufacturer's written instructions.
6. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.6 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
4. Bolted flanged joints.
5. Heat-fused joints.
6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.
C. MSS Valves: Install as component of connected piping system.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.8 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions and specifications.

3.9 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated on building plans.

3.10 CONCRETE VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C891.

3.11 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.

C. AWWA Fire Hydrants: Comply with AWWA M17.

D. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.12 CONNECTIONS

A. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.

B. Connect water-distribution piping to interior domestic water and fire-suppression piping.

3.13 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig (350-kPa) increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig (0 kPa). Slowly increase
again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.14 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."

3.15 CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
   a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
   b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
   c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
   d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 221113
SECTION 221313 - FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Nonpressure-type transition couplings.
   2. Pressure-type pipe couplings.
   3. Expansion joints and deflection fittings.
   5. Concrete.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:
   1. Show system piping in profile. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet (1:500) and to vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

B. Product Certificates: For each type of pipe and fitting.

C. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. PVC Type PSM Sewer Piping:
   1. Pipe: ASTM D3034, SDR 26, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
   2. Fittings: ASTM D3034, PVC with bell ends.
2.2 NONPRESSURE-TYPE TRANSITION COUPLINGS

A. Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition coupling; for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and include corrosion-resistant-metal tension band and tightening mechanism on each end.

2.3 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps per plan details; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 inches.
10. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

B. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser, with 4-inch- minimum-width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.4 CONCRETE

A. General: Cast-in-place concrete complying with ACI 318 and the following:

1. KCMMB-4K Mix Design
B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio.
   2. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
   1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
      a. Invert Slope: 1.2 percent through manhole.
   2. Benches: Concrete, sloped to drain into channel.
      a. Slope: 4 percent.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
   2. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed steel.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details to indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.

F. Install gravity-flow, nonpressure, drainage piping according to the following:
1. Install piping pitched down in direction of flow, at minimum slope of 1.2 percent unless otherwise indicated.
2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
3. Install piping with 36-inch minimum cover.
5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
6. Install PVC corrugated sewer piping according to ASTM D2321 and ASTM F1668.
7. Install PVC Type PSM sewer piping according to ASTM D2321 and ASTM F1668.

G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A674 or AWWA C105/A21.5:
   2. Hubless cast-iron soil pipe and fittings.
   3. Expansion joints and deflection fittings.

H. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.2 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:
   4. Join PVC corrugated sewer piping according to ASTM D2321.
   5. Join PVC Type PSM sewer piping according to ASTM D2321 and ASTM D3034 for elastomeric-seal joints or ASTM D3034 for elastomeric-gasket joints.
   6. Join dissimilar pipe materials with nonpressure-type, flexible couplings.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
   1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
      a. Unshielded flexible couplings for pipes of same or slightly different OD.
      b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
      c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
3.3  MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C891.

C. Form continuous concrete channels and benches between inlets and outlet.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.4  CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.5  CONNECTIONS

A. Make connections to existing piping and underground manholes.

   1. Use commercially manufactured wye fittings for piping branch connections. 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 with 28-day compressive strength of 3000 psi.

   2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.

   3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes by cutting opening into existing unit large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of, and be flush with, inside wall unless otherwise indicated. On outside of pipe or manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

      a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.

      b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.

   4. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.6  IDENTIFICATION

A. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

   1. Use warning tape or detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.7 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:
   
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Hydrostatic Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction and the following:
   
   a. Fill sewer piping with water. Test with pressure of at least 10-foot head of water, and maintain such pressure without leakage for at least 15 minutes.
   b. Close openings in system and fill with water.
   c. Purge air and refill with water.
   d. Disconnect water supply.
   e. Test and inspect joints for leaks.

6. Manholes: Perform hydraulic test according to ASTM C969.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 221313
SECTION 260500-COMMON WORK RESULTS FOR ELECTRICAL

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.

B. MSDS forms shall be provided. Before excavating trenching, if required, verify underground utilities with a locating service.

C. Furnish and install all electrical work as shown on drawings, as required by their specifications, and as required for a complete and functional installation.

D. This section applies to all electrical sections.

1.2 WORK REQUIRED:

A. Furnish and install all electrical systems as shown and specified, including wiring and connections to equipment furnished under other sections and any work not specifically noted but that can be reasonably inferred or is necessary to provide a complete and functional system.

1.3 SUMMARY

A. This Section includes the following electrical materials and methods:

1. Supporting devices for electrical components.
2. Sleeves and sleeve seals.
3. Electrical identification.
4. Electrical demolition.
5. Cutting and patching for electrical construction.
6. Touchup painting.

1.4 QUALITY ASSURANCE


B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
1.5 **SEQUENCING AND SCHEDULING**

A. Coordinate electrical equipment installation with other building components.

B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for electrical installations.

C. Coordinate installing required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

D. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning prior to closing in the building.

E. Coordinate requirements for access panels and doors where electrical items requiring access are concealed by finished surfaces. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces. Match existing identification schemes where applicable.

F. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.

1.6 **SUBMITTALS**

A. Delegated-Design Submittal: For hangers and supports for electrical systems.

   1. Include design calculations and details of hangers.
   2. Include design calculations for seismic restraints.

B. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
   4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

**PART 2 - PRODUCTS**

2.1 **SUPPORTING DEVICES**

A. Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7. Refer to structural drawings for seismic design criteria.
B. Delegated Design: Engage a qualified professional engineer, to design hanger and support system.

C. Channel and angle support systems, hangers, anchors, sleeves, brackets, fabricated items, and fasteners are designed to provide secure support from the building structure for electrical components. Comply with MFMA-6.

1. Material: Steel, except as otherwise indicated, protected from corrosion with zinc coating or with treatment of equivalent corrosion resistance using approved alternative finish or inherent material characteristics.

2. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel, except as otherwise indicated.

3. Select channel dimensions for applicable load criteria, unless noted otherwise.

D. Steel channel supports have 9/16-inch diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Fittings and accessories mate and match with channels and are from the same manufacturer.

E. Raceway and Cable Supports as Described in NECA 1 and NECA 101: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps or "click"-type hangers. Support shall be designed for types and sizes of raceway and cable supported.

F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable iron casting with hot-dip galvanized finish.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

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

      1) Hilti Inc.
      2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel (stainless steel where exposed to moisture), for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.

2.2 ELECTRICAL IDENTIFICATION

A. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

C. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with machine printed numbers and letters.

D. Nameplate material shall be laminated phenolic plastic, black front and back with white core, engraved and fastened with stainless steel self-tapping screws. Letters shall be as follows:

1. Match existing identification schemes where applicable for switchboards, circuit breakers, generator, etc. If none exists, follow guidelines below.
2. Panelboards, switchboards, disconnect switches, motor controllers, transformers and individual circuit breakers and equipment integral disconnects: 3/8” for equipment name or designation and 1/4” for voltage rating and power source.
3. Individual circuit breakers in switchboards and miscellaneous items. 1/4” for circuit and load served, including location.

2.3 WARNING LABELS AND SIGNS


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. Colors, legend, and size appropriate to the application.
2.4 UNDERGROUND-LINE WARNING TAPE

A. Tape:
   1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
   2. Printing on tape shall be permanent and shall not be damaged by burial operations.
   3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:
   1. Comply with ANSI Z535.1 through ANSI Z535.5.
   2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
   3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service.

D. Overall Thickness: 5 mils.
   1. Foil Core Thickness: 0.35 mil.
   2. Weight: 28 lb/1000 sq. ft.
   3. 3-Inch (75-mm) Tensile According to ASTM D 882: 70 lbf, and 4600 psi.

2.5 SLEEVES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.6 TOUCHUP PAINT

A. For Equipment: Provided by equipment manufacturer and selected to match equipment finish.

B. For Non-equipment Surfaces: Matching type and color of undamaged, existing adjacent finish.

C. For Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

2.7 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.

3. Pressure Plates: Stainless steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.8 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30 minute working time.

2.9 CABLE TIES

A. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
   2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
   3. UL 94 Flame Rating: 94V-0.
   4. Temperature Range: Minus 50 to plus 284 deg F.
   5. Color: Black.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Install seismic bracing restraints in accordance with manufacturers instructions. Refer to structural drawings for additional requirements.
   1. Provide testing of anchorages and attachments as required by the authority having jurisdiction.

C. Install components and equipment to provide the maximum possible headroom where mounting heights or other location criteria are not indicated.

D. Install items level, plumb, and parallel and perpendicular to other building systems and components, except where otherwise indicated.
E. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations. Do not install equipment on material in required working spaces of other equipment.

F. Give right of way to raceways and piping systems installed at a required slope.

G. Comply with National Electrical Code requirements in general, 6’6” headroom, 36” in front of 120 Vac equipment, and 42” in front of 480 Vac (to ground) equipment.

H. Conductors feeding the following items shall be installed in separate dedicated raceways. Common pullboxes or wireways shall not be used.
   1. Services.
   2. Generators.
   3. Switchboards and panelboards.
   4. Rectifiers.
   5. UPS’s: Input and Output.
   6. HVAC equipment serving network spaces.
   7. Motor control centers.

I. Coordinate cutting and drilling of concrete floors, walls, and other structural elements to avoid cutting reinforcing steel.

3.2 ELECTRICAL SUPPORTING METHODS

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with single-bolt conduit clamps using spring friction action for retention in support channel.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.3 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
   a. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

F. Do not support electrical systems from HVAC ductwork, piping, fire protection piping or other unrelated systems.

G. Vertical Conductor Supports: Install simultaneously with conductors.

H. Miscellaneous Supports: Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices except where components are mounted directly to structural features of adequate strength.

I. In open overhead spaces, cast boxes threaded to raceways need not be separately supported, except where used for fixture support; support sheet-metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.

J. Sleeves: Install for cable and raceway penetrations of concrete slabs and walls, except where core-drilled holes are used. Install for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls. Seal space around sleeves with grout.
K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for required annular clear space between pipe and sleeve for installing mechanical sleeve seals.

L. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for required annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

M. Sleeve Seals: Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

N. Conductor and Cable Sealing: At penetrations of exterior walls, walls between areas of differing environment, and point of entry of underground conduits, seal around conductors with approved flexible duct sealant.

O. Firestopping: Apply to cable and raceway penetrations of fire-rated floor and wall assemblies. Reestablish the original fire-resistance rating of the assembly at the penetration. Firestopping must be in accordance with a UL recognized system and shall comply with UL 1479.

P. Install identification devices where required.

1. Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.
2. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated on the Contract Documents or required by codes and standards. Use consistent designations throughout the Project.
3. Tag or label power circuit conductors in panelboards and in each cabinet, pull box, junction box, and outlet box with tape marker. Label shall identify branch circuit number or load.
4. Tag or label power circuits for future connection and circuits in raceways and enclosures with other circuits with tape marker. Identify source and circuit numbers in each cabinet, pull box, junction box, and outlet box.
5. Color Coding and Labeling:
   a. Color code wiring as follows: Colored insulation, matching existing color coding if applicable, or use the following if no consistent scheme exists:

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Phase A</th>
<th>Phase B</th>
<th>Phase C</th>
<th>Neutral</th>
<th>Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>120/208V</td>
<td>Black</td>
<td>Red</td>
<td>Blue</td>
<td>White</td>
<td>Green</td>
</tr>
<tr>
<td>277/480V</td>
<td>Brown</td>
<td>Orange</td>
<td>Yellow</td>
<td>White</td>
<td>Green</td>
</tr>
</tbody>
</table>
6. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

7. Panelboards, switchboards, disconnect switches, motor controllers, transformers and individual circuit breakers, and equipment integral disconnects: Apply laminated phenolic identification nameplate.

Q. Install Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting:

2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment indicating presence of multiple sources.

R. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at below finished grade.

1. Provide warning tape for all exterior underground circuits exceeding 150 volts to ground.
2. Provide warning tape for all exterior underground communications raceways.

3.4 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for electrical installations. Perform cutting by skilled mechanics of the trades involved.

B. Repair disturbed surfaces to match adjacent undisturbed surfaces.

END OF SECTION 260500
SECTION 260513 - MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes cables and related cable splices, terminations, and accessories for medium-voltage (2001 to 35,000 V) electrical distribution systems.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of cable. Include splices and terminations for cables and cable accessories.

1.3 INFORMATIONAL SUBMITTALS
A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION
A. 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.
B. Comply with IEEE C2 and NFPA 70.
C. Source Limitations: Obtain cables and accessories from single source from single manufacturer.

2.2 CABLES
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. General Cable; General Cable Corporation.
   2. Southwire Company.
   3. Superior Essex Inc.
B. Cable Type: Type MV 105.
C. Conductor Insulation: Ethylene-propylene rubber.
   1. Voltage Rating: 15 kV.
   2. Insulation Thickness: 133 percent insulation level.
D. Conductor: Copper.

E. Comply with UL 1072, AEIC CS8, ICEA S-93-639/NEMA WC 74, and ICEA S-97-682.

F. Conductor Stranding: Compact round, concentric lay, Class B.

G. Strand Filling: Conductor interstices are filled with impermeable compound.

H. Shielding: Copper tape, helically applied over semiconducting insulation shield.

I. Shielding and Jacket: Corrugated copper drain wires embedded in extruded, chlorinated, polyethylene jacket.

J. Cable Jacket: Sunlight-resistant PVC.

2.3 CONNECTORS

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

3. Thomas & Betts Corporation; A Member of the ABB Group.

B. Comply with ANSI C119.4 for connectors between aluminum conductors or for connections between aluminum to copper conductors.

C. Copper-Conductor Connectors: Copper barrel crimped connectors.

2.4 SOLID TERMINATIONS

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

3. Thomas & Betts Corporation; A Member of the ABB Group.

B. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class shall be equivalent to that of cable. Include shield ground strap for shielded cable terminations.

1. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone-rubber, insulator modules; shield ground strap; and compression-type connector.
2. Class 2 Terminations, Indoors: Kit with stress-relief tube, nontracking insulator tube, shield ground strap, and compression-type connector. Include cold-shrink-rubber sleeve moisture seal for end of insulation whether or not supplied with kits.
2.5 MEDIUM-VOLTAGE TAPES

A. Description: Electrical grade, insulating tape for medium voltage application.

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

1. 3M.
4. Thomas & Betts Corporation; A Member of the ABB Group.

C. Ethylene/propylene rubber-based, 30-mil splicing tape, rated for 130 deg C operation. Minimum 3/4 inch wide.

D. Silicone rubber-based, 12-mil self-fusing tape, rated for 130 deg C operation. Minimum 1-1/2 inches wide.

E. Insulating-putty, 125-mil elastic filler tape. Minimum 1-1/2 inches wide.

2.6 SOURCE QUALITY CONTROL

A. Test and inspect cables according to ICEA S-97-682 before shipping.

B. Test strand-filled cables for water-penetration resistance according to ICEA T-31-610, using a test pressure of 5 psig.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cables according to IEEE 576.

B. Proof conduits prior to conductor installation by passing a wire brush mandrel and then a rubber duct swab through the conduit. Separate the wire brush and the rubber swab by 48 to 72 inches on the pull rope.

1. Wire Brush Mandrel: Consists of a length of brush approximately the size of the conduit inner diameter with stiff steel bristles and an eye on each end for attaching the pull ropes. If an obstruction is felt, pull the brush back and forth repeatedly to break up the obstruction.

2. Rubber Duct Swab: Consists of a series of rubber discs approximately the size of the conduit inner diameter on a length of steel cable with an eye on each end for attaching the pull ropes. Pull the rubber duct swab through the duct to extract loose debris from the duct.

C. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
1. Where necessary, use manufacturer-approved pulling compound or lubricant that does not deteriorate conductor or insulation.
2. Use pulling means, including fish tape, cable, rope, and basket-weave cable grips, that do not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.
3. Use pull-in guides, cable feeders, and draw-in protectors as required to protect cables during installation.
4. Do not pull cables with ends unsealed. Seal cable ends with rubber tape.

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

E. Support cables according to Section 260500 "Common Work Results For Electrical."

F. Install direct-buried cables on leveled and tamped bed of 3-inch-thick, clean sand. Separate cables crossing other cables or piping by a minimum of 2 inches of tamped earth, plus an additional 2 inches of sand. Install permanent markers at ends of cable runs, changes in direction, and buried splices.

G. Install "buried-cable" warning tape 12 inches above cables.

H. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cables around walls by the longest route from entry to exit; support cables at intervals adequate to prevent sag.

I. Install sufficient cable length to remove cable ends under pulling grips. Remove length of conductor damaged during pulling.

J. Install cable splices at pull points and elsewhere as indicated; use standard kits. Install terminations at ends of conductors, and seal multiconductor cable ends with standard kits.

K. Install separable insulated-connector components as follows:

1. Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.
2. Portable Feed-Through Accessory: At each terminal junction, with one on each terminal.
3. Standoff Insulator: At each terminal junction, with one on each terminal.

L. Seal around cables passing through fire-rated elements according to 260500 "Common Work Results for Electrical."

M. Install fault indicators on each phase where indicated.

N. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.

O. Ground shields of shielded cable at one point only. Maintain shield continuity and connections to metal connection hardware at all connection points.

P. Identify cables according to 260500 "Common Work Results for Electrical." Identify phase and circuit number of each conductor at each splice, termination, pull pull point, and junction box.
Arrange identification so that it is unnecessary to move the cable or conductor to read the identification.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
2. After installing medium-voltage cables and before electrical circuitry has been energized, test for compliance with requirements.
3. Perform Partial Discharge test of each new conductor according to NETA ATS, Ch. 7.3.3 and to test equipment manufacturer's recommendations.
4. Perform Dissipation Factor test of each new conductor according to NETA ATS, Ch. 7.3.3 and to test equipment manufacturer's recommendations.

B. Prepare test and inspection reports.

END OF SECTION 260513
SECTION 260519 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART I - 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.

B. Related Sections:
   1. Division 26 section "Grounding" for grounding conductors.
   2. Division 26 section "Electrical Equipment Testing."
   3. Division 26 section “Underground Ducts and Raceways for Electrical Systems.”

1.2 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for general power wiring systems rated 600 V and less.

1.3 SUBMITTALS

A. Product data: Manufacturer trade name, insulation type, and conductor type, gauge, and voltage rating.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide wires and cables specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in National Electrical Code, Article 100.

B. Comply with NFPA 70.

C. Comply with NECA 1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver wires and cables according to NEMA WC 26.

B. Deliver materials and equipment to project site in manufacturer’s original packaging with labeling showing product name, brand, model, project name, address, and Contractor’s name. Store in location agreeable with Architect, secure from weather or accidental damage.
1.6 **COORDINATION**

A. Coordinate layout and installation of cables with other installations.

B. Revise locations and elevations from those indicated, as required to suit field conditions and as approved by Architect.

**PART 2 - PRODUCTS**

2.1 **BUILDING WIRES AND CABLES**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Encore Wire
   2. Southwire Company.
   3. Or approved equal

B. UL-listed building wires and cables. Comply with NEMA WC 70.

C. Insulation:
   1. Type THHN/THWN-2: Flame-retardant polyvinyl chloride insulation with polyamide jacket, per UL-83 and UL-1063. Rated 90°C in dry or wet locations, gasoline and oil resistant II, sunlight resistant II. Insulation or jacket shall be color-coded in accordance with identification requirements.
   2. Type XHHW-2: Crosslinked polyethylene insulation per UL-44 and VW-1. Rated 90°C in dry or wet locations, gasoline and oil resistant II, sunlight resistant II. Insulation shall be color-coded in accordance with identification requirements.

D. Conductor Material: Copper, minimum 98% conductivity, soft drawn copper. Stranded, uncoated bare copper conductors per ASTM-B3, ASTM-B787 and ASTM-B8.

E. Identification: Insulation shall be marked in accordance with the NEC, Sizes #1/0 AWG and larger: rated for CT use and complies with IEEE 1202/UL FT4 flame test.

2.2 **CONNECTORS AND SPLICES**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. FCI Connect; Burndy Products
   3. 3M Company
   4. Panduit
   5. Thomas and Betts

B. UL-listed, factory-fabricated wiring connectors of size, ampacity rating, material, type, and class for application and service indicated.
C. Connectors for splices and taps for conductors No. 8 AWG and smaller: 3M “Scotchlok” or approved equal. Self-stripping and twist-on connectors are not acceptable.

D. Terminals for stranded conductors No. 8 AWG and smaller: Pre-insulated crimp type.

E. Lugs and connectors for conductors No. 6 AWG and larger: U.L. listed long-barrel compression types of tin-plated solid copper. One piece tubular construction with flat rectangular tongues. Use two hole lugs for sizes No. 4/0 AWG and larger. Acceptable manufacturers:
   1. FCI Connect; Burndy Products.
   2. Panduit.
   3. Or approved equal

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with requirements for installation tolerances and other conditions affecting performance of wires and cables. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRE AND INSULATION APPLICATIONS

A. General power and lighting branch circuits #10 AWG and smaller: Type THWN-2/THHN in raceway.

B. All circuits #8 and larger: Type XHHW-2 in raceway.

C. Class 1 Control Circuits: Type THWN-2/THHN in raceway.

D. Class 2 Control Circuits: Type CL2 in raceway.

3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions.

B. Remove existing wires from raceway before pulling in new wires and cables.

C. Pull Conductors: 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.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
E. Install exposed cables, parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Division 26 Section "Common Work Results for Electrical."

G. Identify wires and cables according to Division 26 Section "Common Work Results for Electrical."

3.4 CONNECTIONS

A. Conductor Splices: Do not splice any conductors except general lighting and receptacle branch circuits.

B. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.

C. Use splice and tap connectors compatible with conductor material.

D. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack.

E. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer.

F. For compression lugs, use only U.L. Listed hexagonal or circumferential crimping tools approved by manufacturer of terminals or lugs. Universal crimps will not be accepted. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed.

G. For copper-to-copper lug to busbar connections, clean contact surfaces immediately prior to mating to remove dirt or old joint compound.

1. Clean tinned or plated surfaces with fine steel wool. Do not use abrasive cleaning agents or emery cloth on tinned or plated surfaces.
2. Prepare unplated contact surfaces by cleaning to bright metal with emery cloth. Remove nicks and ridges by filing. Wipe off all copper particles.
3. For connections in outdoor equipment or exposed to weather, coat mating surfaces of lug and bus bar with Thomas & Betts Kopr-Shield prior to bolting. Do not use “Pentrox A” or other compounds containing zinc particles.

H. Install flat washer and conical spring-tension washer under nut for all compression connectors.

I. Where not furnished with equipment, provide SAE 5 grade, zinc plated steel or type 304 stainless steel hardware.

J. 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.

3.5 FIELD QUALITY CONTROL
A. Perform electrical acceptance testing as specified in Division 26 section, “Electrical Equipment Testing.”

B. Correct malfunctioning conductors and cables at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

END OF SECTION 260519
SECTION 260526 – GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes methods and materials for grounding for the following applications:
   1. AC-power systems and equipment.

1.3 SUBMITTALS

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

B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features, including the following:
   1. Hand holes.
   2. Ground electrodes and accessories.
   4. Grounding arrangements and connections for separately derived systems.
   5. Grounding connectors.
   6. Inspection hand holes.
   7. Miscellaneous grounding accessories.

1.4 DEFINITIONS

A. General

1. Anti-Oxidation Compound: A blend of colloidal copper and inhibitors for rust protection, corrosion protection, and increased connection conductivity.

2. Exothermic Weld: A high-current-capacity fusion weld. Used to reduce corrosion-induced impedance in External Ground Ring connections.

3. Ground Window: An imaginary sphere of 3 foot radius surrounding ground bar that is the protected area by that bar. Conductors that connect to equipment bonded to this bar should pass through this imaginary sphere.
4. Halo: A copper conductor mounted near the ceiling circling the equipment room walls. The halo is typically used for the grounding of cable tray, air conditioner vents, doorframes, and other miscellaneous metallic conductors.

5. Isolated Ground Bar: A conductive copper bar insulated from all surrounding conductive material used to ground specific items.

6. Isolated Ground Zone: An area or room that is bonded to only one point and is isolated or insulated from all other grounds, usually a switch room.

B. Ground Bar Sections

1. Absorber: The "A" section of a ground bar where conductors are bonded that accept transient current and dissipate it to earth. Examples are the External Ground Ring and the cold-water pipe bond.

2. Isolated: The "I" section of a ground bar where conductors are bonded for an Isolated Ground Zone (IGZ).

3. Non-Isolated Ground Zone: The "N" section on a ground bar where conductors are bonded that connect to equipment that is not in the Isolated Ground Zone but is not a producer of transient current. An example would be rack frame grounds.

4. Producer: The "P" section on a ground bar where conductors are bonded that connect to equipment or transient protectors that are producers of transient current. An example would be AC switchgear multigrounded neutral.

C. Ground Bar Acronyms

1. BGR: Buried Ground Ring or External Ground Ring.

2. MGB: Master Ground Bar. The bar used to bond other bars. In an ideal world this would be the facility principal ground bar and the single point of connection between the exterior and the interior grounding.

1.5 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.

C. Inspection: Owner reserves an option to appoint a representative to inspect all parts of the work in this specification, including preparation of materials and equipment to be used.
1. The inspector shall advise Owner of work progress and of work performance and shall notify Contractor of any infringements or variations from this specification.
2. The inspector may not allow Contractor to vary in any way from this specification without written authorization from Owner and Architect.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors:
   1. Copper Wire or Cable Insulated for 600 V: Comply with requirements of Division 26 section, “Low Voltage Conductors and Cables.”
   3. Insulated conductors for use indoors which are not installed in raceways shall be low halogen type and comply with Telcordia GR-347 CORE. Insulation rated 600V, type RHH/RHW-2 in accordance with UL 44. The exterior jacket shall be green. Comply with UL 1685, “Vertical Tray Fire Propagation and Smoke Release Test”. Comply with NEMA WC-70.

B. Bare Copper Conductors:
   4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

C. Grounding Bars:
   1. Ground Bars shall be manufactured exactly as specified; no deviations are allowed.
   2. Acceptable manufacturers:
      a. Erico – Type “CC.”
      b. Harger – Type “GBI 144XXC.”
      c. Or approved equal
   3. Ground Bar dimensions and characteristics shall be as specified below unless noted otherwise in drawings.
      a. Shall be 1/4 inch thick rectangular bars of pure annealed copper, with insulators.
      b. Shall be electroplated with tin 0.0003 inches thick typical, 0.0002 inches thick minimum.
      c. Dimensions shall be accurate within 1/32 inch.
      d. Hole diameters shall be accurate within 1/64 inch.
      e. Hole spacing between top row and center row holes shall be 3/4 inch; between center row and bottom row holes shall be 1 inch (Telco); and between top row and bottom row shall be 1-3/4 inch (NEMA). Horizontal spacing of the holes shall be 2 inches on center. All holes shall be countersunk 1/16 inch.
f. Ground bars shall be U.L. listed where required by Authority Having Jurisdiction.

D. Flexible Metal Conductor: Flexible 1-inch tinned copper braided jumper or tinned flexible insulated conductor. Length shall be as required by job conditions. Acceptable manufacturers:

1. FCI Connect-Burndy Products Type 'B'.
2. Erico Products, Inc. Type 'FJ2GXX'.
3. Or approved equal

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used.

B. Listed and labeled for specific types, sizes, and combinations of conductors and other items connected.

C. Connectors between Conductors and Pipes or Conductors and Gate Posts: Copper or copper alloy; bolted pressure-type; at least two bolts.

1. Pipe Connectors: Larger than 1 inch diameter – Clamp type, sized for pipe. U.L. Listed. FCI Connect-Burndy GAR-TC.
2. Pipe Connectors: 1 inch and smaller diameter – Clamp type, sized for pipe. U.L. Listed. FCI Connect-Burndy C-5.
3. Gate Posts: Clamp type sized for post U.L. listed. FCI Connect-Burndy Products No. GAR or approved equal.

D. Bolted Compression Type Connectors: U.L. listed 2-hole, long-barrel compression type lug of tin-plated solid copper with inspection window and approved for use with conductor materials and stranding. One piece tubular construction with flat rectangular tongues. Acceptable manufacturers:

1. FCI Connect-Burndy Products.
2. Panduit.
3. Or approved equal

Burndy types: stranded code conductor, YAZ-2N; #2 solid, YA3C2TC; narrow tongue where approved for restricted spaces, YA-L-2NT; flexible conductor, YAZ-FX.

E. ‘C’ crimp type lugs and shall be Burndy Type YC-C model No. YC2C4 or equivalent.

F. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions. Acceptable products:

2. Erico Products, Inc; CADWELD.
3. Or approved equal

G. Anti-Oxidation Compound: Acceptable products:
1. Thomas and Betts, KOPR-SHIELD.
2. FCI Connect; Burndy Products, Penetrox-E.
3. Or approved equal

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 5/8 inch in diameter by 10 feet long. U.L. listed. Minimum thickness of copper cladding shall be 0.0012 in. Acceptable Manufacturers:

1. Harger.
2. Erico.
3. Or approved equal

2.4 INSPECTION HANDHOLES

A. Concrete fiberglass composite construction, 12 inches by 24 inches by 30 inches deep, with open bottom. Cover shall be marked, “GROUNDING”. Quazite type PG or approved equal.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Structural Steel: Welded connectors.

B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

3.2 BONDING OF MISCELLANEOUS EXTERIOR METAL

A. Connect to the grounding system all external permanent and stationary metallic objects within six feet of any portion of the grounding system, includes: ice shields, HVAC equipment, metal poles, metal stairs, metal conduits, metal water pipes, metal buildings, fuel tanks, generator modules, or sheds. Connections to metal stairs and railings shall be exothermic welded. Replace disturbed galvanizing with product as recommended by manufacturer.

B. Connections at HVAC equipment, generator enclosure and fuel tank shall utilize 2-hole compression lugs as specified herein.
C. For buried connections, use No.2 bare tinned solid copper wire and use an exothermic weld to make all connections, taking the shortest possible route, not exceeding the horizontal plane, and with no bend having a radius of less than eight inches.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all alternating current feeders and branch circuits. Minimum size shall be in accordance with the NEC, or larger where indicated on Drawings.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

3.4 ISOLATED GROUND BAR SYSTEM

A. All ground bars shall be installed and interconnected as shown on drawings.

B. Mount ground bars on 1-1/2” stand-off insulators with metal wall brackets as shown on Drawings.

C. Terminate conductors on ground bars as indicated on drawings. All ground bar connections shall be welded or utilize compression lugs as shown on Drawings. Lugs shall be as specified herein. Exothermic welds may not be used within the building if telecommunications equipment has been installed. All conductors shall bond to the bar on the exact places shown. Stacking of lugs is not acceptable.

D. Coat mating surfaces of lugs with anti-oxidation compound as specified herein. Do not cover lug.

E. Connection Hardware: Bolts, nuts and washers shall be 18-8 stainless steel. Provide flat washer at each bolt head. Provide flat washer and conical spring tension washer at each nut.

F. Where connections are made to steel or any other dissimilar metal or where indicated, a dragon tooth washer shall be used between the lug and steel, bolt-flat washer-steel-dragon tooth washer-lug-flat washer-belleville washer-nut.

G. Ground bar conductors shall be insulated for 600V.

H. Insulation of ground bar conductors shall be green.

I. Conductor Minimum Bend Radius: Ground bar interconnect conductors shall be installed with minimum bend radius of 12 inches.

J. Provide RNC sleeves for wall penetrations. Do not run the grounding conductors against steel structural members. Splices and pull boxes with coiled lengths of conductors are not permitted.

K. Label all conductors at each termination with 1/8” tall black letters on white background which identify their origin. Apply labels to each end of each conductor for proper identification. All
labels shall be unique. Position labels so that they can be easily read. Apply clear heat shrink tubing over the entire length of the label for protection. All ground bar interconnect conductors shall also be permanently labeled “Do Not Disconnect” as indicated on the Drawings. Label each ground bar with designation indicated on Drawings.

L. Ground lugs on opposite sides of the ground bar may share holes in the ground bar if connected properly. In no cases shall lugs be mounted on top of each other on a ground bar.

M. All ground bars shall have a sign posted on them with the following information: "Install long barrel multiple crimps (using UL tool and circumferential die or hex die) two hole lugs on all grounding conductors."

N. The ground bars shall be mounted at approximately 7' -6" above floor. Mount ground bar labels on wall adjacent to ground bars.

3.5 ACCESS FLOOR GROUNDING

A. Ground access floor system pedestals as indicated on Drawings.

3.6 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. When securing any ground wires, solid or stranded, insulated or un-insulated, never use any clips or other devices that are conductive and form a closed loop. Metallic clips are acceptable if they do not form a closed loop. A metal clip that is “U” shaped but is mounted on a conductive metal surface is considered a closed loop.

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.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install flexible bonding jumper to bond across flexible duct connections to achieve continuity.

E. For compression lugs, use only UL Listed hexagonal or circumferential crimping tools approved by manufacturer of terminals or lugs. Universal crimps will not be accepted. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on conductor. The proper number of crimps shall be as directed by the manufacturer of the lug. Coat conductors with anti-oxidation compound
before installing lugs. Coat mating surfaces with anti-oxidation compound. Bolted compression connectors for conductors larger than #4/o AWG shall have 1-3/4" bolt spacing. Where connecting to painted metal surfaces, carefully remove paint from area of connection.

F. In-line Connections: Crimp with manufacturer’s approved tool and die. Only two conductors shall be crimped in any one ‘C’ crimp.

G. Exothermic Welds: Perform in accordance with manufacturer’s instructions. Use only molds and weld material approved for the exact conductor configuration and orientation of joint. Document underground joints with digital photos before backfill.

H. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. Bolts shall have a minimum of 3 threads exposed after proper torque tightening. Where these requirements are not available, use those specified in UL 486A.

I. Firestopping: Apply to penetrations of fire-rated floor and wall assemblies. Reestablish the original fire-resistance rating of the assembly at the penetration.

END OF SECTION 260526
SECTION 260533 – RACEWAYS 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

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

1. Raceways include the following:
   a. RMC: Rigid metal conduit (galvanized steel).
   b. EMT: Electrical metallic tubing.
   c. FMC: Flexible metal conduit.
   d. LFMC: Liquid tight flexible metallic conduit.
   e. RNC: Rigid nonmetallic conduit (PVC).
   f. Wireways.
   g. Surface raceways.

2. Raceways excluded from use:
   a. ENT: Electrical non-metallic tubing.
   b. Reduced wall flexible conduit.
   c. Armored cable - including MC and BX cable.
   d. Type EF flexible conduit.

3. Boxes, enclosures, and cabinets include the following:
   a. Device boxes.
   b. Outlet boxes.
   c. Pull and junction boxes.
   d. Cabinets and hinged-cover enclosures.

B. Related Sections include the following:
   1. Division 26 Section "Common Work Results for Electrical" for raceway and box supports.
   2. Division 26 Section "Grounding" for grounding conductor raceways.

1.3 SUBMITTALS

A. Product Data: For raceways, fittings, boxes, surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
B. Shop Drawings: Include layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.

C. Seismic Qualification Data: Certificates, for enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
4. Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.

1.4 QUALITY ASSURANCE

A. Listing and Labeling: Provide raceways and boxes specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.

B. Comply with NECA's "Standard of Installation", except where stricter requirements are indicated.

C. Comply with NFPA 70, and local codes.

1.5 COORDINATION

A. Coordinate layout and installation of raceways and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Allied Tube & Conduit; a Tyco International Ltd. Co.
2. Republic Conduit
3. Wheatland Tube Company.
4. Western Tube and Conduit Corporation

B. RMC: ANSI C80.1, UL 6; zinc-coated steel.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.
E. LFMC: Flexible steel conduit with PVC jacket.

F. Fittings: NEMA FB 1; listed for use with conduit/tubing materials.
   1. Use only threaded fittings for RMC.
   2. Use only compression type, zinc-coated steel fittings for EMT.
   3. Fittings for hazardous locations: comply with UL 886.

G. Minimum raceway size: ¾” trade size.

2.2 NONMETALLIC CONDUIT

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. CANTEX Inc.
   2. Lamson & Sessions; Carlon Electrical Products.
   3. Or approved equal

B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B, unless otherwise indicated.

C. Minimum raceway size: ¾” trade size.

2.3 OUTLET AND DEVICE BOXES

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Electric; FL Industries.
   2. Crouse-Hinds; Div. of Cooper Industries.
   5. Spring City Electrical Manufacturing Co.

B. Sheet Metal Boxes: NEMA OS 1.

C. Cast-Metal Boxes: NEMA FB 1, Type FD, cast box.

D. Metal Floor Boxes: Cast metal, fully adjustable, rectangular. Type and size as indicated. Coordinate cover with project conditions. Color to be selected by Architect. Cover shall be designed to accept flooring insert where applicable.

2.4 PULL AND JUNCTION BOXES

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Electric; FL Industries.
   2. Crouse-Hinds; Div. of Cooper Industries.
5. Spring City Electrical Manufacturing Co.

B. Sheet Metal Boxes: NEMA OS 1. NEMA class as required by location.

C. Cast-Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.5 ENCLOSURES AND CABINETS

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. American Electric; FL Industries.
   2. Crouse-Hinds; Div. of Cooper Industries.
   5. Spring City Electrical Manufacturing Co.

B. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch. NEMA class as required by location.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.

C. Cabinets: NEMA 250, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment. NEMA class as required by location.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of raceway installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 WIRING METHODS

A. Comply with the following unless otherwise indicated:
   1. Exposed, not subject to severe physical damage: EMT.
   2. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations where installed less than 10 feet above finished floor:
      a. Loading dock.
      b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   3. Concealed: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except in wet or damp locations, use LFMC.
5. Outdoors, Damp or Wet Locations: RMC.
6. Underground: RMC or RNC with RMC elbows and stub-ups.

B. No raceways shall be installed under floor slabs on grade, except where specifically noted.

3.3 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Conceal conduit and EMT, unless otherwise indicated, within finished walls and ceilings.

C. Conduit Bends:
   1. Field bends or offsets are permitted in 1" and smaller conduit only.
   2. Elbows in 1 1/4" conduit and larger sizes shall be factory made, or use hydraulic one-shot conduit bender.
   3. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

D. Complete raceway installation before starting conductor installation.

E. Support raceways as specified in Division 26 Section "Common Work Results for Electrical."

F. Use temporary closures to prevent foreign matter from entering raceways.

G. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

H. Use raceway fittings compatible with raceways and suitable for use and location.

I. Run concealed raceways, with a minimum of bends, in the shortest practical distance considering the type of building construction and obstructions, unless otherwise indicated.

J. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
   1. Run parallel or banked raceways together, on common supports where practical.
   2. Make bends in parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

K. Join raceways with fittings designed and approved for the purpose and make joints tight.
   1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
   2. Use insulating bushings to protect conductors #4 AWG and larger.
   3. Set screw type fittings shall not be used.
L. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

M. Terminations: Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished side against the box. Where terminations are not secure with 1 locknut, use 2 locknuts: 1 inside and 1 outside the box. Holes in sheet metal enclosures to be made with hole punches; concentric rings shall not be used.

N. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align raceways so the coupling is square to the box and tighten the chase nipple so no threads are exposed.

O. Install pull wires in empty raceways. All conduits which are installed hereunder and left empty for future use or where conductors are to be installed by representative of signal or instrumentation system manufacturer shall have pull rope left in place for future use. For conduits 3/4" and smaller, provide No. 12 TW copper wire or 3/16" polyethylene rope. Conduits 1" and larger shall have 3/16" polyethylene rope. Leave at least 12 inches of slack at each end of pull wire.

P. Install raceway sealing fittings according to manufacturer's written instructions. Locate fittings at suitable, approved, and accessible locations and fill them with UL-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 where required by National Electrical Code.

Q. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with the finished floor. Extend conductors to equipment with RMC; FMC may be used 6 inches above the floor. Install threaded flush plugs flush with floor for future equipment connections.

R. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in wet or damp locations. Install separate ground conductor across flexible connections.

S. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

T. Risers for conduit below grade or slab, including elbows, shall be double tape wrapped rigid with Scotchwrap #50 or Johns-Manville VID-10 at double ½ lap (four net layers).

U. A minimum of 24" separation shall be maintained between data/telephone and power conduits.

V. Outlet and device boxes
   1. Do not install boxes back-to-back in walls. Provide minimum 6" separation, except in acoustic walls. Provide minimum 24" separation in acoustic or fire rated walls.
   2. Provide knockout closures for unused openings.
   3. Support boxes independently of conduit, except for small cast boxes that are connected to two rigid metal conduits, both supported within 12" of box.
4. Use deep gang type boxes where two or more devices are mounted together. Do not use sectional type boxes. Provide barriers to separate wiring of different voltage systems.
5. Coordinate mounting heights and locations of outlets mounted above counters, benches and splash plates.
6. Provide recess outlet boxes in finished areas unless noted otherwise. Secure boxes to interior wall and partition studs, accurately positioning them to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall. Use adjustable steel channel fasteners for flush ceiling outlet boxes.
7. Align all wall-mounted outlet boxes and rings for switches, thermostats, sensors and similar devices.
8. Provide cast outlet boxes in exterior locations exposed to the weather, wet locations, and any surface mounted interior locations, unless otherwise noted on the drawings.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure coatings, finishes, and cabinets are without damage or deterioration at the time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.5 CLEANING

A. On completion of installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 260533
SECTION 260543 – UNDERGROUND DUCTS AND RACEWAYS 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 1 Specification Sections, apply to this Section.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 31 Section "Earth Moving" for general requirements for excavation, backfill and related items for ducts.
   2. Division 26 Section "Raceways and Boxes for Electrical Systems" for interior work.

1.2 SUMMARY

A. This Section includes underground conduits and ducts, duct banks, and other underground utility structures.

1.3 SUBMITTALS

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

B. Certificate for concrete and steel used in underground precast concrete utility structures, according to ASTM C 858.

C. Coordination drawings showing duct profiles and coordination with other utilities and underground structures. Include plans and sections drawn to accurate scale.

1.4 QUALITY ASSURANCE


B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.

C. Coordinate layout and installation of ducts with final arrangement of other utilities as determined in the field.
1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store precast concrete units at site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

PART 2 - PRODUCTS

2.1 CONDUIT AND DUCT

A. Rigid Steel Conduit: ANSI C80.1, galvanized.

B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B, unless otherwise indicated.

2.2 ACCESSORIES

A. Duct Supports: Rigid PVC spacers selected to provide minimum duct spacings and concrete cover depths indicated, while supporting ducts during concreting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine site to receive ducts for compliance with installation tolerances and other conditions affecting performance of the underground ducts. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 EARTH MOVING

A. Excavation and Backfill: Conform to Division 31 Section "Earth Moving," but do not use heavy-duty, hydraulic-operated compaction equipment.

3.3 CONDUIT AND DUCT INSTALLATION

A. Install nonmetallic conduit and duct as indicated according to manufacturer's written instructions.

B. Slope: Pitch ducts minimum of 4 inches per 100 feet (1:300) to drain away from buildings and equipment.
C. Curves and Bends: Use manufactured elbows for stub-ups at equipment and at building entrances. Use manufactured long sweep bends with a minimum radius of 25 feet (7.5 m) both horizontally and vertically at other locations.

D. Make joints in ducts and fittings watertight according to manufacturer's instructions. Stagger couplings so those of adjacent ducts do not lie in the same plane.

E. Separation Between Direct-Buried, Nonencased Ducts: 3 inches (75 mm) minimum for like services, and 6 inches (150 mm) minimum between power and signal ducts. Separate 12 inches (305 mm) minimum from other utilities.

   1. Depth: Except as otherwise indicated, install top of conduits at 30" (760 mm) minimum below finished grade in nontraffic areas and at least 36" (920 mm) below finished grade in vehicular traffic areas.

F. Direct-Buried Duct Banks:

   1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
   2. Space separators close enough to prevent sagging and deforming of ducts, with not less than 5 spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
   3. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Division 31 Section "Earth Moving" for pipes less than 6 inches in nominal diameter.
   4. Install backfill as specified in Division 31 Section "Earth Moving"
   5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving".

G. Stub-Ups: Use rigid steel conduit for stub-ups to equipment. For equipment mounted on outdoor concrete pads, extend steel conduit a minimum of 5 feet (1.5 m) from edge of pad. Install insulated grounding bushings on the terminations. Couple steel conduits to the ducts with adapters designed for the purpose and then encase coupling with 3 inches (75 mm) of concrete.

H. Sealing: Provide temporary closure at terminations of ducts that are wired under this Project. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15 psi (1.03 MPa) hydrostatic pressure.

I. Pulling Cord: Install 100-pound-test nylon cord in all ducts.
3.4 FIELD QUALITY CONTROL

A. Testing: Demonstrate capability and compliance with requirements upon completion of installation of underground duct and utility structures.

1. Duct Integrity: Rod ducts with a mandrel 1/4 inch smaller in diameter than internal diameter of ducts. Where rodding indicates obstructions in ducts, remove the obstructions and retest.

B. Correct installations where possible, and retest to demonstrate compliance. Otherwise, remove and replace defective products and retest.

3.5 CLEANING

A. Pull brush through full length of ducts. Use round bristle brush with a diameter ½ inch (12 mm) greater than internal diameter of duct.

END OF SECTION 260543
SECTION 261219 - PAD-MOUNTED, LIQUID-FILLED, MEDIUM-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 SUMMARY
   A. Section includes pad-mounted, liquid-filled, medium-voltage distribution transformers.

1.2 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Shop Drawings: For pad-mounted, liquid-filled, medium-voltage transformers.
      1. Include plans and elevations showing major components and features.
      2. Include single-line diagram.
      3. Manufacturer's published time-current curves of the transformer high-voltage fuses, with transformer damage curve, inrush curve, and thru fault current indicated.

1.3 INFORMATIONAL SUBMITTALS
   A. Source quality-control reports.
   B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS
   A. Operation and maintenance data.

1.5 QUALITY ASSURANCE
   A. Testing Agency Qualifications: Member company of NETA or an NRTL.
      1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION
   A. 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.
2.2 PERFORMANCE REQUIREMENTS

A. Windings Material: Aluminum.

B. Surge Arresters: Comply with IEEE C62.11, Distribution Class; metal-oxide-varistor type, fully shielded, separable-elbow type, suitable for plugging into the inserts provided in the high-voltage section of the transformer.

   1. Install at last transformer on primary circuit.

C. Winding Connections: The connection of windings and terminal markings shall comply with IEEE C57.12.70.

D. Insulation: Transformer self-cooled (KNAN) kVA rating shall be as follows: The average winding temperature rise above a 30 deg C ambient temperature shall not exceed 65 deg C and 80 deg C hottest-spot temperature rise at rated kVA when tested according to IEEE C57.12.90, using combination of connections and taps that give the highest average winding temperature rise.

E. Tap Changer: External handle, for de-energized operation.

F. Enclosure Integrity: Comply with IEEE C57.12.28 for pad-mounted enclosures that contain energized electrical equipment in excess of 600 V that may be exposed to the public.

G. Mounting: An integral skid mounting frame, suitable to allow skidding or rolling of transformer in any direction, and with provision for anchoring frame to pad.

H. Insulating Liquids:

   1. Less flammable, dielectric, FM approved and UL listed as complying with NFPA 70 requirements for fire point of not less than 300 deg C when tested according to ASTM D 92, and the requirements of the National Electrical Safety Code. Liquid shall be nontoxic, non-bioaccumulating and biodegradable.

I. Corrosion Protection:

   1. Transformer coating system shall be electrostatically applied powder-coat finish, complying with requirements of IEEE C57.12.28, in manufacturer's standard color green.

2.3 SINGLE-PHASE, PAD-MOUNTED TRANSFORMERS

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

   1. ABB Electrification Products.
   2. Cooper Industries, Inc.
3. **Howard Industries, Inc.**

B. Description: liquid-filled, two-winding, 60-Hz, 65 deg C rise above a 30 deg C average ambient, self-cooled transformer.

1. 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.
2. Comply with IEEE C57.12.25.

C. Compartment Construction:

1. Single compartment for high- and low-voltage sections, clamshell style, with provision for padlocking hinged cover and single-point latching.
2. Corrosion resistant locking assembly with captive penta-head security bolt, floating nut and padlock provision
3. Provide Type 1 terminal arrangement.

D. Primary Fusing: Designed and rated to provide thermal protection of transformer by sensing overcurrent and high liquid temperature.

1. 150-kV BIL current-limiting fuses, conforming to the requirements of IEEE C37.47.
2. Interrupting Rating: 50,000 root mean square (rms) A symmetrical at the system voltage.
3. Fuse Assembly: Bayonet-type, liquid-immersed, expulsion fuses in series with liquid-immersed, partial-range, current-limiting fuses. Bayonet fuse shall sense both high currents and high oil temperatures to provide transformer with thermal protection.
4. Provide bayonet fuse assembly with an oil retention valve and an external drip shield inside the housing to eliminate or minimize oil spills. Valve shall close when fuse holder is removed.
5. Provide a conspicuously displayed warning adjacent to the bayonet fuse(s), cautioning against removing or inserting fuses unless transformer has been de-energized and tank pressure has been released.

E. High-Voltage Section: Dead-front design.

1. To connect primary cable, use separable insulated connectors; coordinated with and complying with requirements of Section 260513 "Medium-Voltage Cables." Bushings shall be one-piece units, with ampere and BIL ratings the same as connectors.
2. Bushing inserts:
   a. Conform to requirements of IEEE 386.
   b. Rated at 200 A, with voltage class matching connectors. Provide a parking stand near each bushing well.
   c. Provide insulated protective caps for insulating and sealing out moisture from unused bushing inserts.
3. Bushing wells configured for loop-feed application.
5. Dead-front surge arrester(s).
6. Tap-changer operator.
7. Sectionalizing switch operator.
8. Ground pad.

F. Low-Voltage Section:

1. Bushings with spade terminals drilled for terminating the number of conductors indicated on the Drawings, and the lugs that comply with requirements of Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

G. Capacities and Characteristics:

2. Voltage Ratings: 7,200 V - 240/120 V.
3. Transformer BIL (kV): Comply with IEEE C57.12.25 requirements.
4. Minimum Tested Impedance (Percent at 85 deg C): 3.2.

H. Transformer Accessories:

1. High-voltage sectionalizing switch.
2. Drain and filter connection.
4. Pressure-vacuum gauge.
5. Magnetic liquid level indicator.
6. Automatically resetting pressure-relief device with manual bleeder. Device flow shall be as recommended by manufacturer.
7. Stainless-steel ground connection pads.

2.4 SERVICE CONDITIONS

A. Transformers shall be suitable for operation under service conditions specified as usual service conditions in IEEE C57.12.00.

1. Altitude: 1,500 feet

2.5 WARNING LABELS AND SIGNS

A. Comply with requirements for labels and signs specified in Section 260500 "Common Work Results for Electrical."

1. High-Voltage Warning Label: Provide self-adhesive warning signs on outside of high-voltage compartment door(s). Sign legend shall be "DANGER HIGH VOLTAGE" printed in two lines of nominal 2-inch high letters. The word "DANGER" shall be in white letters on a red background and the words "HIGH VOLTAGE" shall be in black letters on a white background.

2. Arc Flash Warning Label: Provide self-adhesive warning signs on outside of high-voltage compartment door(s), warning of potential electrical arc flash hazards and appropriate personal protective equipment required.
2.6 SOURCE QUALITY CONTROL

A. Provide manufacturer's certificate that the transformer design tests comply with IEEE C57.12.90.

1. Perform the following factory-certified routine tests on each transformer for this Project:

   a. Resistance.
   b. Turns ratio, polarity, and phase relation.
   c. Transformer no-load losses and excitation current at 100 percent of ratings.
   d. Transformer impedance voltage and load loss.
   e. Operation of all devices.
   f. Lightning impulse.
   g. Low frequency.
   h. Leak.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and space conditions for compliance with requirements for pad-mounted, liquid-filled, medium-voltage transformers and other conditions affecting performance of the Work.

B. Examine roughing-in of conduits and grounding systems to verify the following:

   1. Wiring entries comply with layout requirements.
   2. Entries are within conduit-entry tolerances specified by manufacturer, and no feeders will cross section barriers to reach load or line lugs.

C. Examine concrete bases for suitable conditions for transformer installation.

D. Verify that ground connections are in place and that requirements in Section 260526 "Grounding" have been met. Maximum ground resistance shall be 5 ohms at transformer location.

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

3.2 INSTALLATION

A. Install transformers on cast-in-place concrete equipment base(s). See Drawing for details.

B. Comply with requirements for vibration isolation and seismic control devices specified in Section 260500 "Common Work Results for Electrical"

C. Maintain minimum clearances and workspace at equipment according to manufacturer's written instructions and IEEE C2.
3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding".

1. For counterpoise, use tinned bare copper cable not smaller than No. 4/0 AWG, buried not less than 30 inches below grade interconnecting the grounding electrodes. Bond surge arrester and neutrals directly to transformer enclosure and then to grounding electrode system with bare copper conductors, sized as shown. Keep lead lengths as short as practicable, with no kinks or sharp bends.

2. Fence and equipment connections shall not be smaller than No. 4 AWG. Ground fence at each gate post and corner post and at intervals not exceeding 10 feet. Bond each gate section to fence post using 1/8 by 1 inch tinned flexible braided copper strap and clamps.

3. Make joints in grounding conductors and loops by exothermic weld or compression connector.

4. Terminate all grounding and bonding conductors on a common equipment grounding terminal on transformer enclosure.

5. Complete transformer tank grounding and lightning arrester connections prior to making any other electrical connections.

B. Terminate medium-voltage cables in incoming section of transformers according to Section 260513 "Medium-Voltage Cables."

3.4 SIGNS AND LABELS

A. Comply with installation requirements for labels and signs specified in Section 260500 "Common Work Results for Electrical."

B. Install warning signs as required to comply with 29 CFR 1910.269.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. General Field-Testing Requirements:


   b. After installing transformer but before primary is energized, verify that grounding system at the transformer is tested at specified value or less.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain systems.

END OF SECTION 261219
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.

B. Related sections: The following sections contain requirements that relate to this section:
   1. Division 26 Specification Section, “Common Work Results for Electrical.”

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, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Seismic Qualification Data: Certificates, for transformers, accessories, and components, from manufacturer.
   1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
   3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
   4. Certification: Indicate that equipment meets Project and equipment seismic requirements.

C. 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. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

D. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

E. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. Include the following:
   1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
   2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

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

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. 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.

D. Comply with NEMA PB 1.

E. Comply with NFPA 70.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NEMA PB 1.

1.6 PROJECT CONDITIONS
A. Environmental Limitations:
   1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
   2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.
b. Altitude: Not exceeding 6600 feet.

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet.
3.  

1.7 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.

1.8 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Three spares for each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Seismic Performance: Transformers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the transformer will remain in place without separation of any parts when subjected to the seismic forces specified and the transformer will be fully operational after the seismic event."
2. Refer to structural drawings for seismic design criteria.

B. Enclosures: Surface mounted cabinets, unless otherwise indicated.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor Locations: NEMA 250, Type 3R.

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, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.


C. Phase, Neutral, and Ground Buses:
   2. Drilling: Phase buses shall be factory drilled and tapped for all bolt-on devices and at spaces for future devices.
   3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
   4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box. Provide where indicated.
   5. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads. Provide where indicated.

D. Conductor Connectors: Suitable for use with conductor material and sizes.
   2. Main and Neutral Lugs: Compression type.
   3. Ground Lugs and Bus-Configured Terminators: Compression type.
   4. Feed-Through Lugs: Compression type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
   5. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.

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

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current indicated 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.
   3. Industrial Electric Manufacturing,
   4. 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.
   1. For doors more than 36 inches high, provide two latches, keyed alike.

D. Mains: Top or bottom mounted circuit breaker, or main lugs only, as indicated.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers. Circuit breakers shall be connected with machine screws. Self-tapping screws are not acceptable.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers or 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.
   3. Industrial Electric Manufacturing.
   4. Square D; a brand of Schneider Electric.

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

C. Mains: Top or bottom mounted circuit breaker, or main lugs only, as indicated.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units. Circuit breakers shall be connected with machine screws. Self-tapping screws are not acceptable.

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.
   3. Square D; a brand of Schneider Electric.

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, NEMA AB3, and with interrupting capacity to meet indicated fault currents. Voltage ratings shall be suitable for the application.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings (sizes 600A and larger):
   a. Instantaneous trip.
   b. Long- and short-time pickup levels.
   c. Long- and short-time time adjustments.
4. GFCI Circuit Breakers: Where indicated, provide single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
5. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Where indicated, provide class B ground-fault protection (30-mA trip).
6. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
   a. Standard frame sizes, trip ratings, and number of poles.
   b. Lugs: suitable for number, size, trip ratings, and conductor materials. Compression type for main breakers. Mechanical style for branches.
   c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
   d. Padlock provision: Where indicated provide means for locking circuit breakers in OFF position.
   e. Shunt Trip: Where indicated, provide trip coil energized from separate circuit.
   f. Undervoltage Trip: Where indicated, provide undervoltage release, set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
   f. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install panelboards and accessories according to NEMA PB 1.1.
B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

C. Mount top of trim 78 inches above finished floor unless otherwise indicated.

D. 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.

E. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.

F. Install filler plates in unused spaces.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

H. Comply with NECA 1.

3.3 IDENTIFICATION

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

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. 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 "Common Work Results for Electrical."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Common Work Results for Electrical."

3.4 FIELD QUALITY CONTROL

A. Perform electrical acceptance testing as specified in Division 26 section, “Electrical Equipment Testing.”

B. Correct malfunctioning units at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.
B. Set field-adjustable circuit-breaker trip ranges as specified by Engineer.

C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

   1. Measure as directed during period of normal system loading.
   2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
   3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
   4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.6 PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

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 1 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. This Section includes receptacles, connectors, switches, and finish plates.

1.3 QUALITY ASSURANCE
   A. Comply with National Electrical Code for devices and installation.
   B. Listing and labeling: Provide products that are listed and labeled for their applications and
      installation conditions and for the environments in which installed.
      1. The terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article
         100.

1.4 COORDINATION
   A. Wiring Devices for Owner-Furnished Equipment: Match devices to plug connectors for Owner-
      furnished equipment.
   B. Cord and Plug Sets: Match cord and plug sets to equipment requirements.

PART 2 - PRODUCTS

2.1 WIRING DEVICES
   A. Comply with NEMA Standard WD 1, "General Purpose Wiring Devices."
   B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.
   C. Color: As indicated on Drawings.
   D. Receptacles, Straight-Blade and Locking Type: Comply with UL Standard 498, "Electrical
      Attachment Plugs and Receptacles," heavy-duty grade except as otherwise indicated.
   E. Duplex convenience receptacles: Specification grade grounding type, 125 volt, 20 ampere; two
      current carrying contacts and one grounding contact which is internally connected to frame;
accommodate standard parallel blade cap; back and side wired. Configuration NEMA 5-20R. Molded of high strength thermoplastic and high strength nylon face.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; 5362
   b. Leviton; 5362
   c. Pass & Seymour; 5362

F. GFCI Receptacles: hospital-grade, duplex, straight blade, feed-through type. Comply with NEMA WD 6, UL 498, and UL 943, Class A, 125 V, 20 A: Comply with UL 498 Supplement SD. Configuration NEMA 5-20R.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Hubbell; HGF8300.
   b. Leviton; 6898-HG.
   c. Pass & Seymour; 2091-SHG.

2. Where indicated for portable generator charging stations: GFCI, simplex, straight blade, hospital grade, nightlight, 125 V, 20 A. Pass & Seymour; 2095HGNTLW.

G. Receptacles in damp or wet locations: All 125V and 250V, 15A and 20A non-locking receptacles shall be a listed weather-resistant type and shall be marked “WR” on the face where visible when installed.

H. Cord and Plug Sets: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with type SOW-A jacket. Green-insulated grounding conductor, and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Male configuration with nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.


J. Wall Plates: Leviton series 84001-S1: Applicable configurations required; or equal.

K. Wet-Location, Weatherproof in-use cover: NEMA 250, complying with type 3R weather-resistant thermoplastic.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Taymac MM740C-B or MM7440C-B.
   b. Red Dot CKNM
   c. Intermatic WP1000C
2.2  MULTIOUTLET ASSEMBLIES

A. Comply with Standard UL 5, "Surface Metal Raceways and Fittings."

B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.

C. Raceway Material: Metal, with manufacturer's standard finish unless indicated otherwise.

PART 3 - EXECUTION

3.1  INSTALLATION

A. Install devices and assemblies plumb and secure.

B. Install wall plates when painting is complete.

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

D. Protect devices and assemblies during painting.

E. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit arrangement of partitions and furnishings.

F. Receptacles: Identify the panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on the face plate and durable wire markers or tags within boxes.

3.2  FIELD QUALITY CONTROL

A. Testing: Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Test ground-fault circuit interrupter operation with both local and remote fault simulations according to manufacturer's recommendations.

C. Replace damaged or defective components.

3.3  CLEANING

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

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.

B. Related sections: The following sections contain requirements that relate to this section:

1. Division 26 Specification Section, “Common Work Results for Electrical.”
2. Division 26 Specification Section, “Low Voltage Electrical Conductors and Cables.”

1.2 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Enclosed Molded-case circuit breakers (MCCBs).

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, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.

B. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. Include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. 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.

D. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
   1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
   2. Altitude: Not exceeding 6600 feet.

1.6 COORDINATION

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

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   3. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position. Voltage rating shall be suitable for the application.

C. 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; labeled for copper and aluminum neutral conductors. Provide for circuits with neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Compression type, suitable for number, size, and conductor material. Mechanical lugs may be used for conductors No. 8 AWG and smaller.

2.2 NONFUSIBLE SWITCHES

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Square D; a brand of Schneider Electric.

A. Type HD, Heavy Duty, Single Throw, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position. Voltage rating shall be suitable for the application.

B. 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; labeled for copper and aluminum neutral conductors. Provide for circuits with neutral conductors.
3. Lugs: Compression type, suitable for number, size, and conductor material. Mechanical lugs may be used for conductors No. 8 AWG and smaller.

2.3 ENCLOSED MOLDED-CASE CIRCUIT BREAKERS

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

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
3. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, and NEMA AB 3, with interrupting capacity to meet indicated fault currents. Voltage rating shall be suitable for the application.


E. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replaceable electronic trip; and the following field-adjustable settings (sizes 600A and larger):

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.

F. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Compression type, suitable for number, size, trip ratings, and conductor material. Mechanical lugs may be used for conductors No. 8 AWG and smaller.
3. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
4. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors. Provide for circuits with neutral conductors.
5. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
7. Shunt Trip: Where indicated, provide trip coil energized from separate circuit.
8. Undervoltage Trip: Where indicated, provide undervoltage release, set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
9. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Other types where indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.3 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Common Work Results for Electrical."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Perform electrical acceptance testing as specified in Division 26 section, “Electrical Equipment Testing.”

B. Correct malfunctioning units at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified by Engineer.

END OF SECTION 262816
PART 1 - GENERAL

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

1.2 SUMMARY
A. This section defines electrical acceptance testing to be performed in the field upon completion of installation.
B. Perform all testing as required in this section and elsewhere in these specifications and drawings.
C. Provide labor, materials, equipment, tools and services to perform operations required for, and reasonably incidental to the testing and inspection of each item of equipment provided or installed under this division of the specifications.
D. Tests and inspections for each system and each item of equipment shall be in accordance with the manufacturer’s instructions.
E. Perform test to demonstrate that the equipment is operational within industry and manufacturer’s tolerances and installed in accordance with the design Drawings and specifications.
F. Upon completion of tests and inspections, attach a label to each device tested or inspected. Labels shall indicate date and by whom (company name) tested as well as whether or not the device passed or failed, or passed with exceptions.
G. Perform grounding electrical tests.
H. Related Sections: The following Sections contain requirements that relate to this section:
   1. Division 26 Specification "Grounding."
   2. Division 26 Specification "Wiring Devices."
I. All tests as described herein apply to contractor-furnished and owner-furnished electrical products.

1.3 APPLICABLE CODES, STANDARDS, AND REFERENCES
A. The publications listed for a part of these specifications to the extent referenced.
   2. All inspections and tests shall be performed in accordance with applicable codes and standards including: NEC, ANSI, IEEE, NFPA, NEMA, National Electrical Safety Code, and OSHA.
1.4 QUALIFICATIONS OF INDEPENDENT TESTING ORGANIZATION

A. The testing organization shall have been engaged in inspection, testing, calibration, and adjusting of electrical distribution systems for a minimum of five years.

B. The independent testing organization shall have a calibration program with accuracy traceable every six months in an unbroken chain, to the National Institute of Standards and Technology (NIST).

C. Inspection, testing, and calibration shall be performed by an engineering technician, certified by a national organization, with a minimum of five years experience in inspecting, testing, and calibration of electrical equipment.

D. Testing Agency Qualifications: Testing agency that is a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency’s Field Supervisor: Person currently certified by the InterNational Electrical Testing Association in accordance with ANSI/NETA ETT-2000, Level III or higher.

1.5 DIVISION OF RESPONSIBILITY

A. The contractor’s personnel may perform routine insulation resistance, continuity, and rotational tests. The contractor shall perform Functional Testing.

B. The Contractor’s responsibility shall include the following:

1. Engage the services of the testing organization to perform all specified tests other than those indicated above.
2. Supply a suitable and stable source of power to the testing organization. Notify the testing organization when equipment becomes available for acceptance testing.
3. The independent testing organization shall maintain a written record of all tests and shall assemble and certify a final test report.
4. The Contractor shall supply a mobile generator as required for the specified testing, and provide cables necessary for connection.
5. Coordinate work to expedite project scheduling.

C. Prior to commencement of testing, the Contractor shall supply a complete set of electrical drawings, specifications, manufacturers’ data, and pertinent change orders to the testing organization.

D. The testing organization shall perform tests and inspections as specified. Responsibilities shall include the following:

1. Notify the A/E as to when testing will commence.
2. Provide sufficient protective barriers and warning signs to conduct tests and inspections safely.
3. Report any material or workmanship found to be defective during tests and inspections to the A/E.
4. Make final settings and adjustments of the electrical equipment.
5. Maintain written records of test. Upon completion of the project, furnish four (4) copies of the test report to the A/E in accordance with Division 1 and no later than 7 calendar days after acceptance of the project for review prior to final acceptance. The test report shall be bound and its contents certified by the testing organization. The report shall include the following;
a. Summary of project.
b. Description of the equipment tested.
c. Description of test.
d. List of the test equipment used.
e. Test results.
f. Conclusion and recommendations.
g. Appendix, including completed test forms.

1.6 POWER SYSTEM STUDIES

A. Set all overcurrent protective devices in accordance with coordination study (furnished by Architect/Engineer).

1.7 TEST INSTRUMENT CALIBRATION

A. The testing organization shall maintain test instruments which have been calibrated within rated accuracy. Dated calibration labels shall be visible on the test equipment.

B. Instruments shall be calibrated in accordance with the following frequency schedule:
   1. Field instruments - 6 months maximum.
   2. Laboratory instruments - 12 months.
   3. Leased specialty equipment - 12 months (where accuracy is guaranteed by lessor).

1.8 SAFETY PRACTICES

A. Safety practices shall include, but not be limited to, the following requirements:
   1. Occupational Safety and Health Act of 1970-OSHA.
   3. Applicable safety operating procedures of governing authorities.

B. Perform tests with apparatus de-energized, except where otherwise specifically required.

C. Power circuits shall have conductors shorted to ground by a hot-line grounded device approved for that purpose.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES

A. Perform each test and inspection until acceptable results are obtained in accordance with the manufacturer’s recommendations, unless otherwise specified.
B. Perform test and inspections for each system and item of equipment as applicable, unless otherwise specified. Inspect for physical damage and defective materials or installation work. Inspect materials and installation work for proper physical, electrical and mechanical conditions.

C. Promptly report any discrepancies or unsatisfactory conditions determined by any test or inspection.

D. Perform insulation resistance tests for each applicable system and item of equipment. Do not perform this test on solid state devices or wiring connected to solid state devices. Be aware that in some cases terminated cables cannot be tested unless disconnected from end devices. Coordinate the test with the Contractor in this instance.

E. Over-potential tests shall not proceed until insulation resistance tests are satisfactorily performed. Perform over-potential tests for each system and item of equipment as specified.

3.2 CIRCUIT BREAKERS – MOLDED CASE

A. Check each circuit breaker for proper mounting, conductor size and feeder designation.

B. Operate circuit breaker to insure smooth operation.

C. Open unsealed breakers and check internal components for tightness, where applicable.

D. Circuit breakers 100A frame size and larger:
   1. Measure contact resistance in micro-ohms. Investigate deviations greater than 50% as compared to adjacent poles and similar breakers
   2. Perform an insulation-resistance test at 1000 volts DC from pole-to-pole and from each pole-to-ground with breaker closed and across open contacts.
   3. Determine long-time minimum pickup current by primary current injection.
   4. Determine long-time delay by primary injection.
   5. Determine short-time pickup and delay by primary current injection.
   6. Determine instantaneous pickup by primary current injection.
   7. Make final settings in accordance with the coordination study.

3.3 SWITCHES & FUSES

A. Inspect physical and mechanical condition.

B. Verify correct application of manufacturer’s lubricants.

C. Verify correct blade alignment, blade penetration, travel stops and mechanical operation.

D. Verify fuse sizes and types are in accordance with construction documents.

E. Verify fuse holders have adequate mechanical support.

F. Test all interlocking systems for correct operation and sequencing.

G. Verify correct phase barriers installation.

H. Inspect all indicating and control devices for correct operation.
I. Perform insulation resistance test on each pole, phase-to-phase and phase-to-ground, with switch closed and across each open pole for one minute. Test switches rated less than 250 VAC at 500 VDC. Panels switches higher than 250 VAC shall be tested at 1000 VDC.

J. Measure contact resistance across each switchblade and fuse holder.

K. Measure fuse resistance. Investigate for any values that deviate from each other by more than 15 percent.

L. Microhm and millivolt drop values shall not exceed manufacturer’s recommendations. Investigate and correct as required. Investigate any values which deviate from similar components by more than 50 percent.

M. Verify operation of open fuse trip device.

N. Verify operation of auxiliary switches.

3.4 GROUND FAULT PROTECTION

A. In addition to the following, perform ground fault system tests as required by the authority having jurisdiction. Submit reports as required.

B. Verify ground connection is made ahead of neutral disconnect link and on the line side of any ground fault sensor.

C. Verify all phase conductors and neutral pass through zero sequence sensors.

D. Verify grounded conductor is solidly grounded.

E. Verify correct operation of all functions of the self-test panel.

F. Set pickup and time delay settings in accordance with coordination study to be provided by Engineer.

G. Measure system neutral-to-ground resistance with the neutral disconnect link removed. Replace link after testing.

H. Verify the following by primary current injection:

1. Relay does not operate at 90 percent of the pickup setting.
2. Pickup is less than 125 percent of setting or 1200 amperes, whichever is smaller.
3. Time delay of relay at 150 percent or greater of pickup.

I. Verify reduced control voltage tripping capability: 55 percent.

3.5 PANELBOARDS

A. Visual and mechanical inspection per NETA ATS 7.1.

B. Perform insulation resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute. Test panels rated less than 250 VAC at 500 VDC. Panels rated higher than 250 VAC shall be tested at 1000 VDC.
C. Test panelboards containing electronic devices and Transient Voltage Surge Suppressors in accordance with manufacturers' written recommendations.

3.6 CABLES - LOW VOLTAGE - 600V MAXIMUM

A. Inspect cable support and termination. Inspect cables for physical damage and connections as per the single-line diagram. Ensure equipment edges are not in contact with cables or that protective padding is provided. Verify cable size, type, ratings match specifications and single-line diagram. Verify correct over-current protection.

B. Check visible cable bends against ICEA and manufacturer's minimum allowable bending radius.

C. Verify that neutrals and grounds are properly terminated for normal operation of protective devices, especially if cables are terminated through window type cable trays.

D. Perform insulation resistance tests on each cable individually, with respect to ground and other cables in conduit. Test at 1000 volts DC for one (1) minute. Investigate test values less than 50 Mohms.

E. Perform continuity tests to confirm proper cable connections. Verify that all phase, neutral, and ground conductors are routed together in raceways and properly grouped within switchgear to minimize heating.

3.7 GROUNDING SYSTEMS

A. Refer to Division 26 Section “Grounding and Bonding for Electrical Systems.”

3.8 WIRING DEVICES

A. Refer to Division 26 Section “Wiring Devices.”

3.9 THERMOGRAPHIC SURVEY

A. Thermographic surveys shall be performed as follows on new equipment and new conductor terminations prior to substantial completion. Test shall be performed after current (load or test set) has been sustained for at least 30 minutes prior to imaging. Imaging of automatic transfer switches shall be performed in normal and emergency positions.


2. Equipment to be scanned shall include switches, buses, cables, cable and bus connections and molded case switches.

3. Provide a report indicating the following:

   a. Problem area (location of "hot spot").
   b. Indicate temperature rise between "hot spot" and normal or reference area.
   c. Indicate cause of heat.
   d. Indicate phase unbalance, if present.
   e. Index of areas scanned.

4. Items to be included in thermographic survey:
   a. Panelboards.
b. Transformers.
c. Enclosed circuit breakers and switches.

5. Test Parameters:
   a. Scanning distribution systems with ability to detect 1 degree C rise between subject area and reference at 30 degree C.
   b. Equipment shall detect emitted radiation and convert detected radiation to visual signal.
   c. Provide photographs (thermograms) of the deficient area as seen on imaging system.
   d. Infrared survey should be performed during periods of maximum possible loading.

6. Test Results:
   a. Temperature gradients of 1 to 3 degrees C indicate possible deficiency and warrant investigation. Corrective measures may not be required. The testing organization shall review deficiency with the Owner and Engineer and make recommendations.
   b. Temperature gradients of 4 to 15 degrees C indicate minor deficiency where repair is probably required. The testing organization shall review deficiency with the Owner and Engineer and make recommendations.
   c. Temperature gradients of 16 degrees and above indicate major deficiency. Immediately advise the Owner and Engineer so that power can be secured and repairs made.
   d. Provide a report indicating the equipment and devices scanned. Provide photographs and/or thermograms of any deficient areas as seen on the imaging system.

7. Repeat thermographic survey after telecommunications equipment is installed, at a time to be designated by the Owner.

END OF SECTION 269000
SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Protecting existing vegetation to remain.
   2. Removing existing vegetation.
   3. Clearing and grubbing.
   4. Stripping and stockpiling topsoil.
   5. Removing above- and below-grade site improvements.
   6. Disconnecting, capping or sealing site utilities.
   7. Temporary erosion- and sedimentation-control measures.

1.2 MATERIAL OWNERSHIP
A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 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 Owner or authorities having jurisdiction.
B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises as noted on the Drawings.
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 temporary erosion control measures are in place.
E. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
   1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.
B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.
C. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. In addition to the information provide herein, the contractor shall adhere to and enforce all provisions of the SWPPP prepared for this project. Contractor shall maintain a copy of the SWPPP on the site at all times.
B. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion and sedimentation control Drawings and requirements of authorities having jurisdiction.
C. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
D. Inspect, maintain, and repair erosion and sedimentation control measures during construction until permanent vegetation has been established.
E. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to plans.
B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
   1. Arrange with utility companies to shut off indicated utilities.
B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Unless otherwise noted, Notify Architect not less than 72 hours in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground or as otherwise directed by the Project Geo-technical Engineer.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.
B. Strip topsoil to depth determined by the site geo-technical engineer in a manner to prevent intermingling with underlying subsoil or other waste materials.
C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

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

END OF SECTION 311000
SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Subbase course for concrete walks pavements.
5. Subbase course and base course for asphalt paving.

B. The recommendations provided in the Geotechnical Engineering Report shall govern all aspects of this project. Any discrepancies between this guideline and said report shall be brought to the Engineer’s immediate attention for clarification and resolution.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

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

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.3 QUALITY ASSURANCE
   A. Pre-excavation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS
   A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.
   B. Do not commence earth moving operations until plant-protection measures specified on plans are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS
   A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
   B. Refer to the Geotechnical Engineering Report for definitions and requirements of suitable and/or unacceptable soil materials and properties.

2.2 ACCESSORIES
   A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION
   A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
   B. Protect and maintain erosion and sedimentation controls during earth moving operations.
   C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
3.2 EXCAVATION, GENERAL
A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES
A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.4 EXCAVATION FOR WALKS AND PAVEMENTS
A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES
A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches each side of pipe or conduit.

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

1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material, 4 inches deeper elsewhere, to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

3.6 SUBGRADE INSPECTION
A. Proof-roll subgrade below the building slabs and all pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Engineer, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION
A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Engineer.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Engineer.

3.8 STORAGE OF SOIL MATERIALS
A. Stockpiles borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL
A. Place backfill on subgrades free of mud, frost, snow, or ice.
B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.
D. Trenches under Roadways: Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway sub-base course.
E. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
F. Place and compact final backfill of satisfactory soil to final subgrade elevation.
G. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.10 SOIL FILL
A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
B. Place and compact fill material in layers to required elevations as follows:
   1. Under grass and planted areas, use satisfactory soil material.
   2. Under walks and pavements, use satisfactory soil material.
   3. Under steps and ramps, use engineered fill.
   4. Under building slabs, use engineered fill.
   5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL
A. Unless otherwise noted by the site geo-technical report, uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS
A. Unless otherwise directed by the Geotechnical engineering report for this project, place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
C. Compact soil materials as directed by the Geotechnical Engineering Report for this project.

3.13 GRADING
A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch
   2. Walks: Plus or minus 1/2 inch.
   3. Pavements: Plus or minus 1/2 inch.
C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.
3.14 **SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS**  
A. Place subbase course and base course as directed by the Geotechnical Engineering Report for this project.

3.15 **DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE**  
A. Place drainage course on subgrades as directed by the Geotechnical Engineering Report for this project.

3.16 **FIELD QUALITY CONTROL**  
A. Testing Agency: Engage a qualified geotechnical engineering testing agency to perform tests and inspections.  
B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.  
C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.  
D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 **PROTECTION**  
A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.  
B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.  
C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.  
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 **DISPOSAL OF SURPLUS AND WASTE MATERIALS**  
A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

**END OF SECTION 312000**
SECTION 312625 - EROSION CONTROL/STORM WATER POLLUTION PREVENTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

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

B. Other related documents.

1.2 GENERAL

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

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

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

1.3 DEFINITIONS

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

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

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

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

E. Temporary Slope Drain: A temporary facility used to carry water down a slope.
F. **Ditch Check:** An obstruction placed at frequent intervals across ditches, creating small ponds to cause sediment to settle and be contained.

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

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

I. **Straw Bales:** Standard agricultural bales used to filter the flow of water, trap, deposit sediment, and/or divert water.

J. **Silt Fence:** A geotextile barrier fence to contain sediment by removing suspended particles from water passing through the fence.

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

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

### 1.4 Submittals

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

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

### PART 2 - PRODUCTS

#### 2.1 Materials

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

B. Ditch Checks:

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

C. Riprap for Temporary Erosion Control: Type 1 Rock Blanket conforming to MoDOT 611.32.
D. Pipe: Corrugated metal (16 Ga.) or ADS N12 Corrugated Plastic.

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

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

   TABLE 1

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Wire Fence Supported Requirements</th>
<th>Self Supported Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tensile Strength, Lbs.</td>
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<td>90 Minimum²</td>
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<tr>
<td>Elongation at 50% Minimum</td>
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<td>Tensile Strength (45 Lbs.)</td>
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<td>Minimum 70%</td>
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<td>Ultraviolet Degradation</td>
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<td>Strength Retained</td>
<td>Strength Retained</td>
</tr>
<tr>
<td>at 500 hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: 1. All numerical values represent minimum average roll value.
A. When tested in any principal direction.
B. Virginia DOT test method.

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

2.2 CERTIFICATION AND SAMPLING:

A. The Contractor shall furnish a manufacturer’s certification, stating the material conforms to the requirements of these specifications.
B. The certification shall include, or have attached, typical results of tests for the specified properties, representative of the materials supplied.
C. The Owner’s Representative reserves the right to sample and test any material offered for use.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. The Owner’s Representative may limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow, or fill operations.
B. The Owner’s Representative may direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams, other watercourses, lakes, ponds, or other areas of water impoundment. Work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, use of temporary mulches, seeding or other control devices or methods to control erosion.
C. The Contractor shall incorporate permanent erosion control features at the earliest practicable time.
D. The Contractor at no additional cost shall provide temporary pollution control measures needed to control erosion during normal construction practices to the Owner.
E. Contractor shall designate trained and knowledgeable personnel to coordinate all SWPPP activities and identify these personnel to the Owner’s Representative during construction. Missouri Department of Natural Resources (DNR) offers training classes in Erosion Control free of charge in Jefferson City. Contact for training: David Goggins at (573) 751-2556.
F. The SWPPP is a living document. As the conditions of the site changes, the SWPPP should be updated by the Contractor.
G. The SWPPP is subject to random inspection by the Owner. The SWPPP should be kept up to date by the Contractor and available for inspection at any time.

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

### 3.2 LIMITATION OF AREA DISTURBED:

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

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

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

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

### 3.3 RIVERS, STREAMS, AND IMPOUNDMENTS:

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

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

C. Frequent fording of live streams with construction equipment will not be permitted.

D. Temporary bridges or other structures shall be used when the Contractor’s operations include cycling of equipment across streams, rivers, or impoundments.

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

### 3.4 BORROW AND WASTE AREAS

A. Material pits other than commercially operated sources and material spoil areas shall be subject to pollution control measures of this specification. An offsite location does not relieve the Contractor of his contractual obligation to prevent the introduction of silt or other pollutants into receiving waterways.
3.5 CONFLICT WITH FEDERAL, STATE OR LOCAL LAWS, RULES OR REGULATIONS

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

3.6 TEMPORARY BERMS

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

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

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

C. Construction Requirements:

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

3.7 TEMPORARY SLOPE DRAINS

A. General:

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

B. General Requirements

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

C. Construction Requirements:

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

3.8 DITCH CHECKS

A. General:

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

B. Construction Requirements:

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

C. Maintenance:

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

3.9 SEDIMENT BASIN

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

B. Construction Requirements:

1. The area where a sediment basin is to be constructed shall be cleared of vegetation.
2. Construct the inlets of sediment basins with a wide cross-section and a minimum grade to prevent turbulence and allow deposition of soil particles.
   a. The minimum depth is 2'; the maximum depth is 6'.
   b. The minimum width is 5'; the maximum width is 20'.
   c. The minimum length is 25'; the maximum length is 200'.
   d. The minimum volume shall be 1,815 CF per acre of drainage area.
3. Sediment basins shall remain in service until all disturbed areas draining into the structure have been stabilized.
4. When use of sediment basin is discontinued, backfill all excavations and compact fill. Fill material shall be removed and the existing ground restored to the original or plan grade.
5. Maintenance
6. When the depth of sediment reaches 1/3 of the depth of structure in any part of the pool, all accumulation shall be removed.
7. Removed sediment shall be disposed of in locations that the sediment will not erode into the construction areas or into natural waterways. The same holds true for excavated material removed during construction of the sediment basin.

3.10 TEMPORARY SEEDING AND MULCHING

A. General

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

B. Construction Requirements:

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

3.11 STRAW BALES

A. General

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

B. Construction Requirements:

1. Bales of straw shall be utilized to control erosion, trap sediment, and divert runoff.
2. Bales must be adequately braced from behind.

3.12 SILT FENCE

A. General

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

B. General Requirements:

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

C. Installation

1. Geotextile at the bottom of the fence shall be buried as indicated on the detail.
2. The trench shall be backfilled and the soil compacted over the geotextile. The geotextile shall be spliced together as indicated on the detail.
3. Post Installation
   a. Post spacing shall not exceed 8' for wire support fence installation or 5' for self supported installations.
   b. Posts shall be driven a minimum of 24” into the ground. Where rock is encountered, posts shall be installed in a manner approved by the Owner’s Representative.
   c. Closer spacing, greater embedment depth and/or wider posts shall be used in low areas, soft, or swampy ground to ensure adequate resistance to applied loads.
4. When support fence is used, the mesh shall be fastened securely to the upstream side of the post.
   
   a. The mesh shall extend into the trench a minimum of 2" and extend a maximum of 36" above the original ground surface.

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

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

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

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

### 3.13 TEMPORARY PIPE

A. General:

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

B. Construction Requirements:

1. All temporary pipes shall be installed in the same manner as permanent pipe is installed on the project to assure that the water does not cause erosion around the pipe.

2. Material to backfill the pipe should be placed in 6" lifts and mechanically compacted. Compaction testing will not be required.

### 3.14 SEDIMENT REMOVAL

A. General

1. Sediment deposits shall be removed when:

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

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

END OF SECTION 312625
SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes Concrete Paving, Including the Following:

1. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.5 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, fabricated from steel wire into flat sheets.


D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars.

G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60 (Grade 420) deformed bars; assembled with clips.

H. Plain-Steel Wire: ASTM A 1064/A 1064M.

I. Deformed-Steel Wire: ASTM A 1064/A 1064M.

J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A; coated.

K. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A 767/A 767M, Class I coating. Cut bars true to length with ends square and free of burrs.

L. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars.

M. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

N. Hook Bolts: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

O. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

P. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

Q. Zinc Repair Material: ASTM A 780/A 780M.
2.4 CONCRETE MATERIALS

A. All Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Refer to Concrete Mix KCMMB-4K.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182

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, dissipating.

2.6 CONCRETE MIXTURES

A. Refer to KCMM-4K Mixture.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT INSTALLATION

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

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at maximum intervals of 15 feet unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
   a. Tolerance: Ensure that sawed joints are within 3 inches (75 mm) either way from centers of dowels.
2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moist subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies and side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of

3.7 DETECTABLE WARNING INSTALLATION

A. Blockouts: Form blockouts in concrete for installation of detectable paving units.

1. Tolerance for Opening Size: Plus 1/4 inch (6 mm), no minus
B. Cast-in-Place Detectable Warning Tiles: Form blockouts in concrete for installation of tiles. Screed surface of concrete where tiles are to be installed to elevation, so that edges of installed tiles will be flush with surrounding concrete paving. Embed tiles in fresh concrete immediately after screeding concrete surface.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:

1. Elevation: 1/2 inch
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-feet- (3-m-) long; unleveled straightedge not to exceed 1/2 inch (13 mm).
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 5000 sq. ft. (465 sq. m) or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231/C 231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

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

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.11 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313
PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division Specification sections, and the Approved DNR Land Disturbance Permit, apply to the Work specified in this Section.

1.2 DESCRIPTION OF WORK
A. Furnish all materials, labor, equipment and services necessary to perform all Work.
B. Work included in this Section includes clearing of weeds, seed bed preparation, installation of erosion control fabric and seeding operations required for seeding of the areas shown on Drawings.

1.3 SPECIFICATIONS AND STANDARDS

PART 2 - PRODUCTS

2.1 SEED
A. All seed shall be furnished in sealed, standard containers, unless otherwise approved. Seed which has become wet, moldy, or otherwise damaged will not be acceptable.
B. Each container of seed shall be fully labeled in accordance with the Federal Seed Act and seed certifications shall be signed and made part of seed invoices.
C. Seed shall be Fescue, 97 percent pure live seed
D. Invoices and tags for seed shall show type furnished. Upon acceptance of the seeded areas, a final check of total quantities of seed used will be made against total area seeded and if minimum rates of application or specified quantities have not been met, the Architect will require distribution of additional quantities of these materials to make up minimum application specified.

2.2 FERTILIZER
A. Fertilizer shall be uniform in composition, free-flowing, suitable for application with approved equipment and delivered to the site unopened in original containers each bearing the manufacturer’s guaranteed analysis and in conformity with state fertilizer laws. Fertilizer shall contain the following minimum percentage of plant food by weight.
1. 12 percent available nitrogen
2. 12 percent available phosphoric acid
3. 12 percent available potash

B. Fertilizer application rates shall be 600 pounds per acre.

C. Invoices for fertilizer shall show grade furnished. Upon acceptance of the seeded areas, a final check of total quantities of fertilizer used will be made against total area seeded and if minimum rates of application or specified quantities have not been met, the Architect will require distribution of additional quantities of these materials to make up minimum application specified.

2.3 EROSION CONTROL FABRIC

A. Fabric shall be “Soil Saver” as is distributed by Jim Walls Company in Dallas, Texas (214) 239-8577; or “Curlex Blankets” as is distributed by American Excelsior Company in North Kansas City, Missouri (816) 842-3034; or approved equal.

2.4 STAPLES

A. Staples shall be a No. 11 gauge steel wire formed into a “U” shape, 6 inches long.

PART 3 - EXECUTION

3.1 GROUND PREPARATION

A. General: the ground areas are to be seeded and fertilized as indicated on the Drawings and/or as specified herein. Equipment necessary for the proper preparation of the ground surface and for handling and placing all required materials shall be on hand, in good condition and shall be approved before the Work is started.

B. Clearing: Prior to tillage, seeding or other specified operations, all vegetation which might interfere with the indicated treatment of the areas shall be mowed, grubbed, raked and the debris removed from the site. Prior to or during grading and tillage operations, the ground surface shall be cleared of materials which might hinder final operations. Areas which have been disturbed shall be finish graded and/or developed as indicated on the Drawings or as specified.

C. Tillage: After the areas required to be seeded have been brought to the finish grades as specified, they shall be thoroughly tilled to a depth of at least 6 inches by plowing, disk ing, harrowing or other approved methods until the condition of the soil is acceptable to the Architect. Work shall be performed only during period when beneficial results are likely to be obtained. When conditions are such by reason of drought, excessive moisture, or other factors that satisfactory results are not likely to be obtained, Work shall be stopped. Work shall be resumed only when desired results are likely to be obtained.

D. Leveling: Any undulations or irregularities in the surface resulting from tillage, fertilizing or other operations shall be leveled with a float drag before seeding operations are begun.
E. Fertilizing: Fertilizer shall be distributed uniformly at the rate previously specified per 1,000 square feet over the areas to be seeded and shall be incorporated into the soil to a depth of at least 3 to 4 inches by disking, harrowing or other approved methods. The incorporation of fertilizer may be a part of the tillage operation hereinbefore specified. Distribution by means of an approved seed drill equipped to sow seed and distribute fertilizer at the same time will not be accepted. Fertilizer shall be incorporated into the soil a minimum of 10 days before seed is planted.

F. Inspection: A minimum of 48 hours prior notice must be given to the Construction Administrator before fertilizing may commence.

G. Planting Time: All seeding Work shall be done between the dates of April 1 to May 15 for spring planting and from August 15 to October 15 for fall planting except as otherwise directed in writing by the Construction Administrator.

H. Planting Condition: No planting shall be done until a permanent source of water is available at the site for use by the Owner.

3.2 SEEDING

A. General: Prior to seeding, any previously prepared seedbed areas compacted or damaged by interim rains, traffic, or other cause shall be reworked to restore the ground condition previously specified. Seed shall be planted by drill seeding.

B. Drill Seeding: Seed shall be uniformly drilled to an average depth of ½ inch and at the rate of 8 pounds per 1,000 square feet using equipment having drills not more than 6 ½ inches apart. Row markers shall be used with the drill seeder.

C. Rolling: Immediately after seeding, except for slopes 3 horizontal to 1 vertical and greater, the entire area shall be firmed with a roller not exceeding 90 pounds for each foot of roller width. Do not roll areas seeded with seed drills equipped with rollers.

D. Inspection: A minimum of 48 hours prior notice must be given to the Construction Administrator before seeding may commence.

3.3 INSTALLATION OF EROSION CONTROL FABRIC

A. Fabric shall be rolled out in place. Fabric shall be applied without stretching and shall lie smoothly but loosely on the soil surface. The Contractor shall refer to the Drawings for details of fabric fastening.

B. Application of the erosion control fabric shall occur the same day that the seeding of an area has taken place.

C. Fabric shall completely cover all areas which are shown on the Drawings to be protected from erosion. After fabric installation, the entire area shall be rolled with a smooth roller weighing between 200 to 250 pounds. After rolling, the fabric shall be in intimate contact with the soil surface at all points. Any clods, etc., which hold the fabric off the ground should be removed. The fabric shall be forced down into any depressions and held there with a staple.
3.4 MAINTENANCE

A. General: The project areas shall be kept clean at all times and care shall be taken that use of the premises shall not be unduly hampered by Work herein specified. The intent of this Section is to ensure a healthy, well-established turf, and prevent soil erosion in compliance with the Land Disturbance Permit issued by the Missouri Department of Natural Resources.

B. Responsibility: The Owner shall be responsible for maintenance of all seeded areas upon completion of seeding and general acceptance by the Construction Administrator.

C. Damage: Damage to seeded areas during the project shall be repaired by the persons responsible for causing such damage.

3.5 GENERAL ACCEPTANCE

A. The Construction Administrator shall make an inspection of the seeded areas upon completion of seeding. Seeded areas shall be considered acceptable if the specified quantities of fertilizer & seed have been properly applied.

3.6 GUARANTEE

A. The Contractor is responsible for the proper application of the fertilizer & seeding. Watering, weeding, re-seeding, and mowing will be the responsibility of the Owner after proper application of the seed.

END OF SECTION 329200
SECTION 334200 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. PE pipe and fittings.
2. PVC pipe and fittings.
3. Concrete pipe and fittings.
4. Non-pressure transition couplings.
5. Expansion joints.
6. Cleanouts.
7. Encasement for piping.
8. Manholes.
9. Polymer-concrete, channel drainage systems.
10. Catch basins.
12. Pipe outlets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Manholes: Include plans, elevations, sections, details, frames, and covers.
2. Catch Basins and Stormwater Inlets. Include plans, elevations, sections, details, frames, covers, and grates.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CORRUGATED-PE PIPE AND FITTINGS

A. Advanced Drainage Systems (ADS) N-12 HDPE Pipe or Approved Equal

B. Corrugated-PE Drainage Pipe and Fittings NPS 3 to NPS 10 (DN 80 to DN 250): AASHTO M 252, Type S, with smooth waterway for coupling joints.
C. Corrugated-PE Pipe and Fittings NPS 12 to NPS 60 (DN 300 to DN 1500): AASHTO M 294, Type S, with smooth waterway for coupling joints.

D. Corrugated-PE Siltight Couplings: PE sleeve with ASTM D1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings.

E. Corrugated-PE Soiltight Couplings: AASHTO M 294, corrugated, matching pipe and fittings.

2.2 PVC PIPE AND FITTINGS


B. PVC Corrugated Sewer Piping:
   2. Fittings: ASTM F949, PVC molded or fabricated, socket type.

C. Adhesive Primer: ASTM F656.

2.3 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C76 (ASTM C76M).
   1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C443 (ASTM C443M), rubber gaskets or sealant joints with ASTM C990 (ASTM C990M), bitumen or butyl-rubber sealant
   2. Minimum Class III

2.4 NONPRESSURE TRANSITION COUPLINGS

A. Comply with ASTM C1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
   1. For Concrete Pipes: ASTM C443 (ASTM C443M), rubber.
   2. For Plastic Pipes: ASTM F477, elastomeric seal or ASTM D5926, PVC.
   3. For Dissimilar Pipes: ASTM D5926, PVC or other material compatible with pipe materials being joined.

C. Shielded, Flexible Couplings:
1. Description: ASTM C1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Ring-Type, Flexible Couplings:

1. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.5 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside caulk or spigot connection and countersunk, tapered-thread, brass closure plug.

2. Top-Loading Classification(s): Heavy Duty

3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast-iron soil pipe and fittings.

B. PVC Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.6 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C478 (ASTM C478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.

2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.

3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.

4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 6-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.

5. Riser Sections: 6-inch (102-mm) minimum thickness, and lengths to provide depth indicated.

6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.


8. Resilient Pipe Connectors: ASTM C923 (ASTM C923M), cast or fitted into manhole walls, for each pipe connection.

9. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals.

10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole
frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.

11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

2.7 CONCRETE

A. General: Cast-in-place concrete in accordance with ACI 318 (ACI 318M) and ACI 350 (ACI 350M)

B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio, unless otherwise noted on the Plan Sheet Construction Details.

2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
2. Benches: Concrete, sloped to drain into channel.

D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.

2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

2.8 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C478 (ASTM C478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 6-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 6-inch (102-mm) minimum thickness, 48-inch (1200-mm) diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.

7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.

8. Steps: **Individual FRP steps or FRP ladder**, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals.

9. Pipe Connectors: ASTM C923 (ASTM C923M), resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: Per Plan

2.9 **STORMWATER INLETS**

A. Curb Inlets: Made with vertical curb opening.

B. Gutter Inlets: Made with horizontal gutter opening. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy duty.

**PART 3 - EXECUTION**

3.1 **EARTHWORK**

A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 **PIPING INSTALLATION**

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, nonpressure drainage piping in accordance with the following:

1. Install piping pitched down in direction of flow.
2. Install piping **NPS 6 (DN 150)** and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
3. Install piping with 18 inches minimum cover.
5. Install hubless cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
6. Install ductile-iron piping and special fittings in accordance with AWWA C600 or AWWA M41.
7. Install PE corrugated sewer piping in accordance with ASTM D2321.
8. Install PVC sewer piping in accordance with ASTM D2321 and ASTM F1668.
9. Install nonreinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."
10. Install reinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."

F. Install corrosion-protection piping encasement over the following underground metal piping in accordance with ASTM A674 or AWWA C105/A21.5:

2. Hubless cast-iron soil pipe and fittings.
3. Ductile-iron pipe and fittings.
4. Expansion joints.

### 3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping in accordance with the following:

4. Join ductile-iron culvert piping in accordance with AWWA C600 for push-on joints.
5. Join ductile-iron piping and special fittings in accordance with AWWA C600 or AWWA M41.
6. Join corrugated-PE piping in accordance with ASTM D3212 for push-on joints.
7. Join PVC corrugated sewer piping in accordance with ASTM D2321 for elastomeric-seal joints.

B. Join force-main pressure piping in accordance with the following:
   1. Join PVC pressure piping in accordance with AWWA M23 for gasketed joints.
   2. Join dissimilar pipe materials with pressure-type couplings.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use Medium-Duty, top-loading classification cleanouts in unpaved areas.
   2. Use Heavy-Duty, top-loading classification cleanouts in paved areas.

B. Set cleanout frames and covers in earth in cast-in-place concrete block, per construction details. Set with tops 1 (25) inch (mm) above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants in accordance with ASTM C891.

C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.

D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 2 (76) inches (mm) above finished surface elsewhere unless otherwise indicated.

3.6 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.7 STORMWATER INLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated.
C. Install outlets that spill onto grade, anchored with concrete, where indicated.

D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

E. Construct energy dissipaters at outlets, as indicated.

3.8 CONCRETE PLACEMENT

A. Place cast-in-place concrete in accordance with ACI 318 (ACI 318M).

3.9 CHANNEL DRAINAGE SYSTEM INSTALLATION

A. Install with top surfaces of components, except piping, flush with finished surface.

B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.

C. Fasten grates to channel sections if indicated.

D. Assemble channel sections with flanged or interlocking joints.

3.10 CONNECTIONS

A. Make connections to existing piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).

3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.

   a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.

   b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

B. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
   a. Shielded flexible couplings for same or minor difference OD pipes.
   b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
   c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.11 IDENTIFICATION

A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.12 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.

1. Defects requiring correction include the following:
   a. Alignment: Less than full diameter of inside of pipe is visible between structures.
   b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
   c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
   d. Infiltration: Water leakage into piping.
   e. Exfiltration: Water leakage from or around piping.

2. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
3. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems in accordance with requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Gravity-Flow Storm Drainage Piping: Test in accordance with requirements of authorities having jurisdiction and the following:
   a. Exception: Piping with soil-tight joints unless required by authorities having jurisdiction.
   b. Option: Test plastic piping in accordance with ASTM F1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.
D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.13 CLEANING
A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION 334200
APPENDIX A
Geotechnical Engineering Report
Geotechnical Engineering Report

RV Park and Restroom Building
Sedalia, Missouri
April 24, 2019
Terracon Project No. 02195009

Prepared for:
GBA
Lenexa, Kansas

Prepared by:
Terracon Consultants, Inc.
Lenexa, Kansas
April 24, 2019

GBA
9801 Renner Boulevard, Suite 300
Lenexa, Kansas 66219

Attn: Mr. Brad Burton, P.E.
913.577.8341
bburton@gbateam.com

Re: Geotechnical Engineering Report
RV Park and Restroom Building
Missouri State Fairgrounds
Sedalia, Missouri
Terracon Project No. 02195009

Dear Mr. Burton:

We have completed a subsurface exploration and geotechnical engineering evaluation for the referenced project. This study was performed in general accordance with Terracon Proposal No. P02195009, dated January 10, 2019. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations and floor slabs for the project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Daniel A. Barnett, P.G.
Project Geologist
Missouri: 2007035892

Kole C. Berg, P.E.
Senior Engineer
Missouri: 2002016417
REPORT TOPICS

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SITE CONDITIONS ...................................................... 1
PROJECT DESCRIPTION ........................................... 2
GEOTECHNICAL CHARACTERIZATION ............................ 2
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Note: This report was originally delivered in a web-based format. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION AND EXPLORATION PLANS
EXPLORATION RESULTS
SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.
INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering evaluation performed for the proposed RV Park and Restroom Building to be located at the Missouri State Fairgrounds in Sedalia, Missouri. Eight exploratory borings were performed at the site to depths ranging from approximately 10 to 15 feet below existing site grades. This report describes the subsurface conditions encountered at the boring locations, presents the test data, and provides geotechnical recommendations for the following items:

- earthwork
- foundations
- floor slabs
- seismic site class

Maps showing the site and boring locations are shown in the Site Location and Exploration Plan section. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the Exploration Results section.

SITE CONDITIONS

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
</table>
| Project Location      | Latitude/Longitude  
RV Park: 38.696990° N, 93.262465° W  
Restroom Building: 38.693248° N, 93.259220° W | |
| Existing Improvements | The RV park location is a grass-covered field with gravel drives, scattered trees, and utility poles. Existing buildings are present north and west of the proposed restroom building location. |
| Existing Topography   | Topographic site plans were not provided. Based on review of elevation data in online mapping software, site grades slope gradually down to the east at the RV park. Site grades are relatively level at the restroom building location. |
PROJECT DESCRIPTION

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RV Park</td>
<td>A new sanitary sewer main and minimal site grading is planned at the RV park.</td>
</tr>
<tr>
<td>Restroom Building</td>
<td>The proposed restroom building will be a single-story structure with a grade-supported floor slab. We anticipate the building will have masonry walls.</td>
</tr>
<tr>
<td>Finished Floor Elevation (FFE)</td>
<td>The FFE of the restroom building was not provided. We anticipate the FFE will be near existing site grades.</td>
</tr>
</tbody>
</table>
| Maximum Loads            | Anticipated structural loads for the restroom building were not provided. Based on our experience with similar structures, we considered the following maximum loads:  
Walls: 3 klf  
Floor: 100 psf |
| Grading                  | Site grading plans were not provided. We anticipate maximum cuts and fills of 2 feet will be required to develop design grades. |
| Below-Grade Structures   | No below-grade structures are planned.                                      |
| Free-Standing Retaining Walls | No retaining walls are planned.                                             |

GEOTEchnICAL CHARACTERIZATION

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the Exploration Results section and the GeoModel can be found in the Figures section of this report.

<table>
<thead>
<tr>
<th>Model Layer</th>
<th>Layer Name</th>
<th>General Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fat Clay</td>
<td>Stiff to hard, contained variable amounts of chert fragments</td>
</tr>
</tbody>
</table>

GEOTEchnICAL OVERVIEW

Based on conditions encountered at the boring locations, it appears feasible to support the new restroom building on shallow spread footings bearing on stiff native clay or engineered fill materials.

Expansive fat clay soils were encountered at the site. These materials have the potential to shrink and swell with seasonal fluctuations in the soil moisture content. We recommend restroom building floor slabs be supported on at least 24 inches of low volume change (LVC) material. In
areas that are currently above or less than 2 feet below the planned bottom of floor slab level, native fat clay soils should be undercut to accommodate placement of LVC material. In areas where more than 2 feet of fill will be placed below the bottom-of-floor-slab level, at least the upper 24 inches of new engineered fill should consist of LVC material. Placement of a layer of LVC material below floor slabs, as recommended in this report, will not eliminate all future subgrade volume change and resultant floor slab movements. However, use of an LVC zone should reduce the potential for subgrade volume change. Details regarding the LVC zone are provided in Earthwork.

This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and at least minor cracking in the structure could still occur. The severity of cracking and other cosmetic damage caused by movement of the floor slabs will probably increase if any modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and cosmetic distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. We would be pleased to discuss other construction alternatives with you upon request. The General Comments section provides an understanding of the report limitations.

EARTHWORK

Site preparation, excavation, subgrade preparation and placement of engineered fills should conform to recommendations presented in this section. The recommendations presented for design and construction of earth-supported elements including foundations and slabs are contingent upon the recommendations outlined in this section being followed. We recommend earthwork on this project be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of subgrade preparation, engineered fill, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

Site Preparation

Vegetation, topsoil, and any loose, soft or otherwise unsuitable soils present within the proposed construction areas should be stripped. Based on information obtained at the boring locations, stripping depths on the order of 4 inches should be anticipated to remove the root zone materials. However, greater stripping depths may be required in areas not explored by the borings. Organic soils removed during site preparation should not be used as fill outside landscape areas.

The soils within the planned restroom building area should be further undercut as necessary to accommodate placement of the recommended 24-inch thick LVC layer below floor slabs. The undercut areas should extend a minimum of 5 feet laterally outside the building wall lines, where
practical. Undercutting to facilitate placement of the LVC layer would not be necessary in areas where more than 2 feet of fill will be placed to develop the floor slab subgrade level.

Following initial stripping and any necessary undercutting, the exposed soils should be proofrolled. A Terracon representative should observe the proofrolling. Proofrolling can be accomplished using a loaded tandem-axle dump truck with a gross weight of at least 20 tons, or similarly loaded equipment. Areas that display excessive deflection (pumping) or rutting during proofroll operations should be improved by scarification/compaction or by removal and replacement with engineered fill.

**Fill Material Types**

A sample of each fill material type should be tested prior to being used on the site. Our professional opinions concerning suitability of fill materials are presented in the following table.

<table>
<thead>
<tr>
<th>Fill Type 1</th>
<th>USCS Classification</th>
<th>Acceptable Location for Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Volume Change (LVC) material</td>
<td>GM(^2) or CL (LL&lt;45 and PI&lt;23)</td>
<td>All locations and elevations, except where free-draining material is required.</td>
</tr>
<tr>
<td>On-site soils (native clay soils)</td>
<td>CH</td>
<td>Landscape areas and at depths greater than 24 inches below restroom building finished grade.</td>
</tr>
<tr>
<td>Well-graded granular</td>
<td>GW(^3)</td>
<td>Where free-draining material is required.</td>
</tr>
</tbody>
</table>

1. Engineered fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade.
2. MoDOT Type 5 or an approved alternate gradation of crushed limestone aggregate.
3. Granular materials with less than 5 percent fines (material passing the #200 sieve), such as ASTM C33 Size No. 57 aggregate or an approved alternate gradation.

Low volume change (LVC) material placed below the building floor slabs can consist of well-graded crushed stone aggregate (e.g., MoDOT Type 5). Lean clay soils with a liquid limit less than 45 and plasticity index less than 23 could also be used as LVC material, but these soils would be susceptible to softening and disturbance if they become wetted by surface water and precipitation. Soils that meet the LVC criteria were not encountered in the borings. Therefore, the use of imported LVC materials should be expected. If a granular leveling course (such as
crushed stone aggregate) is used immediately below the floor slabs, this material can be considered part of the LVC zone.

**Fill Compaction Requirements**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift Thickness (maximum)</td>
<td>9 inches in loose thickness when large, self-propelled compaction equipment is used. 4 inches when small, hand-guided equipment (plate or &quot;jumping jack&quot; compactor) is used.</td>
</tr>
<tr>
<td>Minimum Compaction Requirements</td>
<td>At least 95 percent of the material’s maximum dry density.</td>
</tr>
<tr>
<td>Moisture Content of Clay Soil</td>
<td>-2 to +2 percent of optimum moisture content value.</td>
</tr>
<tr>
<td>LL&lt;45</td>
<td></td>
</tr>
<tr>
<td>LL&gt;45</td>
<td>0 to 4 percent above the optimum moisture content value.</td>
</tr>
<tr>
<td>Moisture Content of Granular Material</td>
<td>Sufficient to achieve compaction without pumping when proofrolled</td>
</tr>
</tbody>
</table>

1. As determined by the standard Proctor test (ASTM D 698)

We recommend that engineered fill be tested for moisture content and compaction during placement. If the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.

**Utility Trench Backfill**

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. If utility trenches are backfilled with relatively clean granular material, they should be capped with at least 18 inches of clay fill to reduce the infiltration and conveyance of surface water through the trench backfill.

Utility trenches are common sources of water infiltration and migration. All utility trenches that penetrate beneath buildings should be effectively sealed to restrict water intrusion and flow through the trenches that could migrate below the building. We recommend constructing an effective “trench plug” that extends at least 5 feet out from the face of the building exterior. The plug material should consist of clay compacted as recommended in Earthwork. The clay fill should be paced to completely surround the utility line and be compacted in accordance with recommendations in this report. Alternatively, flowable fill could be used to construct the trench plug.
Grading and Drainage

During construction, grades should be developed to direct surface water flow away from or around the site. Exposed subgrades should be sloped to provide positive drainage so that saturation of subgrades is avoided. Surface water should not be permitted to accumulate on the site. Final surrounding grades should promote rapid surface drainage away from the structures. Accumulation of water adjacent to the structure could contribute to significant moisture increases in the subgrade soils and subsequent softening/settlement or expansion/heave.

After construction, we recommend verifying final grades to document that effective drainage has been achieved. Grades around the structures should also be periodically inspected and adjusted as necessary, as part of the structure’s maintenance program.

Earthwork Construction Considerations

Terracon should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proofrolling, placement and compaction of engineered fill, backfilling of excavations into completed subgrades, and just prior to construction of foundations and slabs.

Care should be taken to avoid disturbance of prepared subgrades. Unstable subgrade conditions can develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. If unstable subgrade conditions develop, stabilization measures will need to be employed. Construction traffic over the completed subgrade should be avoided to the extent practical. If the subgrade becomes frozen, desiccated, saturated, or disturbed, the affected materials should be removed or these materials should be scarified, moisture conditioned, and compacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, “Excavations” and its appendices, and in accordance with any applicable local, state, and federal safety regulations. The contractor should be aware that slope height, slope inclination, and excavation depth should in no instance exceed those specified by these safety regulations. Flatter slopes than those dictated by these regulations may be required depending upon the soil conditions encountered and other external factors. These regulations are strictly enforced and if they are not followed, the owner, contractor, and/or earthwork and utility subcontractor could be liable and subject to substantial penalties. Under no circumstances should the information provided in this report be interpreted to mean that Terracon is responsible for construction site safety or the contractor’s activities. Construction site safety is the sole responsibility of the contractor who shall also be solely responsible for the means, methods, and sequencing of the construction operations.
SHALLOW FOUNDATIONS

Foundation Design Parameters

Based on the conditions encountered at the borings, the restroom building can be supported on shallow footings that bear on stiff native clay soils and/or engineered fill.

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum net allowable bearing pressure</td>
<td>2,500 psf</td>
</tr>
<tr>
<td>Minimum embedment below finished grade for frost protection</td>
<td>3 feet</td>
</tr>
<tr>
<td>Minimum footing widths</td>
<td>Isolated footings: 30 inches</td>
</tr>
<tr>
<td></td>
<td>Continuous footings: 16 inches</td>
</tr>
<tr>
<td>Estimated total settlement</td>
<td>1 inch or less</td>
</tr>
<tr>
<td>Estimated differential settlement</td>
<td>1/2 to 2/3 of the total settlement over a horizontal distance of 50 feet</td>
</tr>
</tbody>
</table>

1. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. This pressure assumes that any soft soils or other unsuitable materials, if encountered, will be undercut and replaced with engineered fill.
2. This embedment depth is recommended to provide frost protection and to reduce the effects of seasonal moisture variations in the foundation bearing soils.
3. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of engineered fill below the footings, and the quality of the earthwork operations and footing construction.

Foundation Construction Considerations

The base of all foundation excavations should be free of water and loose materials prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. If the soils at the bearing level become excessively dry, disturbed, saturated, or frozen, the affected soil should be removed prior to placing concrete. If the excavations must remain open overnight or for an extended period of time, placement of a lean concrete mud-mat over the bearing soils should be considered.

All footing bearing surfaces should be observed and tested by Terracon. If unsuitable conditions are encountered, footing excavations should be extended deeper to suitable bearing materials. Footings can bear directly on suitable soils at the lower level or on lean concrete backfill as shown in the following figure.
The footings could also bear on properly compacted backfill extending down to suitable soils as shown in the following figure. Overexcavation for compacted engineered fill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing elevation. The overexcavation should then be backfilled up to the footing base elevation with well graded granular material (e.g., MoDOT Type 5 aggregate or an approved alternate gradation) placed and compacted as recommended in Earthwork.

SEISMIC CONSIDERATIONS

<table>
<thead>
<tr>
<th>Code</th>
<th>Site Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012 International Building Code (IBC)</td>
<td>D 1</td>
</tr>
</tbody>
</table>

1. The 2012 International Building Code (IBC) seismic site class definitions are based on average properties of the subsurface profile to a depth of 100 feet. The exploratory borings terminated within fat clay soils at a maximum depth of 15 feet. Our opinion of site classification is based on the subsurface conditions at the boring locations and our knowledge of local geological and geotechnical conditions.
FLOOR SLABS

Floor Slab Design Parameters

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor Slab Support</td>
<td>At least 24 inches of low volume change (LVC) material</td>
</tr>
<tr>
<td>Modulus of Subgrade Reaction</td>
<td>100 pounds per square inch per inch of deflection (psi/in or pci) for point loading conditions</td>
</tr>
<tr>
<td>Granular Leveling Course Layer Thickness</td>
<td>4 inches (minimum)</td>
</tr>
</tbody>
</table>

1. Well graded crushed stone (e.g., MoDOT Type 5 aggregate) or open-graded crushed stone (e.g. ASTM C33, Size No. 57 aggregate) can be used as the leveling course.
2. These granular materials may be considered part of the LVC zone.

Joints should be constructed in slabs at regular intervals as recommended by the American Concrete Institute (ACI) to help control the location of cracks. Joints or any cracks that develop in the floor slab should be sealed with a water-proof, non-extruding compressible compound.

Loads on footings that support structural walls and column loads are typically greater than floor slab loads. Consequently, footings should be expected to settle more than the adjacent floor slabs. The structural engineer should consider the potential for differential movement between foundations and grade-supported floor slabs.

Typically, some increase in the floor slab subgrade moisture content will occur because of gradual accumulation of capillary moisture, which would otherwise evaporate if the floor slab had not been constructed. The use of a vapor retarder should be considered beneath concrete slabs-on-grade that will be covered with wood, tile, carpet or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Floor Slab Construction Considerations

If LVC materials consist of clay, the subgrade should be maintained in a relatively moist condition until the floor slab is constructed. If the subgrade becomes desiccated prior to construction of the floor slab, the affected material should be removed or the materials should be scarified, moistened, and compacted. Upon completion of grading operations in the building area, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the building floor slab.

On most project sites, the site grading is generally accomplished early in the construction phase. However, as construction proceeds, the subgrade may be disturbed due to utility excavations,
construction traffic, desiccation, rainfall etc. As a result, the floor slab subgrade soils may not be suitable for placement of the granular course and/or concrete at the time of building construction, and corrective action may be required.

Terracon should evaluate the condition of the floor slab subgrades immediately prior to placement of the granular leveling course and construction of the slabs. Particular attention should be paid to areas containing backfilled trenches and high traffic areas that were previously disturbed during construction. Where unsuitable conditions are located within the floor slab subgrade soils, the subgrade should be improved by removing and replacing the affected material with properly compacted fill.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between boring locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing.
Site safety, cost estimating, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.
FIGURES

Contents:
GeoModel
This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

<table>
<thead>
<tr>
<th>Model Layer</th>
<th>Layer Name</th>
<th>General Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fat clay</td>
<td>Stiff to hard, contained variable amounts of clay fragments</td>
</tr>
</tbody>
</table>

**LEGEND**

- Topsoil
- Fat Clay
- Fat Clay with Gravel

**NOTES:**
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.
ATTACHMENTS
EXPLORATION AND TESTING PROCEDURES

Field Exploration

The boring locations were surveyed and marked in the field by GBA. Ground surface elevations indicated on the boring logs were provided by GBA. The borings were drilled with a track-mounted, rotary drill rig using solid-stem, continuous flight augers to advance the boreholes. Samples of the soil encountered in the borings were obtained using thin-walled tube and split-barrel sampling procedures. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample. In the split-barrel sampling procedure, a standard 2-inch outside diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. The drill crew backfilled the borings with auger cuttings after completion of drilling/sampling and prior to leaving the site.

The drill crew prepared a field log of each boring to record data including visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. The final boring logs included with this report represent the engineer's interpretation of the subsurface conditions at the borings based on field and laboratory data and observation of the samples.

Laboratory Testing

Representative soil samples were tested in the laboratory to measure their natural water content, dry unit weight, unconfined compressive strength, and Atterberg limits. The test results are provided on the boring logs included in Exploration Results.

The soil samples were classified in the laboratory based on visual observation, texture, plasticity, and the laboratory testing described above. The soil descriptions presented on the boring logs are in accordance with the enclosed General Notes and Unified Soil Classification System (USCS). The estimated USCS group symbols for native soils are shown on the boring logs, and a brief description of the USCS is included in this report.
SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan
Exploration Plan (2 pages)

Note: All attachments are one page unless noted above.
EXPLORATION RESULTS

Contents:

Boring Logs (B-1 through B-8)

Note: All attachments are one page unless noted above.
**BORING LOG NO. B-1**

**PROJECT:** RV Park and Restroom Building  
**SITE:** Missouri State Fairgrounds, Sedalia, Missouri  
**CLIENT:** GBA, Lenexa, Kansas

<table>
<thead>
<tr>
<th>DEPTH (FT)</th>
<th>SURFACE ELEV.</th>
<th>DEPTH (FT)</th>
<th>ELEVATION (FT)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>SAMPLE RECOVERY</th>
<th>FIELD TEST RESULTS</th>
<th>UNCONSOLIDATED COMPRESSIVE STRENGTH (SF)</th>
<th>WATER CONTENT (%)</th>
<th>VERTICAL EARTHWEIGHT (kN)</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>875.1</td>
<td>6.5</td>
<td>888.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.5</td>
<td></td>
<td>8.0</td>
<td>865</td>
<td><strong>FAT CLAY (CH),</strong> brown, stiff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.0</td>
<td></td>
<td>10.0</td>
<td>865</td>
<td><strong>FAT CLAY (CH),</strong> with chert fragments, brown, hard</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Boring Terminated at 10 Feet*

**Identification lines are approximate. In-situ, the transition may be gradual.**

**Hammer Type:** Automatic

**Advancement Method:** Solid stem flight augers

**Abandonment Method:** Boring backfilled with Auger Cuttings and/or Bentonite

**See Explanations and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).**

**Elevations were provided by others.**

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered

**Notes:**

**Boring Started:** 04-09-2019  
Boring Completed: 06-05-2019

**Dill Rig:** 684  
**Diller:** D8

**Project No.:** 02185009

**Terracon**

15820 W 113th St  
Lenexa, KS
**BORING LOG NO. B-2**

**PROJECT:** RV Park and Restroom Building  
**SITE:** Missouri State Fairgrounds  
Sedalia, Missouri

**CLIENT:** GBA  
Lenexa, Kansas

<table>
<thead>
<tr>
<th>MODEL LAYER</th>
<th>LOCATION</th>
<th>DEPTH (FT)</th>
<th>ELEVATION (FT)</th>
<th>DEPTH (PL)</th>
<th>ELEVATION (PL)</th>
<th>SURVEY OBSERVATIONS</th>
<th>SAMPLE TYPE</th>
<th>RECOVERY (IN)</th>
<th>FIELD TEST RESULTS</th>
<th>UNCONFORMED COMPRESSIVE STRENGTH (PSI)</th>
<th>TAPIA (H-H)</th>
<th>ATHERBORG LIMITS</th>
</tr>
</thead>
</table>
| 0.3-3.3     | See Exploration Plan  
Latitude: 38.6973° Longitude: -93.2626°  
Surface Elev: 861.1 (PL)  
Elevation: 557.5 | 3.3 | 3.5 | 10 | 8 | 10 | 10 | FAT CLAY (CH), brown, stiff  
FAT CLAY (CH), with chert fragments, brown and reddish brown, very stiff | 3-5-7 | 3-8-18 | 11-5-10 | 4-7-9 | 26 | 22 | 34 | 49 |

**Boring Terminated at 10 Feet**

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

**Notes:**

Advancement Method: Solid-stem flight augers  
Abandonment Method: Boring backfilled with Auger Cuttings and/or Bentonite

See **Explanation and Testing Procedures** for a description of field and laboratory procedures used and additional data (if any).

See **Supporting Information** for explanation of symbols and abbreviations.

Elevations were provided by others.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered

**Terracon**

16520 W 113th St  
Lenexa, KS

Boring Started: 04-08-2019  
Boring Completed: 05-08-2019  
Drill Rig: 884  
Driller: D6  
Project No.: 02158009
# Boring Log No. B-3

**Project:** RV Park and Restroom Building  
**Client:** GBA  
**Site:** Missouri State Fairgrounds, Sedalia, Missouri  
**Client:** Lenexa, Kansas

### Soil Layers

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>Fat Clay (CH), brown, stiff</td>
</tr>
<tr>
<td>3.5</td>
<td>Fat Clay (CH), with chert fragments, brown and reddish brown, very stiff</td>
</tr>
<tr>
<td>1.0</td>
<td>Boring Terminated at 10 Feet</td>
</tr>
</tbody>
</table>

### Field Test Results

<table>
<thead>
<tr>
<th>Sample</th>
<th>Recovery (%)</th>
<th>Unconfined Compressive Strength (psi)</th>
<th>Water Content (%)</th>
<th>Dry Unit Weight (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>3.4-5</td>
<td>N=9</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>4.9-17</td>
<td>N=26</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4.5-10</td>
<td>N=15</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>8.9-15</td>
<td>N=24</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

### Notes:

- **Advancement Method:** Solid-stem flight augers  
- **Abandonment Method:** Boring backfilled with Auger Cuttings and/or Bentonite  
- **Groundwater:** Not encountered

---

**Terracon**  
15620 W 113th St  
Lenexa, KS  
Project No.: 02195009

---

**Laboratory Reports**  
For full soil test results, please refer to the detailed laboratory reports.  
**Access:** [Laboratory Data Portal]

---

**Declaration:**  
This boring log is not valid if separated from original report.  
For full information, please contact Terracon at 913-277-9366.
BOARING LOG NO. B-4

PROJECT: RV Park and Restroom Building
SITE: Missouri State Fairgrounds
Sedalia, Missouri

CLIENT: GBA
Lenexa, Kansas

LOCATION: See Exploration Plan
Latitude: 38.6966° Longitude: -90.2641°

Surface Elev: 875.2 (ft)

DEPTH (FL) ELEVATION (FL)

4" Root Zone

FAT CLAY (CH), brown and gray brown, stiff

Layer 1

8.5

FAT CLAY (CH), with chert fragments, brown and reddish brown, hard

stiff

Layer 2

10.0

Boring Terminated at 10 Feet

Water Level Observations

Groundwater not encountered

Terracon
15630 W 113th St
Lenexa, KS

Boring Started: 04-05-2019
Boring Completed: 04-08-2019
Dill Rig: 684
Diller: DB
Project No.: 02195009

Notes:

Hammer Type: Automatic

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
Solid-stem flight augers

Abandonment Method:
Boring backfilled with Auger Cuttings and/or Bentonite

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.
**BORING LOG NO. B-5**

**PROJECT:** RV Park and Restroom Building  
**SITE:** Missouri State Fairgrounds  
Sedalia, Missouri  

**CLIENT:** GBA  
Lenexa, Kansas  

**LOCATION:** See Exploration Plan  
Latitude: 36.6568° Longitude: -93.21626°  
Surface Elev: 862.6 (ft)  

<table>
<thead>
<tr>
<th>DEPTH (FL)</th>
<th>SAMPLE TYPE</th>
<th>FIELD TEST REB (L)</th>
<th>UNCOVERED COMPRRESSIVE STRESS (PSI)</th>
<th>DRY UNIT WEIGHT (psf)</th>
<th>LL-PL-PI</th>
</tr>
</thead>
<tbody>
<tr>
<td>4' ROOT ZONE</td>
<td>3-4-6 N=10</td>
<td>29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAT CLAY (CH), brown, stiff</td>
<td>3-4-6 N=10</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAT CLAY (CH), with chert fragments, brown and reddish brown, hard</td>
<td>3</td>
<td>50/5&quot;</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>stiff</td>
<td>4-4-6 N=10</td>
<td>37</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Boring Terminated at 10 Feet**

**Notes:**
- Stratification lines are approximate. In-situ, the transition may be gradual.
- Hammer Type: Automatic

**Advancement Method:** Solid-stem flight augers

**Abandonment Method:** Boring backfilled with Auger Cuttings and/or Bentonite

**Groundwater not encountered**

**Terracon**

15620 W 113th St  
Lenexa, KS  

**Boring Started:** 04-06-2019  
**Boring Completed:** 04-06-2019  
**Deli Rig:** 894  
**Deli:** 63  
**Project No.: 02195209**
**BORING LOG NO. B-6**

**PROJECT:** RV Park and Restroom Building  
**SITE:** Missouri State Fairgrounds, Sedalia, Missouri

**CLIENT:** GBA, Lenexa, Kansas

<table>
<thead>
<tr>
<th>DEPTH (FL)</th>
<th>WATER LEVEL OBSERVATIONS</th>
<th>SAMPLE TYPE</th>
<th>FIELD TEST RESULTS</th>
<th>UNCONSOLIDATED COMPRESSIBILITY</th>
<th>DRY UNIT WEIGHT (pF)</th>
<th>ATTERBERG LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
<td>4&quot; root zone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.5</td>
<td>Fat clay (CH), brown, stiff</td>
<td>X 10</td>
<td>2-3-9 N=12</td>
<td>25</td>
<td>60-20-40</td>
<td></td>
</tr>
<tr>
<td>8.455</td>
<td>Fat clay (CH) with chert fragments, brown and reddish brown, very stiff</td>
<td>X 10</td>
<td>9-14-17 N=31</td>
<td>19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.6</td>
<td>7-5-5 N=10</td>
<td>X 8</td>
<td></td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>3-3-5 N=8</td>
<td>X 10</td>
<td></td>
<td>39</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Boring Terminated at 10 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

**Hammer Type:** Automatic

**Advancement Method:** Solid-snare flight augers

**Abandonment Method:** Boring backfilled with Auger Cuttings and/or Bentonite

**Notes:**

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

**WATER LEVEL OBSERVATIONS**

Groundwater not encountered

**Terracon**

15630 W 113th St
Lenexa, KS

Boring Started: 04-06-2019  
Boring Completed: 04-08-2019

Drill Rig: 884  
Driller: DB

Project No: 0215609
**BOREING LOG NO. B-7**

**PROJECT:** RV Park and Restroom Building  
**SITE:** Missouri State Fairgrounds  
Sedalia, Missouri  
**CLIENT:** GBA  
Lenexa, Kansas

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>See Exploration Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Elev.: 674.1 (FL)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEPTH (FL)</th>
<th>ELEVATION (FL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>367.5</td>
</tr>
<tr>
<td>6.5</td>
<td>360.5</td>
</tr>
<tr>
<td>13.8</td>
<td>350.5</td>
</tr>
</tbody>
</table>

**3" ROOT ZONE**

**FAT CLAY (CH),** brown, medium stiff to stiff

<table>
<thead>
<tr>
<th>DEPTH (FL)</th>
<th>FIELD TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2.2-3</td>
</tr>
<tr>
<td>20</td>
<td>2990</td>
</tr>
</tbody>
</table>

**FAT CLAY (CH),** with chert fragments, brown and reddish brown, stiff

<table>
<thead>
<tr>
<th>DEPTH (FL)</th>
<th>FIELD TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>9.6-6</td>
</tr>
<tr>
<td>10</td>
<td>4.4-5</td>
</tr>
</tbody>
</table>

**Boring Terminated at 13.8 Feet**

**Stratification lines are approximate. In-situ, the transition may be gradual.**

**Hammer Type:** Automatic

**Advancement Method:** Solid-stem flight augers

**Abandonment Method:** Boring backfilled with Auger Cuttings and/or Bentonite

**Boring Started:** 04-05-2019  
**Boring Completed:** 04-05-2019

**Notes:**

**WATER LEVEL OBSERVATIONS**

- **13.5 feet while drilling**  
- **13.5 feet upon completion**

**Terracon**

15620 W 113th St  
Lenexa, KS

**Project No.: 02195009**
BOARING LOG NO. B-8

PROJECT: RV Park and Restroom Building

SITE: Missouri State Fairgrounds
Sedalia, Missouri

CLIENT: GBA
Lenexa, Kansas

LOCATION: See Exploration Plan

Lat: 38.6931°, Long: -93.2591°

Surface Elev.: 876.4 (FL)

DEPTH (ft)

ELEVATION (FL)

DEPTH

UPLP

SAMPLE

RECOVERY

(in.)

FIELD TEST

RESULTS

UNCOMPRESSED

COMPRESSIVE

STRENGTH

(PSI)

WATER

CONTENT

ATTERBERGS

LIMITS

LL-PL-Pi

2.5

3.0

6.0

692.5

7.0

869.5

10.0

861.6

3' ROOT ZONE

FAT CLAY (CH), brown, stiff to very stiff

10

3-4-6

N=10

24

60-20-40

FAT CLAY (CH), with charcoal fragments, brown and reddish brown, hard

6

50/6"n

28

10.0

3-4-5

N=9

42

15.0

19-15-18

N=34

12

Boring Terminated at 15 Feet

Stratification lines are approximate; in-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Solid-stem flight augers

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (if any).

Notes:

Assessment Method:
Boring backfilled with Asphalt Cuttings and/or Bentonite

See Supporting Information for explanation of symbols and abbreviations.

Elevations were provided by others.

WATER LEVEL OBSERVATIONS

✓ 13 feet while drilling
✓ 13 feet upon completion

Terracon

15820 W 112th St
Lenexa, KS

Drill Rig: 884
Driller: DB

Project No.: 02195008

Boring Started: 04-08-2019
Boring Completed: 01-08-2019
SUPPORTING INFORMATION

Contents:

General Notes
Unified Soil Classification System

Note: All attachments are one page unless noted above.
### Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests

<table>
<thead>
<tr>
<th>Group Name</th>
<th>Group Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GW</td>
<td>$\text{Cu} &gt; 4$ and $1 \leq \text{Cc} &lt; 3$</td>
<td>Well-graded gravel</td>
</tr>
<tr>
<td>GP</td>
<td>$\text{Cu} &lt; 4$ and/or $[\text{Cc}&lt;1 \text{ or } \text{Cc}&gt;3.0]$</td>
<td>Poorly graded gravel</td>
</tr>
<tr>
<td>GM</td>
<td>Fines classify as ML or MH</td>
<td>Silty gravel F, G, H</td>
</tr>
<tr>
<td>GC</td>
<td>Fines classify as CL or CH</td>
<td>Clayey gravel F, G, H</td>
</tr>
<tr>
<td>SW</td>
<td>$\text{Cu} &gt; 6 \text{ and } 1 \leq \text{Cc} &lt; 3$</td>
<td>Well-graded sand</td>
</tr>
<tr>
<td>SP</td>
<td>$\text{Cu} &lt; 6 \text{ and/or } [\text{Cc}&lt;1 \text{ or } \text{Cc}&gt;3.0]$</td>
<td>Poorly graded sand</td>
</tr>
<tr>
<td>SM</td>
<td>Fines classify as ML or MH</td>
<td>Silty sand G, H, I</td>
</tr>
<tr>
<td>SC</td>
<td>Fines classify as CL or CH</td>
<td>Clayey sand G, H, I</td>
</tr>
<tr>
<td>CL</td>
<td>PI $&gt; 7$ and plots on or above &quot;A&quot; line</td>
<td>Lean clay $K_L, M$</td>
</tr>
<tr>
<td>ML</td>
<td>PI $&lt; 4$ or plots below &quot;A&quot; line</td>
<td>Silt $K_L, M$</td>
</tr>
<tr>
<td>OL</td>
<td>Liquid limit - oven dried $&lt; 0.75$</td>
<td>Organic clay $K_L, M, N$</td>
</tr>
<tr>
<td>MH</td>
<td>Liquid limit - not dried $&lt; 0.75$</td>
<td>Elastic Silt $K_L, M$</td>
</tr>
<tr>
<td>PT</td>
<td>Peat</td>
<td></td>
</tr>
</tbody>
</table>

- **A**: Based on the material passing the 3-inch (75-mm) sieve.
- **B**: If field sample contains cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
- **C**: Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
- **D**: Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

### Plasticity Index (PI) vs. Liquid Limit (LL)

- If fines are organic, add "with organic fines" to group name.
- If field sample contains ≥ 15% gravel, add "with gravel" to group name.
- If Atterberg limits plot shaded area, soil is a CL-ML, silty clay.
- If soil contains 15 to 25% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
- If PI ≥ 4 and plots on or above "A" line, add "gravelly" to group name.
- If PI $< 4$ or plots below "A" line, add "sandy" to group name.
- If PI plots on or above "A" line.
- If PI plots below "A" line.
- If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
- If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
- If PI ≥ 4 and plots on or above "A" line.

### Equations

- Equation of "A" line:
  - Horizontal at PI = 4 to LL = 25.5.
  - Then PI = 0.73 (LL = 20)
- Equation of "U" line:
  - Vertical at LL = 16 to PI = 7.
  - Then PI = 0.9 (LL = 8)
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APPENDIX B
DNR Land Disturbance Permit
JUL 11 2017

OA-Facilities Mgmt, Design, and Construction
301 West High Street, Hst Rm 370
Jefferson City, MO 65101

Dear OA-Facilities Mgmt,

Enclosed please find your Missouri State Operating Permit which authorizes land disturbance activities for Office of Administration. This permit has been issued at your request and is based upon information submitted in your application to the Missouri Department of Natural Resources.

Please note that prior to the beginning of land disturbance activities other permits may also be required. Especially note the requirements for a Missouri Department of Natural Resources 401 Water Quality Certification and the U.S. Army Corps of Engineers 404 permit. A 401 Certification is needed when placing material, or fill, into the jurisdictional waters of the United States. Examples are culverts under road crossings, riprap along stream banks and storm water outfall pipes. The term ‘jurisdictional waters’ refers to large lakes, rivers, streams and wetlands, including those that don’t always contain water.

The permitting and certification process is shared between the department and the U.S. Army Corps of Engineers. More details can be found at the US Army Corps of Engineer’s Website at http://www.usace.army.mil/. Some of these activities are also described on page 2, item 3 of the enclosed permit.

This permit contains several requirements and should be thoroughly read and understood by you. If your permit requires environmental monitoring, copies of the necessary forms have been enclosed. In all future correspondence regarding your permit please reference your permit number as shown on page 1 of the permit.

Please contact the Water Pollution Enforcement and Compliance Unit if you would like to schedule an Environmental Assistance Visit (EAV) at 573-751-1300. During the visit, staff will review the requirements of the permit and answer any questions that you may have. Staff will also be available to walk the site to advise on Best Management Practices required by the permit. The department’s regional office staff may also contact you to schedule an EAV.
If you were adversely affected by this decision, you may be entitled to an appeal before the administrative hearing commission pursuant to 10 CSR 20-1.020 and Sections 644.051.6 and 621.250, RSMo. To appeal, you must file a petition with the administrative hearing commission within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the Administrative Hearing Commission. Contact information for the AHC is as follows: Administrative Hearing Commission, Third Floor, 131 West High Street, Jefferson City, MO 65101 (Mailing address: PO Box 1557, Jefferson City, MO 65102-1557), Phone: 573-751-2422, Fax: 573-751-5018, Website: www.oa.mo.gov/ahc.

Please be aware that this facility may also be subject to any applicable county or other local ordinances or restrictions.

Sincerely,

WATER PROTECTION PROGRAM

[Signature]

David J. Lamb
Acting Director

DJL/sm

Enclosure
MISSOURI STATE OPERATING PERMIT

General Operating Permit

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

Permit No: MOR100038
Owner: OA-Facilities Mgmt, Design, and Construc
Address: 301 West High Street, Hst Rm 370
Jefferson City, MO 65101

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

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

Legal Description: Land Grant 681, Cole County
UTM Coordinates: 571840.000/4270368.000
Receiving Stream: Various State Wide (U)
First Classified Stream - ID#: Missouri R. (P) 701.00
USGS# and Sub Watershed#: 10300102 - 1305

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

FACILITY DESCRIPTION
All Outfalls SIC #1629
All Outfalls - Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, filling and other activity that results in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution of waters of the state)

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

July 01, 2017
Issue Date

Edward B. Galbraith, Director
Division of Environmental Quality

June 22, 2022
Expiration Date

David J. Lamb, Acting Director
Water Protection Program
APPLICABILITY

1. This general permit authorizes the discharge of stormwater and certain non-stormwater discharges from land disturbance sites that disturb one or more acres or disturb less than one acre when part of a larger common plan of development or sale that will disturb a cumulative total of one or more acres over the life of the project. This general permit also authorizes the discharge of stormwater and certain non-stormwater discharges from smaller projects where the Missouri Department of Natural Resources (department) has exercised its discretion to require a permit [10 CSR 20-6.200(1)(B)].

2. This general permit is issued to a city, county, state or federal agency or other governmental jurisdiction for land disturbance projects performed by or under contract to the permittee.

3. A general stormwater control plan or stormwater pollution prevention plan (SWPPP) must be developed prior to issuance of this permit. These plans must include a narrative of the types and appropriate uses of Best Management Practices (BMPs) for erosion and sediment control and stormwater management. All water pollution controls on land disturbance sites shall conform to the storm water control program and/or SWPPP of the city, county or other governmental jurisdiction in which the land disturbance activity is occurring. The requirements of the stormwater control program and/or SWPPP must be at least as stringent as those described in this permit and 10 CSR 20-6.200.

4. A Missouri State Operating Permit must be issued before any site vegetation is removed or the site disturbed. Any site owner/operator subject to these requirements for stormwater discharges and who disturbs land prior to permit issuance from the department is in violation of both State regulations per 10 CSR 20-6.200(1)(A) and Federal regulations per 40 CFR 122.26. The legal owner of the property, right-of-way or the holder of an easement on the property, and operator on which the site is located are responsible for compliance with this permit.

5. This permit authorizes discharges from construction support activities (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas) provided that appropriate stormwater controls are designed, installed, maintained and provided:
   a. The support activity is directly related to the construction site required to have permit coverage for stormwater discharges;
   b. The support activity is not a commercial operation; and
   c. The support activity does not continue to operate beyond the completion of the construction activity at the project it supports.

   The permittee is responsible for compliance with this permit for any construction support activities.

6. This permit authorizes non-stormwater discharges from the following activities provided that these discharges are addressed in the permittee’s specific SWPPP required by this general permit:
   a. Dewatering activities if there are no contaminants other than sediment present in the discharge, and the discharge is treated as specified in Requirements, Section 10.o. of this permit;
   b. Flushing water hydrants and potable water lines;
   c. Water only (i.e., without detergents or additives) rinsing of streets and buildings; and
   d. Site watering to establish vegetation.

7. This general permit does not authorize the:
   a. placement of fill materials in waters or floodplains
   b. obstruction of stream flow,
   c. redirection of stormwater across private property not owned or operated by the permittee, or
d. Changing the channel of a defined drainage course.

These actions may be regulated by other federal, state, or local entities, such as the U.S. Army Corps of Engineers or Federal Emergency Management Agency. This general permit addresses only the quality of the stormwater runoff and the minimization of off-site migration of sediments and other water contaminants.

8. This permit does not authorize land disturbance activity in jurisdictional waters of the United States, unless the permittee has obtained the required Clean Water Act Section 404 Department of the Army permit from the U.S. Army Corps of Engineers and its associated Section 401 Water Quality Certification from the department. Land disturbance activities may not begin in the affected waters of the United States until the required §404 permit and §401 water quality certification have been obtained.

9. This general permit prohibits any discharge of wastewater generated from air pollution control equipment or the containment of scrubber water in lined ponds to waters of the state.

10. This general permit prohibits any discharge of sewage or pollutants to waters of the state including but not limited to:
   a. Any hazardous material, oil, lubricant, solid waste or other non-naturally occurring substance from the site, including fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;
   b. Soaps or solvents used in vehicle and equipment washing;
   c. Hazardous substances or petroleum products from an on-site spill or handling and disposal practices;
   d. Wash and/or rinse waters from concrete mixing equipment including ready mix concrete trucks, unless managed by an appropriate control. Any such pollutants must be adequately treated and addressed in the SWPPP, and cannot be discharged to waters of the state;
   e. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;
   f. Domestic wastewaters, including gray waters; or
   g. Industrial stormwater runoff.

11. The department reserves the right to revoke or deny coverage under this general permit to applicants for stormwater discharges from land disturbance activities at sites that have contaminated soils that will be disturbed by the land disturbance activity or where such materials are brought to the site to use as fill or borrow. A site-specific permit may be required to cover such activities.

12. If at any time the department determines that the quality of waters of the state may be better protected by requiring the owner/operator of the permitted site to apply for a site-specific or different general permit, the department may do so [10 CSR 20-6.010(13)(C)]. Examples of when this may occur:
   a. The permittee is not in compliance with the conditions of this general permit;
   b. The discharge no longer qualifies for this general permit due to changed site conditions and/or regulations; or
   c. Information becomes available that indicates water quality standards have been or may be violated.

   The permittee will be notified in writing of the requirement to apply for a site-specific permit or a different general permit. When issued to the authorized permittee, the applicability of this general permit to the permittee is automatically terminated upon the effective date of the site-specific or different general permit.

13. Any owner/operator authorized by a general permit may request to be excluded from the coverage of the general permit and apply for a site-specific permit [10 CSR 20-6.010(13)(D)].
14. This operating permit does not affect, remove, or replace any requirement of the National Environmental Policy Act; the Endangered Species Act; the National Historic Preservation Act; the Comprehensive Environmental Response, Compensation and Liability Act; or the Resource Conservation and Recovery Act. Determination of applicability for the above mentioned acts is the responsibility of the permittee.

15. This permit does not supersede any requirement for obtaining project approval under an established local authority.

16. This permit is not transferable to other owners or operators.

EXEMPTIONS FROM PERMIT REQUIREMENTS

1. Facilities that discharge all stormwater runoff directly to a combined sewer system are exempt from stormwater permit requirements.

2. Land disturbance activity as described in 10 CSR 20-6.010(1)(B) and 10 CSR 20-6.200(1)(B).

3. Oil and gas related activities as listed in 40 CFR 122.26(a)(2)(ii).

REQUIREMENTS

   Per 40 CFR Part 127 National Pollutant Discharge Elimination System (NPDES) Electronic Reporting Rule, reporting shall be submitted by the permittee via an electronic system to ensure timely, complete, accurate, and nationally-consistent set of data about the NPDES program. All general permit covered facilities under this master general permit shall comply with the department’s requirements for electronic reporting.
   a. Reporting Requirements.
      (1) Application to participate in the department’s eDMR system is required as part of the application for general permit coverage in order to constitute a complete permit application and may be accessed at dnr.mo.gov/env/wpp/edmr.htm.
      (2) The permittee must electronically submit quarterly reports via the eDMR system.
   b. Other actions. The following shall be submitted electronically after such a system has been made available by the department:
      (1) General Permit Applications/Notices of Intent to discharge (NOIs);
      (2) Notices of Termination (NOTs);
      (3) No Exposure Certifications (NOEs); and
      (4) Low Erosivity Waivers and Other Waivers from Stormwater Controls (LEWs).
   c. Electronic Submissions. To access the eDMR system, use the following web link: https://edmr.dnr.mo.gov/edmr/E2/Shared/Pages/Main/Login.aspx.
   d. Waivers from Electronic Reporting.
      (1) The permittee must electronically submit reports unless a waiver is granted by the department in compliance with 40 CFR Part 127.
      (2) The permittee may obtain a temporary or permanent electronic reporting waiver by first submitting an eDMR Waiver Request Form (Form 780-2692: http://dnr.mo.gov/forms/780-2692-f.pdf, by contacting the appropriate permitting office or emailing edm@dnr.mo.gov). The department will either approve or deny this electronic reporting waiver request within 120 calendar days of receipt.
      (3) Only permittees with an approved waiver request may submit reports on paper to the Department for the period that the approved electronic reporting waiver is effective.

2. Quarterly Reports: Permits shall prepare a quarterly report with a list of active land disturbance sites including any off-site borrow or depositional areas associated with the construction project.
and submit the following information electronically as an attachment to the eDMR system until such a time when the current or a new system is available to allow direct input of the data:

a. The name of the project;
b. The location of the project (including the county);
c. The name of the primary receiving water(s) for each project;
d. A description of the project;
e. The number of acres disturbed;
f. The percent of completion of the project;
g. The projected date of completion.

The quarterly report(s) shall be maintained by the permittee and readily available for review by the department at the address provided on the application as well as submitted to the department quarterly via the department’s eDMR system. When a permittee terminates permit coverage, the permittee shall submit with the request for termination, the final quarterly report for the current calendar quarter. The permittee shall submit quarterly reports according to Table A.

<table>
<thead>
<tr>
<th>Activity for the months of:</th>
<th>Report is due:</th>
</tr>
</thead>
<tbody>
<tr>
<td>January, February, March (1st Quarter)</td>
<td>April 28</td>
</tr>
<tr>
<td>April, May, June (2nd Quarter)</td>
<td>July 28</td>
</tr>
<tr>
<td>July, August, September (3rd Quarter)</td>
<td>October 28</td>
</tr>
<tr>
<td>October, November, December (4th Quarter)</td>
<td>January 28</td>
</tr>
</tbody>
</table>

3. This permit is to ensure the design, installation and maintenance of effective erosion and sediment controls minimize the discharge of pollutants by:

a. Controlling stormwater volume and velocity within the site to minimize soil erosion;
b. Controlling stormwater discharges, including both peak flow rates and total stormwater volume, to minimize erosion at outlets and to minimize downstream channel and stream bank erosion and scour in the immediate vicinity of discharge points;
c. Minimizing the amount of soil exposed during construction activity;
d. Minimizing the disturbance of steep slopes;
e. Addressing factors such as the amount, frequency, intensity and duration of precipitation, the nature of resulting stormwater runoff, and soil characteristics, including the range of soil particle size expected to be present on the site to minimize sediment discharges from the site;
f. Providing and maintaining natural buffers around surface waters as detailed in 10.f,
g. Directing stormwater to vegetated areas to increase sediment removal and maximize stormwater infiltration and filtering, unless infeasible; and
h. Minimizing soil compaction and, unless infeasable, preserve topsoil. Minimizing soil compaction or preserving topsoil is not required where the intended function of a specific area of the site dictates that it be compacted or the topsoil be disturbed or removed.

4. Installation of Best Management Practices (BMPs) necessary to prevent soil erosion at the project boundary must be complete prior to the start of all phases of construction.

5. Install sediment controls along any perimeter areas of the site..

a. Remove any sediment per the manufacturer’s instructions or before it has accumulated to one-half of the above-ground height of any perimeter control.
b. For sites where perimeter controls are infeasible, other practices shall be implemented to minimize discharges to perimeter areas of the site.

6. BMPs shall be maintained and remain in effective operating condition during the entire duration of the project, with repairs made within the timeframe specified in the Requirements Section 9 of this permit, until final stabilization has been achieved.

7. Minimize sediment track-out from the site.

a. Restrict vehicle traffic to properly designed exit points such as an aggregate stone with an underlying geotextile or non-woven filter fabric.
b. Use appropriate stabilization techniques at all points that exit onto paved roads.
c. Remove any sediment that has been tracked out within the same business day or by the end of
   the next business day if track-out occurs on a non-business day.

8. **SWPPP Development and Implementation:** The primary requirement of this permit is the
development and implementation of a SWPPP which incorporates site-specific practices to
best minimize the soil exposure, soil erosion, and the discharge of pollutants. The permittee
shall fully implement the provisions of the SWPPP required under this part as a condition of
this general permit throughout the term of the land disturbance project. **The SWPPP must
be developed prior to issuance of the permit and must be updated with details specific to
the land disturbance site prior to conducting any land disturbance activities at the site.**
Either an electronic copy or a paper copy of the SWPPP must be accessible to anyone on-site
at all times when land disturbance operations are in progress, or other operational activities
that may affect the maintenance or integrity of the BMP structures and made available as
specified under the Records Section of this permit.

9. The SWPPP must:
   a. List and describe all points of discharge to receiving water(s);
   b. Incorporate required practices identified below;
   c. Incorporate erosion control practices specific to site conditions;
   d. Provide for maintenance and adherence to the plan;
   e. Discuss whether or not additional authorizations, such as a Section 404 permit and
      associated Section 401 Water Quality Certification are required for the project; and
   f. Name the person responsible for inspection, operation and maintenance of BMPs.

The purpose of the SWPPP is to ensure the design, implementation, management and
maintenance of BMPs in order to prevent sediment and other pollutants in stormwater
discharges associated with the land disturbance activities; compliance with the Missouri
Water Quality Standards; and compliance with the terms and conditions of this general
permit.

The following manuals are acceptable resources for the selection of appropriate BMPs.
**Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites,**
(Document number EPA 833-R-06-004) published by the United States Environmental Protection
Agency (USEPA) in May 2007. This manual as well as other information, including examples of
construction SWPPPs, is available at the USEPA internet site at
https://www.epa.gov/npdes/developing-stormwater-pollution-prevention-plan-swppp; and
the latest version of **Protecting Water Quality: A field guide to erosion, sediment and stormwater
best management practices for development sites in Missouri,** published by the department is

The permittee is not limited to the use of these guidance manuals. Other guidance publications
may be used to select appropriate BMPs. However, all BMPs should be described and justified in
the SWPPP.

10. **SWPPP Requirements:** The following information and practices shall be provided for in the
    SWPPP:
    a. **Nature of the Construction Activity:** The SWPPP briefly must describe the nature of the
       construction activity, including:
       (1) The function of the project (e.g., low density residential, shopping mall, highway, etc.);
       (2) The intended sequence and timing of activities that disturb the soils at the site;
       (3) Estimates of the total area expected to be disturbed by excavation, grading, or other
           construction activities including off-site borrow and fill areas; and
       (4) A general map (e.g., United States Geological Survey quadrangle map, a portion of a city
           or county map, or other map) with enough detail to identify the location of the
           construction site and waters of the state within one mile of the site.
b. **Site Map:** The SWPPP must contain a legible site map showing the site boundaries and points of discharge to receiving water(s) and identifying:
   (1) Direction(s) of stormwater flow and approximate slopes for all phases of construction activities;
   (2) Areas of soil disturbance and areas that will not be disturbed (or a statement that all areas of the site will be disturbed unless otherwise noted);
   (3) Location of permanent and temporary structural and non-structural BMPs identified in the SWPPP;
   (4) Locations where stabilization practices are expected to occur;
   (5) Locations of off-site material, waste, borrow or equipment storage areas;
   (6) Locations of all waters of the state (including wetlands);
   (7) Locations where stormwater discharges to a surface water; and
   (8) Areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

c. **Site Description:** In order to identify the site, the SWPPP shall include facility and points of discharge to receiving water(s) information. The SWPPP shall have sufficient information to be of practical use to contractors and site construction workers to guide the installation and maintenance of BMPs.

d. **Selection of Temporary and Permanent BMPs:** The permittee shall select, install, use, operate and maintain appropriate BMPs for the permitted site and list them in the SWPPP.

e. **Preservation of trees and vegetation:** The SWPPP shall require existing vegetation and trees to be preserved where practical.

f. **Surface Water Buffers:** For surface waters of the state, defined as “all waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common, located on or adjacent to the site,” the permittee must comply with (1)-(3), except as noted in (4):
   (1) Provide and maintain a 50-foot undisturbed natural buffer;
   (2) Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer, or
   (3) If infeasible to provide and maintain an undisturbed natural buffer of any size, implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

(4) The permittee is not required to comply with (1), (2) or (3) above if one of the following exceptions apply and documentation is provided in the SWPPP:
   (a) As authorized per Clean Water Act Section 404 Department of the Army permit and its associated Section 401 Water Quality Certification from the department.
      1. The angle of any crossing shall be as perpendicular as feasible to the water course or natural stream buffer to minimize adverse impacts.
   (b) If there is no discharge of stormwater to waters of the state through the area between the disturbed portions of the site and waters of the state located within 50 feet of your site. This includes situations where you have implemented permanent control measures that will prevent such discharges, such as a berm or other barrier.
   (c) Where no natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for the current development of the site.
      1. Where some natural buffer exists but portions of the area within 50 feet of the waters of the state are occupied by preexisting development disturbances, you are required to comply with (1), (2), or (3) above.
   (d) For linear projects where site constraints make it infeasible to implement a buffer or equivalent provided you limit disturbances within 50 feet of any waters of the state and/or you provide supplemental erosion and sediment controls to treat stormwater
discharges from earth disturbances within 50 feet of the water of state.

(e) For small residential lot construction as defined as ‘a lot being developed for residential purposes that will disturb less than 1 acre of land, but is part a larger common plan of development or sale,’ one has the option of complying with (1), (2) or (3) above or one of the following alternatives:

1. Tiered-technology approach where:
   a. A 50-foot or larger buffer is retained, no additional requirements are needed,
   b. The buffer is greater than 30 feet but less than 50 feet wide, implement double perimeter controls spaced a minimum of at least 5 feet apart between land disturbance and water of the state, or
   c. A less than or equal to 30-foot buffer is maintained, implement double perimeter controls between land disturbance and water of the state and stabilization activities completed with 7 calendar days of temporary or permanent cessation of land disturbance; or

2. Sediment discharge risk based on the site’s slope, location and soil type when combined with buffer width.

(g) Measuring Buffer Width: Where the permittee is retaining a buffer of any size, the buffer should be measured perpendicularly from any of the following points, whichever is further landward from the water:

   (1) The ordinary high water mark of the water body, defined as the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, and/or the presence of litter and debris; or
   (2) The edge of the stream or river bank, bluff, or cliff, whichever is applicable.

(h) Description of BMPs: The SWPPP shall include a description of both structural and non-structural BMPs used one or more times at the site, providing the following general information for each:

   (1) Physical description of the BMP;
   (2) Site conditions that must be met for effective use of the BMP;
   (3) BMP installation/construction procedures, including typical drawings; and
   (4) Operation and maintenance procedures for the BMP.

(i) Specific Instance of BMPs: The SWPPP shall provide the following information for each specific instance where a BMP is to be installed:

   (1) Whether the BMP is temporary or permanent;
   (2) Where, in relation to other site features, the BMP is to be located;
   (3) When the BMP will be installed in relation to each phase of the land disturbance procedures to complete the project; and
   (4) Site conditions that must be met before removal of the BMP if the BMP is not a permanent BMP.

(j) Disturbed Areas: Slopes for disturbed areas must be defined in the SWPPP. A site map or maps defining the sloped areas for all phases of the project must be included in the SWPPP.

   (1) For soil disturbing activities that have temporarily ceased on any portion of the site and will not resume for a period exceeding 14 calendar days:
      (a) The permittee shall construct BMPs to establish interim stabilization; and
      (b) Stabilization must be initiated immediately and completed within 14 calendar days.
   (2) For soil disturbing activities that have been permanently ceased on any portion of the site, final stabilization of disturbed areas must be initiated immediately and completed within 14 calendar days.
   (3) Allowances to the 14 day completion period for temporary and final stabilization may be made due to weather and equipment malfunctions. In drought-stricken areas where initiating vegetative stabilization measures immediately are infeasible, alternative stabilization measures must be employed. The use of allowances shall be documented in the SWPPP.
(4) Interim stabilization shall consist of well-established and maintained BMPs that are reasonably certain to protect waters of the state from sediment pollution over an extended period of time. This may require adding more BMPs to an area than is normally used during daily operations. These BMPs may include a combination of sediment basins, check dams, sediment fences and mulch. The types of BMPs used must be suited to the area disturbed, taking into account the number of acres exposed and the steepness of the slopes. If the slope of the area is greater than 3:1 (three feet horizontal to one foot vertical) or if the slope is greater than 3% and greater than 150 feet in length, then the permittee shall establish interim stabilization within seven days of ceasing operations on that part of the site.

(5) In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed.

k. Installation: The permittee shall ensure the BMPs are properly installed at the locations and relative times specified in the SWPPP.

(1) Peripheral or border BMPs to control runoff from disturbed areas shall be installed or marked for preservation before general site clearing is started. Note that this requirement does not apply to earth disturbances related to initial site clearing and establishing entry, exit and access of the site, which may require that stormwater controls be installed immediately after the earth disturbance.

(2) For phased projects, BMPs shall be properly installed as necessary prior to construction activities.

(3) Stormwater discharges from disturbed areas which leave the site shall pass through an appropriate impediment to sediment movement such as a sedimentation basin, sediment traps and/or silt fences prior to leaving the land disturbance site.

(4) A drainage course change shall be clearly marked on a site map and described in the SWPPP.

(5) If vegetative stabilization measures are being implemented, stabilization is considered “installed” when all activities necessary to seed or plant the area are completed.

l. Sedimentation Basins: The SWPPP shall include a sedimentation basin for each drainage area with ten or more acres disturbed at one time.

(1) The sedimentation basin shall be sized to a local 2-year, 24-hour storm. A 2-year, 24-hour storm event shall be determined for the project location using the National Oceanic and Atmospheric Administration’s National Weather Service Atlas 14 which can be located at http://hdscl.nws.noaa.gov/hdscp/phds/.

(2) Basins designed and initiated under the 2012 Area-Wide Land Disturbance General Permit MO-R100038 or prior authorizations shall comply with the requirements held in those authorizations. Any construction activities designed and initiated under this authorization shall comply with the local 2-year, 24-hour storm event by January 1, 2018.

(3) Accumulated sediment shall be removed from the basin when basin is 50% full.

(4) Utilize outlet structures that withdraw water from the surface when discharging from basins and impoundments unless infeasible.

(5) Discharges from the basin shall not cause scouring of the banks or bottom of the receiving stream.

(6) The SWPPP shall require the basin be maintained until final stabilization of the disturbed area served by the basin.

(7) The SWPPP shall require both temporary and permanent sedimentation basins to have a stabilized spillway to minimize the potential for erosion of the spillway or basin embankment.

(8) Where use of a sediment basin is infeasible, the SWPPP shall evaluate and specify other similarly effective BMPs to be employed to control erosion and sediment delivery. These similarly effective BMPs shall be selected from appropriate BMP guidance documents authorized by this permit. The BMPs must provide equivalent water quality protection to achieve compliance with this permit.
m. **Pollution Prevention Measures:** The SWPPP shall include BMPs for pollution prevention measures. At minimum such measures must be designed, installed, implemented and maintained to:

1. Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;

2. Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk or stormwater contamination (such as final products and material intended for outdoor use);

3. Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures. Included but not limited to the installation of containment berms and use of drip pans at petroleum product and liquid storage tanks and containers; and

n. **Roadways:** Where applicable, upon installation of or connection to roadways, all efforts should be made to prevent the deposition of earth and sediment onto roadways through the use of proper BMPs.

1. Stormwater inlets susceptible to receiving sediment from the permitted land disturbance site shall have curb inlet protection.

2. Where stormwater will flow off the end of where a roadway terminates, a sediment catching BMP such as gravel berm or silt fence shall be provided.

3. Curb inlets shall be cleaned weekly or following a precipitation event that generates a run-off.

o. **Dewatering:** Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, are prohibited unless managed by appropriate controls. The SWPPP shall include a description of any anticipated dewatering methods.

1. The SWPPP shall call for specific BMPs designed to treat water pumped from trenches and excavations and in no case shall this water be pumped off-site without being treated by the specified BMPs.

11. **Good housekeeping practices** shall be maintained at all times to keep waste from entering waters of the state. Solid and hazardous waste management include providing trash containers and regular site cleanup for proper disposal of solid waste such as scrap building material, product/material shipping waste, and food containers and cups, and providing containers and proper disposal of waste paints, solvents and cleaning compounds. The provision of portable toilets for proper disposal of sanitary sewage and the storage of construction materials should be kept away from drainage courses and low areas.

12. All fueling facilities present shall at all times adhere to applicable federal and state regulations concerning underground storage, above ground storage and dispensers.

13. **Hazardous substances** that are transported, stored, or used for maintenance, cleaning, or repair shall be managed according to the provisions of the Missouri Hazardous Waste Laws and Regulations.

14. **Containers:** All paint, solvents, petroleum products, petroleum waste products and storage containers such as drums, cans, or cartons shall be stored according to BMPs. The materials exposed to precipitation shall be stored in watertight, structurally sound, closed containers. All containers shall be inspected for leaks or spillage during the inspection of BMPs.
15. **Amending/Updating the SWPPP**: The permittee shall amend and update the SWPPP as appropriate during the term of the land disturbance activity. The permittee shall amend the SWPPP at a minimum whenever the:
   a. Design, operation, or maintenance of BMPs is changed;
   b. Design of the construction project is changed that could significantly affect the quality of the stormwater discharges;
   d. Department notifies the permittee in writing of deficiencies in the SWPPP;
   e. SWPPP is determined to be ineffective in minimizing or controlling erosion and sedimentation (e.g., there is visual evidence of excessive site erosion or excessive sediment deposits in streams or lakes); and/or
   f. Department determines violations of water quality standards may occur or have occurred.

16. An individual shall be designated by the permittee as the lead for environmental matters. The lead individual for environmental matters shall have a thorough and demonstrable knowledge of the site's SWPPP and sediment and erosion control practices in general. The lead individual for environmental matters or a designated inspector knowledgeable in erosion, sediment and stormwater control principles shall inspect all structures that function to prevent pollution of waters of the state.

17. **Site Inspections**: The permittee (or a representative of the permittee) shall conduct regularly scheduled inspections.
   a. These inspections shall be conducted by a qualified person, one who is responsible for environmental matters at the site, or a person trained by and directly supervised by the person responsible for environmental matters at the site.
   b. Inspections are only required during the project’s normal working hours.
   c. For disturbed areas that have not been finally stabilized, all installed BMPs and other pollution control measures shall be inspected for proper installation, operation and maintenance.
   d. Areas on-site that have been stabilized must be inspected at least once per month.
      (1) For areas where disturbed portions have undergone temporary stabilization at the same time active construction continues on other areas, inspections shall occur at least once a month while stabilized and when re-disturbed shall follow either frequency outlined in subsection h. below.
      (2) For areas where disturbed portions have undergone final stabilization at the same time active construction continues on other areas, inspection frequency may be cease on the finally stabilized areas according to the following:
         (a) After the first monthly inspection, inspect once more within 24 hours of a storm event of 0.25 inches or greater.
         (b) If there are no issues or evidence of stabilization problems, further inspections may cease.
         (c) If unstable site conditions or sediment movement are observed, the site must be re-stabilized and monthly inspections shall occur until final stabilization is confirmed following a storm event of 0.25 inches or greater.
   e. All stormwater outfalls shall be inspected for evidence of erosion or sediment deposition.
   f. When practicable the receiving stream shall also be inspected for 50 feet downstream of the outfall.
   g. Any structural or maintenance problems shall be noted in an inspection report and corrected as soon as possible but not more than seven calendar days after the inspection.
      (1) If weather conditions prevent correction of BMPs within seven calendar days, the reasons for the delay must be documented (including pictures) and there must be a narrative explaining why the work cannot be accomplished within the seven day time period.
      (2) The documentation must be filed with the regular inspection reports.
      (3) The permittee shall correct the problem as soon as weather conditions allow.
   h. All BMPs must be inspected in accordance to one of the two schedules listed below, and any
changes to the frequency of inspections, including switching between the options listed below, must be documented in the SWPPP:

1. At least once every seven calendar days and within 48 hours after any storm event equal to or greater than a 2-year, 24-hour storm has ceased during a normal work day and within 72 hours if the event ceases during a non-work day such as a weekend or holiday; or

2. Once every 14 calendar days and within 24 hours of the occurrence of a storm event of 0.25 inches or greater or the occurrence of runoff from snowmelt. To determine if a storm event of 0.25 inches or greater has occurred on-site, the permittee must either keep a properly maintained precipitation gauge on site, or obtain the storm event information from a weather station near the site.

   a. Inspections shall be conducted within 24 hours once a storm event has produced 0.25 inches within a 24 hour period, even if the storm event is still continuing.

   b. If the permittee has elected to inspect every 14 calendar days and there is a storm event at the site that continues for multiple days, and each day of the storm produces 0.25 inches or more of rain, the permittee is required to conduct an inspection within 24 hours of the first day of the storm and within 24 hours after the end of the storm.

18. The SWPPP must explain how the person responsible for erosion control will be notified when stormwater runoff occurs.

19. **Site Inspections Reports:** A log of each inspection and copy of the inspection report shall be kept readily accessible and must be available upon request by the department. Electronic logs are acceptable as long as reports can be provided in a timely manner. If inspection reports are kept off-site, the SWPPP must indicate where they are stored. The inspection report shall be signed by the permittee or by the person performing the inspection if duly authorized to do so. The inspection report is to include the following minimum information:

   a. Inspector’s name;

   b. Date of inspection;

   c. Observations relative to the effectiveness of the BMPs;

   d. Actions taken or necessary to correct the observed problem; and

   e. Listing of areas where land disturbance operations have permanently or temporarily stopped.

20. **Notification to All Contractors:** The permittee shall be responsible for notifying each contractor or entity (including utility crews and city employees or their agents) who will perform work at the site of the existence of the SWPPP and what action or precautions shall be taken while on-site to minimize the potential for erosion and the potential for damaging any BMP. The SWPPP shall contain a record of notification; for example, a list of contractors or entities given a copy of the SWPPP or education session sign-in sheet. The permittee is responsible for any damage a subcontractor may do to established BMPs and any subsequent water quality violation resulting from the damage.

21. **Public Notification:** The permittee shall post a copy of the public notification sign on page 15 of this permit at the main entrance to the site. The public notification sign must be visible from the public road that provides access to the site’s main entrance. An alternate location is acceptable provided the public can see it and it is noted in the SWPPP. The public notification sign must remain posted at the site until the permit has been terminated.

OTHER DISCHARGES

A record of each reportable release of hazardous substance shall be retained with the SWPPP and made available to the department upon request. The department may also require the submittal of a written or electronic report detailing measures taken to clean up the spill within five (5) days of the spill. Such a report must include the type of material spilled, volume, date of spill, date clean-up was completed, clean-up method, and final disposal method.
SAMPLING REQUIREMENTS AND EFFLUENT LIMITATIONS

The department may require sampling and reporting as a result of illegal discharges, compliance issues, complaint investigations, or other such evidence of contamination from activities at the site. If such an action is needed, the department will specify in writing any sampling requirements, including such information as location, extent and parameters.

RECORDS

1. The permittee shall retain copies of this general permit, the SWPPP and all amendments for the site, results of any monitoring and analysis, and all site inspection records. The records shall be accessible during normal business hours. The records shall be retained for a period of at least three years from the date of the Letter of Termination.

2. The permittee shall provide a copy of the SWPPP to the department, USEPA, or any local agency or government representative if they request a copy in the performance of their official duties.

3. The permittee shall provide a copy of the SWPPP to those who are responsible for installation, operation, or maintenance of any BMP. The permittee, their representative, and/or the contractor(s) responsible for installation, operation and maintenance of the BMPs shall have a current copy of the SWPPP with them when on the project site.

LAND PURCHASE AND CHANGE OF OWNERSHIP

1. If the permittee sells any portion of the permitted site to a developer for commercial, industrial, or residential use, this land remains a part of the common sale and the new owner must obtain a permit prior to conducting any land disturbance activity. Therefore, the original permittee must amend the SWPPP to show that the property has been sold and therefore no longer under the original permit coverage.

2. Property of any size which is part of a larger common plan of development where the property has been stabilized and the original permit terminated will require application of a new land disturbance permit for any future land disturbance activity unless exempted per 10 CSR 20-6.010(1)(B), 10 CSR 20-6.200(1)(B), and 40 CFR 122.26(a)(2)(ii)...

3. If the entire tract is sold to a single entity, then this permit shall be terminated when the new owner obtains a new land disturbance permit for the site.

4. If a portion of a larger common plan of development is sold to an individual for the purpose of building his or her own private residence, a permit is required if the portion of land sold is equal to or greater than one acre while no permit is required for less than one acre of land sold.

TERMINATION

This permit may be terminated when all projects are stabilized. The project is considered to be finally stabilized when perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetation cover shall be at least 70% over 100% of the site. In order to terminate the permit, the permittee shall notify the department by submitting Form H- Request for Termination of a General Permit (http://dnr.mo.gov/forms/780-1409-f.pdf).

DUTY TO REAPPLY

Unless terminated, the permittee shall submit an application for the renewal of this permit by submitting Form E-Application for General Permit (http://dnr.mo.gov/forms/780-0795-f.pdf) and
Form G – Application for Stormwater Permit Under the General Permit: Land Disturbance (http://dnr.mo.gov/forms/780-1408-f.pdf) no later than thirty (30) days prior to the permit’s expiration date. If a facility submits a timely and complete application in accordance with 10 CSR 20-6.010(5)(B), (5)(C), and (10)(E)1, as well as § 644.051.10, RSMo 2015, if the department is unable, through no fault of the permittee, to issue a renewal prior to expiration of the previous permit, the terms and conditions of the expired permit are administratively continued and will remain fully effective and enforceable until such time when a permit action is taken. Failure to submit a renewal application for a facility that is still in operation is a violation of the Missouri Clean Water Law. As part of the complete application and as required by the federal NPDES eReporting rule, participation in the department’s Electronic Discharge Monitoring Report Submission System (eDMR) will be required. Facilities already participating in eDMR need not re-apply upon renewal. More information can be found at: http://dnr.mo.gov/env/wpp/edmr.htm. Failure to apply for renewal of a permit may result in termination of this permit and enforcement action to compel compliance with this condition and the Missouri Clean Water Law. This permit may be applied for and issued electronically once made available by the director in accordance with Section 644.051.10, RSMo.

MODIFICATION, REVOCATION, AND REOPENING

1. The full implementation of this operating permit shall constitute compliance with all applicable federal and state statutes and regulations in accordance with §644.051.16, RSMo, and the CWA section 402(k); however, this permit may be reopened and modified, or alternatively revoked and reissued to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a) (2) of the Clean Water Act, if the effluent standard or limitation so issued or approved:
   a. contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
   b. controls any pollutant not limited in the permit.

2. If this permit is reopened, modified or revoked pursuant to this Section, the permittee retains all rights under Chapter 536 and 644 Revised Statutes of Missouri upon the department’s reissuance of the permit as well as all other forms of administrative, judicial, and equitable relief available under law.

STANDARD CONDITIONS

These Standard Conditions incorporate permit conditions as required by 40 CFR 122.41 or other applicable state statutes or regulations. These minimum conditions apply unless superseded by requirements specified in the permit.

1. Other Information: Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the department, it shall promptly submit such facts or information.

2. Duty to Comply: The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Missouri Clean Water Law and Federal Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

3. Duty to Provide Information: The permittee shall furnish to the department, within a reasonable time, any information which the department may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the department upon request, copies of records required to be kept by this permit.
4. **Inspection and Entry:** The permittee shall allow the department, or an authorized representative (including an authorized contractor acting as a representative of the department), upon presentation of credentials and other documents as may be required by law, to:
   a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of the permit;
   b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
   c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
   d. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Federal Clean Water Act or Missouri Clean Water Law, any substances or parameters at any location.

5. **Signatory Requirement:**
   a. All permit applications, reports required by the permit, or information requested by the department shall be signed and certified. (See 40 CFR 122.22 and 10 CSR 20-6.010)
   b. The Federal Clean Water Act provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than six (6) months per violation, or by both.
   c. The Missouri Clean Water Law provides that any person who knowingly makes any false statement, representation or certification in any application, record, report, plan, or other document filed or required to be maintained pursuant to sections 644.006 to 644.141 shall, upon conviction, be punished by a fine of not more than ten thousand dollars, or by imprisonment for not more than six months, or by both.
STORMWATER DISCHARGES FROM THIS LAND DISTURBANCE SITE ARE AUTHORIZED BY THE MISSOURI STATE OPERATING PERMIT NUMBER:

ANYONE WITH QUESTIONS OR CONCERNS ABOUT STORMWATER DISCHARGES FROM THIS SITE, PLEASE CONTACT THE MISSOURI DEPARTMENT OF NATURAL RESOURCES AT 1-800-361-4827
Missouri Department of Natural Resources
Fact Sheet
MO-R100038

The Federal Water Pollution Control Act [Clean Water Act (CWA)] Section 402 of Public Law 92-500 (as amended) established the National Pollution Discharge Elimination System (NPDES) permit program. This program regulates the discharge of pollutants from point sources into the waters of the United States, and the release of stormwater from certain point sources. All such discharges are unlawful without a permit (Section 301 of the CWA). After a permit is obtained, a discharge not in compliance with all permit terms and conditions is unlawful. Missouri State Operating Permits (permit) are issued by the Missouri Department of Natural Resources (department) under an approved program, operated in accordance with federal and state laws (Federal CWA and Missouri Clean Water Law Section 644 as amended). Permits are issued for a period of five (5) years unless otherwise specified.

Per 40 CFR 124.56, 40 CFR124.8, and 10 CSR 20-6.020(1)(A)2., a Fact Sheet shall be prepared to give pertinent information regarding the applicable regulations, rationale for the development of effluent limitations and conditions, and the public participation process for the permit. A Fact Sheet is not an enforceable part of a permit.

This Fact Sheet is for a:
☐ Major
☐ Minor
☐ Industrial Facility
☐ Variance
☒ Master General Permit
☐ Permit with widespread public interest

Definitions

Common Promotional Plan: A plan undertaken by one (1) or more persons, to offer lots for sale or lease; where land is offered for sale by a person or group of persons acting in concert, and the land is contiguous or is known, designated or advertised as a common unit or by a common name or similar names, the land is presumed, without regard to the number of lots covered by each individual offering, as being offered for sale or lease as part of a common promotional plan.

Immediately: For the purposes of this permit, immediately should be defined as within 24 hours.

Infeasible: Infeasible means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale: A contiguous area where multiple separate and distinct construction activities are occurring under one plan.

Non-structural Best Management Practice: Institutional, educational or pollution prevention practices designed to limit the amount of stormwater runoff or pollutants that are generated in the landscape. An example includes ordinance development.

Ordinary High Water Mark: The line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation and/or the presence of litter and debris.

Peripheral: For the purposes of this permit, peripheral should be defined as the outermost boundary of the area that will be disturbed.

Permanently: For the purposes of this permit, permanently should be defined as any activity that has been
ceased without any intentions of future disturbance.

Structural Best Management Practice: Physical controls working individually or as a group, appropriate to the source, location, and area climate for the pollutant to be controlled. Examples include moving earth for sedimentation basin and planting vegetation.

Waters of the state: Section 644.016.1(27), RSMo defines waters of the state as, “All waters within the jurisdiction of this state, including all rivers, streams, lakes and other bodies of surface and subsurface water lying within or forming a part of the boundaries of the state which are not entirely confined and located completely upon lands owned, leased or otherwise controlled by a single person or by two or more persons jointly or as tenants in common.”

Part I – Facility Information

Facility Type: Industrial Stormwater
Facility Description: Construction or land disturbance activity (e.g., clearing, grubbing, excavating, grading, filling, and other activities that result in the destruction of the root zone and/or land disturbance activity that is reasonably certain to cause pollution to waters of the state).

This permit establishes a SWPPP requirement to minimize pollutants of concern from this type of facility or for all facilities covered under this permit. 10 CSR 20-6.200(6)(A)7. specifies that “general permits shall contain BMP requirements and/or monitoring and reporting requirements to keep the stormwater from becoming contaminated.” Local conditions are not considered when developing conditions for a general permit. A facility may apply for a site-specific permit if they desire a review of local conditions.

While drafting this permit for renewal, the department hosted four public meetings on January 27, February 24, April 18, and May 19, 2016, which allowed stakeholders to voice concerns about conditions within the permit and submit comments during the period of initial involvement. These concerns were taken into consideration when drafting the permit.

Part II – Receiving Stream Information

APPLICABLE DESIGNATIONS OF WATERS OF THE STATE:
Per Missouri Effluent Regulations (10 CSR 20-7.015), the waters of the state are divided into seven (7) categories. This permit applies to facilities discharging to the following water body categories:

- [x] Missouri or Mississippi River [10 CSR 20-7.015(2)]
- [x] Lakes or Reservoirs [10 CSR 20-7.015(3)]
- [x] Losing Streams [10 CSR 20-7.015(4)]
- [x] Metropolitan No-Discharge Streams [10 CSR 20-7.015(5)]
- [x] Special Streams [10 CSR 20-7.015(6)]
- [x] Subsurface Waters [10 CSR 20-7.015(7)]
- [x] All Other Waters [10 CSR 20-7.015(8)]

Missouri Water Quality Standards (10 CSR 20-7.031) defines the Clean Water Commission water quality objectives in terms of "water uses to be maintained and the criteria to protect those uses." The receiving stream and/or 1st classified receiving stream’s beneficial water uses shall be maintained in accordance with 10 CSR 20-7.031(4). The BMP requirement established by this permit are intended to be protective of all streams that fall within the categories of receiving water bodies indicated above. A general permit does not take into consideration site-specific conditions.
Part III – Applicability

Condition number 5 includes support activities. Those support activities are to become part of the land disturbance permitted area and included in the acreage calculations, whether the support activities are located adjacent to, on-site or off-site from the main land disturbance construction area. For example, if the main land disturbance site is 0.6 acres and the project needs fills that is gathered from a borrow site specific to this project which equals 0.5 acres, then the total acreage for this project is an acre or more and the conditions of this permit apply to both the main construction area and the borrow area.

Condition number 14 was expanded to include a more comprehensive list of state and federal requirements that must be taken into consideration.

If the proposed project encounters and will potentially affect a species of concern, please report it to the Missouri Department of Conservation and the United States Fish and Wildlife Service. For more information about requirements of the Endangered Species Act, please visit the following links:

1. To determine the potential for species of concern within or near a project, please visit the United States Fish and Wildlife Services’ “Information, Planning and Conservation” website at http://ecos.fws.gov/ipac/.
2. If there are listed species in the county or township, check to see if critical habitat has been designated and if that area overlaps or is near the project area. Critical habitat designations and associated requirements may also be found at 50 CFR Parts 17 and 226. For additional information, use the map view tool at http://criticalhabitat.fws.gov/crithab/ to find data specific to the state and county.

The Missouri Department of Conservation’s internet site for the Natural Heritage Review may be very helpful and can be found at the following link, https://naturalheritagereview.mdc.mo.gov/.

Part IV – Exemptions

Condition Number 2 was added to cite all state exemptions from permitting requirements, combining several previous cited exemptions into one condition and reference. This includes an exemption for linear construction where the entire disturbance, including clearing of land to access the linear disturbance, is less than two feet in width.

Condition Number 3 was added to cite federal regulations that exclude land disturbance projects related to the installation or maintenance work for oil and gas related activities.

Part V – Rationale of Technology Based Limitations & Permit Conditions

303(d) List & Total Maximum Daily Load (TMDL):
Section 303(d) of the Federal CWA requires that each state identify waters that are not meeting Water Quality Standards and for which adequate water pollution controls have not been required. Water Quality Standards protect such beneficial uses of water as whole body contact, maintaining fish and other aquatic life, and providing drinking water for people, livestock, and wildlife. The 303(d) list helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

Anti-backsliding:
A provision in the Federal Regulations [CWA Section 303(d) (4); CWA Section 402(c); 40 CFR Part 122.44(I)] that requires a reissued permit to be as stringent as the previous permit with some exceptions.

☐ Applicable: Backsliding proposed in this permit conforms to the anti-backsliding provisions of Section 402(c) of the CWA and 40 CFR 122.44. The department has determined that technical mistakes were made in the previous permit [CWA 402(c)(2)(B)(ii)]. The Department has determined that technical mistakes or mistaken interpretations of law were made in issuing the...
permit under section 402(a)(1)(b).

**Settleable Solids**: The Settleable Solids limitation was removed since has been determined to not be a statewide technology or water quality based limitation given a variability of soil type in the state. Increased technology based best management practices have been included and are a more appropriate technology based requirement.

**Water Quality Standard Narrative Prohibitions**: The previous permit contained language which referenced narrative compliance with the water quality standards found in 10 CSR 20-7.031. In order to comply with 40 CFR 122.44(d)(1), the permit writer has conducted reasonable potential determinations for each general and applicable specific criterion and established numeric effluent limitations where reasonable potential exists. While the removal of the previous permit language creates the appearance of backsliding, the permit writer has evaluated discharges associated with this general permit as to whether reasonable potential to cause excursions of specific or general criteria on a statewide level and found that no reasonable potential exists given the proper implementation of a Stormwater Pollution Prevention Plan and associated best management practices and that the requirements of this permit are equally protective as compared to the previous permit. Therefore, given this new information, and the fact that the previous permit special condition was not consistent with 40 CFR 122.44(d)(1), an error occurred in the establishment of the general criteria as a special condition of the previous permit.

**ANTIDEGRADATION**:  
Antidegradation policies ensure protection of water quality for a particular water body on a pollutant by pollutant basis to ensure Water Quality Standards are maintained to support beneficial uses such as fish and wildlife propagation and recreation on and in the water. This also includes special protection of waters designated as an Outstanding National Resource Water or Outstanding State Resource Water [10 CSR 20-7.031(3)(C)]. Antidegradation policies are adopted to minimize adverse effects on water. The department has determined that the best avenue forward for implementing the Antidegradation requirements into general permits is by requiring the appropriate development and maintenance of a SWPPP. The SWPPP must identify all Best Management Practices (BMPs) that are reasonable and effective, taking into account environmental impacts and costs. This analysis must document why no discharge or no exposure options are not feasible at the facility. This selection and documentation of appropriate control measures will then serve as the analysis of alternatives and fulfill the requirements of the Antidegradation Rule and Implementation Procedure 10 CSR 20-7.031(3) and 10 CSR 20-7.015(9)(A)5.

Any facility seeking coverage under this permit, which undergoes expansion or discharges a new pollutant of concern, must update their SWPPP and select new BMPs that are reasonable and cost effective. New facilities seeking coverage under this permit are required to develop a SWPPP that includes this analysis and documentation of appropriate BMPs. Renewal of coverage for a facility requires a review of the SWPPP to assure that the selected BMPs continue to be appropriate.

☑ Applicable: The main pollutant of concern in this permit is sediment. Compliance with the technology-based limitations established in this permit for the protection of General Criteria, along with the evaluation and implementation of BMPs as documented in the SWPPP, meets the requirements of Missouri’s Antidegradation Review [10 CSR 20-7.031(3), 10 CSR 20-7.031 Table A, and 10 CSR 20-7.015(9)(A)5].

**STORMWATER POLLUTION PREVENTION PLAN (SWPPP)**:  
In accordance with 40 CFR 122.44(3)(k) Best Management Practices (BMPs), BMPs are implemented to control or abate the discharge of pollutants when: (1) Authorized under Section 304(e) of the CWA for the control of toxic pollutants and hazardous substances from ancillary industrial activities; (2) Authorized under Section 402(p) of the CWA for the control of stormwater discharges; (3) Numeric effluent limitations are infeasible; or (4) The practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA.
In accordance with Developing Your Stormwater Pollution Prevention Plan, a Guide for Construction Sites (EPA 833-R-06-004; https://www3.epa.gov/npdes/pubs/sw_swppp_guide.pdf) published by the United States Environmental Protection Agency (EPA) in May 2007, BMPs are measures or practices used to reduce the amount of pollution entering waters of the state. BMPs may take the form of a process, activity, or physical structure. EPA developed resources and tools related to construction stormwater along with the BMPs to control and minimize stormwater (https://www.epa.gov/npdes/stormwater-discharges-construction-activities). Along with EPA’s resources and tools, the International Stormwater BMP database (www.bmpdatabase.org/index.htm) may provide guidance on BMPs appropriate for specific industries.

Additionally in accordance with Stormwater Management, a SWPPP is a series of steps and activities to (1) identify sources of pollution or contamination, and (2) select and carry out actions which prevent or control the pollution of stormwater discharges.

☐ Applicable: A SWPPP shall be developed and implemented for each site and shall incorporate required practices identified by the department with jurisdiction, incorporate erosion control practices specific to site conditions, and provide for maintenance and adherence to the plan.

The new permit has been revised to allow permittees to store SWPPP documents electronically as long as they can be provided in an expedient manner.

Release of a hazardous substance must be reported to the department in accordance with 10 CSR 24-3.010. If the spill occurs outside of normal business hours, or if the permit holder cannot reach regional office staff for any reason, the permit holder is instructed to report the spill to the department’s 24 hour Environmental Emergency Response hotline at (573) 634-2436 at the earliest practicable moment after discovery. Leaving a message on a department staff member voice-mail does not satisfy this reporting requirement.

WATER QUALITY STANDARDS:
Per 10 CSR 20-7.031(4), General Criteria shall be applicable to all waters of the state at all times, including mixing zones. Additionally, 40 CFR 122.44(d)(1) directs the department to include in each NPDES permit conditions to achieve water quality established under Section 303 of the CWA, including state narrative criteria for water quality.

SPECIFIC CRITERIA CONSIDERATIONS:
An evaluation of discharges associated with land disturbance activities has been conducted to determine if any pollutants discharged under this general permit would have reasonable potential to cause or contribute toward an excursion of specific water quality criterion. Pollutants discharged from land disturbance activities are not commonly associated with pollutants listed as specific criteria in the Missouri Water Quality Standards; therefore, reasonable potential to cause an excursion of a specific criterion does not exist.

GENERAL CRITERIA CONSIDERATIONS:
In accordance with 40 CFR 122.44(d)(1), effluent limitations shall be placed into the permit for those pollutants which have been determined to cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality. The rule further states that pollutants which have been determined to cause, have the reasonable potential to cause, or contribute to an excursion above a narrative criterion within an applicable State water quality standard, the permit shall contain a numeric effluent limitation to protect that narrative criterion. In order to comply with this regulation, the permit writer will complete reasonable potential determinations on whether the discharge will violate any of the general criteria listed in 10 CSR 20-7.031(4). These specific requirements are listed below followed by derivation and discussion [the lettering matches that of the rule itself, under 10 CSR 20-7.031(4)]. It should also be noted that Section 644.076.1, RMSMo states that it shall be unlawful for any person to cause or permit any discharge of water contaminants from any water contaminant or point source located in Missouri that is in violation of sections 644.006 to 644.141 of the Missouri Clean Water Law or any
standard, rule or regulation promulgated by the commission.

(a) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly or harmful bottom deposits or prevent full maintenance of beneficial uses. The SWPPP requires implementation of best management practices to store, prevent, or minimize stormwater and/or any related land disturbance activity discharges (namely sediment). If one follows their SWPPP and other permit conditions including timely inspections, no reasonable potential to cause an excursion of this narrative exists. Additionally, there had been no indication to the Department that a stream has had issues maintaining beneficial uses as a result of the controlled and managed stormwater discharges per the SWPPP. Therefore, based on the information reviewed during the drafting of this permit, no reasonable potential to cause or contribute to an excursion of this criterion exists.

(b) Waters shall be free from oil, scum and floating debris in sufficient amounts to be unsightly or prevent full maintenance of beneficial uses. Please see (a) above as justification is the same.

(c) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor or prevent full maintenance of beneficial uses. Please see (a) above as justification is the same.

(d) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal or aquatic life. This permit addresses discharges from land disturbance activities and it not expected to include an toxic pollutants. Best management practices are to be addressed in the SWPPP should any toxic pollutant of concern be on-site.

(e) There shall be no significant human health hazard from incidental contact with the water. Please see (a) above as justification is the same.

(f) There shall be no acute toxicity to livestock or wildlife watering. Please see (d) above as justification is the same.

(g) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community. Please see (a) above as justification is the same.

(h) Waters shall be free from used tires, car bodies, appliances, demolition debris, used vehicles or equipment and solid waste as defined in Missouri's Solid Waste Law, section 260.200, RSMo, except as the use of such materials is specifically permitted pursuant to section 260.200-260.247. Please see (a) above. Additionally, any solid wastes received or produced at this facility are wholly contained in appropriate storage facilities, are not discharged, and are disposed of offsite. Therefore, this discharge does not have reasonable potential to cause or contribute to an excursion of this criterion.

The settleable solids requirement was removed from this permit and was replaced with additional, more specific BMP requirements. The settleable solids limit was determined not to be protective of all waters across the state, therefore, it was removed. Examples of these BMPs include requirements to:

- Install and maintain perimeter controls along areas of the site that will receive pollutant discharges;
- Minimize sediment track-out from the site;
- Provide storage for runoff up to and including a 2-year, 24-hour storm event when designing sedimentation basins; and
- Direct stormwater to vegetated areas.

The minimum buffer width was increased from 25 feet to 50 feet. Studies have shown that a 50 foot vegetative buffer more adequately treats sediment from stormwater discharges. This appears to be standard in EPA’s permit as well as in many other states. A literature review was conducted to assess the effectiveness of buffer widths in relation to sediment removal. In an early literature review on grass buffers in agricultural settings, Dosskey (2001) concluded that 40 -100% of sediment entering from cultivated fields was removed using buffer strips 0.5 to 20 meters. Liu et al. (2008) conducted an analysis of 85 estimates of sediment removal by vegetated buffers. They found that sediment removal efficiency ($E_s$, the percentage of inflowing sediment trapped within a buffer) increased with buffer width according to the relationship: $E_s = 13.4 \log_e (w) + 56.9$ in
which \( w \) (m) is buffer width. This equation predicts that \( E_s \) increases from 78% for a 5 meter wide buffer to 88% and 97% at widths of 10 meters and 20 meters, respectively. Yaun et al. (2009; 93 estimates) and Zhang et al. (2010; 81 estimates) garnered similar results to Liu et al.

In order to design controls that match the sediment removal efficiency of a 50-foot buffer, first the permittee must know what this efficiency is for the site. The sediment removal efficiencies of natural buffers vary according to a number of site-specific factors, including precipitation, soil type, land cover, slope length, width, steepness, and the types of sediment controls used to reduce the discharge of sediment prior to the buffer.

Sediment removal efficiencies are based on the U.S. Department of Agriculture’s RUSLE2 (Revised Universal Soil Loss Equation 2) model for slope profiles using a 100-foot long exposed slopes.

Sediment removal is defined as the annual sediment delivered at the downstream end of the 50-foot natural buffer (tons/yr/acre) divided by the annual yield from cleared area (tons/yr/acre).

Sediment removal is in part a function of (1) a perimeter control (i.e., silt fence) located between the disturbed portion of the site and the upland edge of the natural buffer and (2) stormwater flows traveling through a 50-foot buffer of undisturbed natural vegetation.

Additional guidance may be found at https://www.epa.gov/sites/production/files/2017-02/documents/2017_cgp_final_appendix_g_-_buffer_reqs_508.pdf.

Inspection frequencies: Site inspection frequencies have been changed from the previous permit based upon guidance from the USEPA and from stakeholder discussions. These frequencies will allow flexibility but will still allow for frequent enough inspections to ensure that all BMPs are adequately functioning.

**Part VI – Effluent Limitations Determination**

In this general permit, Technology-Based Effluent Limitations are established through the SWPPP and BMP requirements. Effective BMPs may have to be designed on a site-specific basis. The implementation of monitoring provides a tool for each facility to evaluate the effectiveness of BMPs to ensure protection of water quality.

**Part VII – Land Purchase and Change of Ownership**

A “larger common plan of development or sale” is a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan. This term is used in conjunction with common promotional plan, as defined in §644, RSMo.

Any portion of a project that is sold to a developer is still considered part of a larger common plan of development or sale and will require a permit.

If a portion of a site is sold to an individual for the purpose of building his or her private residence:
- A permit is required if the portion of land sold is equal to or greater than one acre.
- A permit is not required if the portion of land sold is less than one acre.

**Part VIII – Termination**

The word ‘plant density’ was removed from the first paragraph since the department determined that percent of vegetative cover more accurately describes the vegetative requirements of this permit. This decision was made after discussion within the department and with stakeholders.

It is preferable that temporary BMPs such as sediment fence be removed prior to permit termination to
eliminate potential solid waste issues that may occur as a result of unnecessary and unmaintained BMPs.

Additional options for winter site stabilization as part of the vegetation requirement may exist, such as using a seeded erosion control blanket.

**Part IX – Duty to Reapply**

This section has been revised to reflect the current applicable statutes which require applicants to submit an application for coverage 30 days prior to expiration of this permit. Currently, a paper application if required; however, applicants are to submit an application for coverage electronically as soon as they are made available by the director. The department will announce the availability status of the new permit and the process to reapply at least 60 days prior to the expiration of the existing permit.

**Part X – Standard Conditions**

This section was revised to only include the standard conditions that specifically apply to this permit. All other conditions have been removed.

**Part XI – Administrative Requirements**

On the basis of preliminary staff review and applicable standards and regulations, the department, as administrative agent for the Missouri Clean Water Commission, proposes to issue a permit(s) subject to certain effluent limitations, schedules, and special conditions contained herein and within the permit. The proposed determinations are tentative pending public comment.

**PUBLIC NOTICE:**
The department shall give public notice that a draft permit has been prepared and its issuance is pending. Additionally, public notice will be issued if a public hearing is to be held because of a significant degree of interest or because of water quality concerns related to a draft permit. No public notice is required when a request for a permit modification or termination is denied; however, the requester and facility must be notified of the denial in writing.

The department must give public notice of a pending permit or of a new or reissued Missouri State Operating Permit. The public comment period is a length of time not less than thirty (30) days following the date of the public notice, during which interested persons may submit written comments about the proposed permit.

For persons wanting to submit comments regarding this proposed permit, please refer to the Public Notice page located at the front of this draft permit. The Public Notice page gives direction on how and where to submit appropriate comments.

- The Public Notice period seeking comments on this permit occurred from March 31 to May 1, 2017.

**DATE OF FACT SHEET: 06/16/2017**

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