PROJECT MANUAL

Upgrade Electric Network

Camp Rising Sun

Lake of the Ozarks State Park

Kaiser, Missouri

Designed By: Rogers-Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
St. Louis, MO 63026

Date Issued: March 28, 2023

Project No.: X2202-01

STATE *of* MISSOURI

OFFICE *of* ADMINISTRATION

Facilities Management, Design & Construction

SECTION 000107 – PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: X2202-01
Upgrade Electric Network,
Camp Rising Sun
Lake of the Ozarks State Park
Kaiser, Missouri 65047

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

Certifications of Responsibility
The design professional whose personal seal and signature appear hereon, assumes responsibility only for what appears on the documents listed below and disclaims, pursuant to Missouri Code of State Regulations CSR 2030-3.060, any responsibility for any and all other plans, specifications, estimates, reports or other documents or instruments not sealed by the undersigned design professional relating to, or intended to be used for any part or parts of the project to which this refers.

Drawings:
All

Specifications:
All

Barry D. Freiner, P.E.

END OF SECTION 000107

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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 01 Specification Sections apply to this Section.

1.2 SUMMARY

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

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

	TITLE	SHEET #	DATE
1.	Cover Sheet	Sheet G-001	03-28-23
2.	Site Maps and Drawing Index	Sheet G-002	03-28-23
3.	Civil Site Plan	Sheet C-101	03-28-23
4.	Civil Details	Sheet C-501	03-28-23
5.	Electrical Symbols, Abbreviations & General Notes	Sheet E-001	03-28-23
6.	Electrical Site Demolition Plan – North	Sheet ES-101	03-28-23
7.	Electrical Site Demolition Plan – South	Sheet ES-102	03-28-23
8.	Electrical Site Plan – North	Sheet ES-103	03-28-23
9.	Electrical Site Plan – South	Sheet ES-104	03-28-23
10.	Electrical Demolition Plans	Sheet ED-401	03-28-23
11.	Electrical Demolition Plans – Alt Bid No. 1	Sheet ED-402	03-28-23
12.	One-Line Diagram – Demolition	Sheet ED-601	03-28-23
13.	Electrical Plans	Sheet E-401	03-28-23
14.	Electrical Plans – Alt Bid No. 1	Sheet E-402	03-28-23
15.	Electrical Details	Sheet E-501	03-28-23
16.	Lighting Fixture Installation Details – Alt Bid No. 1	Sheet E-502	03-28-23
17.	One-Line Diagram	Sheet E-601	03-28-23
18.	Panelboard Schedules & Alt Bid No. 3	Sheet E-602	03-28-23
19.	Panelboard & Lighting Fixture Schedules & Alt Bid No. 1	Sheet E-603	03-28-23

	TITLE	SHEET #	DATE
20.	Panelboard Schedules – Alt Bid No. 1 & Alt Bid No. 3	Sheet E-604	03-28-23

END OF SECTION 000115

SECTION 001116 - INVITATION FOR BID

1.0 OWNER:

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

2.0 PROJECT TITLE AND NUMBER:

A. Upgrade Electric Network
Camp Rising Sun
Lake of the Ozarks State Park
Kaiser, Missouri
Project No.: X2202-01

3.0 BIDS WILL BE RECEIVED:

A. Until: 1:30 PM, Thursday, May 18, 2023

B. **Only electronic bids on MissouriBUYS shall be accepted: https://missouribuys.mo.gov. Bidder must be registered to bid.**

4.0 DESCRIPTION:

A. Scope: The Work consists of replacing and upgrading the electrical outdoor main service equipment, underground power distribution feeders, the main electrical panels in seventeen buildings and the outdoor amphitheater and the site lighting.

B. MBE/WBE/SDVE Goals: MBE 10%, WBE 10%, and SDVE 3%**. NOTE: Only MBE/WBE firms certified by the State of Missouri Office of Equal Opportunity as of the date of bid opening, or SDVE(s) meeting the requirements of Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE participation goals for this project.**

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

5.0 PRE-BID MEETING:

A. Place/Time**:** 10:00 AM, Wednesday, May 3, 2023, at Lake of the Ozarks State Park Office, 403 Hwy 134, Kaiser, MO.

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

6.0 HOW TO GET PLANS & SPECIFICATIONS:

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

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

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

7.0 POINT OF CONTACT:

A. Designer: Rogers-Schmidt Engineering Co., P.C., Barry Freiner, P. E., (636) 600-1551, email: Bfreiner@rogers-schmidt.com

B. Project Manager: Scott Zeller, (573) 751-2668, email: Scott.Zeller@oa.mo.gov

8.0 GENERAL INFORMATION:

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

B. Bid results will be available at https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans after it is verified that at least one bid is awardable and affordable.

Very Important MissouriBUYS Instructions to Help Submit a Bid Correctly

A. The bidder shall submit his or her bid and all supporting documentation on MissouriBUYS eProcurement System. No hard copy bids shall be accepted. Go to https://missouribuys.mo.gov and register. The bidder must register and complete a profile fully with all required documents submitted prior to submitting a bid.

B. Once registered, log in.
1. Under "Solicitation" select "View Current Solicitations."
2. Under "Filter by Agency" select "OA-FMDC-Contracts Chapter 8", then click "Filter Solicitation" button.
3. Select "Active Solicitations" tab.
4. To see the Solicitation Summary, click on the Project Number and the summary will open. Click each heading to open detailed information.

C. Here are simplified instructions for uploading the bid to MissouriBUYS:
1. Find the solicitation by completing Steps 1 through 4 above.
2. Select the three dots under "Actions." Select "Add New Response."
3. When the Quote box opens, give the response a title and select "OK."
4. The detailed solicitation will open. Select "Check All" for the Original Solicitation Documents, open each document, and select "Accept." If this step is not completed, a bid cannot be uploaded. Scroll to the bottom of the page and select "Add Attachments." If you do not see this command, not all documents have been opened and accepted.
5. The Supplier Attachments box will open. Select "Add Attachment" again.
6. The Upload Documents box will open. Read the instructions for uploading. Disregard the "Confidential" check box.
7. Browse and attach up to 5 files at a time. Scroll to bottom of box and select "Upload." The Supplier Attachments box will open. Repeat Steps 5 through 7 if more than 5 files are to be uploaded.
8. When the Supplier Attachments box opens again and uploading is complete, select "Done." A message should appear that the upload is successful. If it does not, go to the Bidder Response tab and select "Submit."
9. The detailed solicitation will open. At the bottom select "Close."

D. Any time a bidder wants to modify the bid, he or she will have to submit a new one. FMDC will open the last response the bidder submits. The bidder may revise and submit the bid up to the close of the solicitation (bid date and time). Be sure to allow for uploading time so that the bid is successfully uploaded prior to the 1:30 PM deadline; we can only accept the bid if it is uploaded before the deadline.

E. If you want to verify that you are uploading documents correctly, please contact Paul Girouard: 573-751-4797, paul.girouard@oa.mo.gov ; April Howser: 573-751-0053, April.Howser@oa.mo.gov ; or Mandy Roberson: 573-522-0074, Mandy.Roberson@oa.mo.gov.

F. If you are experiencing login issues, please contact Web Procure Support (Proactis) at 866-889-8533 anytime from 7:00 AM to 7:00 PM Central Time, Monday through Friday. If you try using a userid or password several times that is incorrect, the system will lock you out. Web Procure Support is the only option to unlock you! If you forget your userid or password, Web Procure Support will provide a temporary userid or password. Also, if it has been a while since your last successful login and you receive an "inactive" message, contact Web Procure (Proactis). If you are having a registration issue, you may contact Office of Administration Division of Purchasing at 573-751-3491.

IMPORTANT REMINDER REGARDING REQUIREMENT FOR OEO CERTIFICATION

A. SECTION 002113 – INSTRUCTIONS TO BIDDERS: Article 15.0, Section D1:

As of July 1, 2020, all MBE, WBE, and MBE/WBE contractors, subcontractors, and suppliers must be certified by the State of Missouri, Office of Equal Opportunity. No certifications from other Missouri certifying agencies will be accepted.

SECTION 002113 – INSTRUCTIONS TO BIDDERS

1.0 - SPECIAL NOTICE TO BIDDERS

A. If awarded a contract, the Bidder's employees, and the employees of all subcontractors, who perform the work on the project must adhere to requirements in Section 013513 – Site Security and Health Requirements as applicable per Agency.

B. The Bidder's prices shall include all city, state, and federal sales, excise, and similar taxes that may lawfully be assessed in connection with the performance of work, and the purchased of materials to be incorporated in the work. THIS PROJECT IS NOT TAX EXEMPT.

2.0 - BID DOCUMENTS

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

B. For the convenience of contractors, sub-contractors and suppliers, copies of construction documents are on file at the office of the Director, Division of Facilities Management, Design and Construction and on the Division's web site - https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans.

3.0 - BIDDERS' OBLIGATIONS

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

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

4.0 - INTERPRETATIONS

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

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

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

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

5.0 - BIDS AND BIDDING PROCEDURE

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

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

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

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

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

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

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

6.0 - SIGNING OF BIDS

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

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

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

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

E. A bid should contain the full and correct legal name of the Bidder. If the Bidder is an entity registered with the Missouri Secretary of State, the Bidder's name on the bid form should appear as shown in the Secretary of State's records.

F. The Bidder should include its corporate license number on the Bid Form and, if the corporation is organized in a state other than Missouri, a Certificate of Authority to do business in the State of Missouri shall be attached to the bid form.

7.0 - RECEIVING BID SUBMITTALS

A. It is the bidder's sole responsibility to assure receipt by Owner of bid submittals by the date and time specified in the Invitation for Bid. Bids received after the date and time specified shall not be considered by the Owner.

B. Bids must be submitted through the MissouriBUYS statewide eProcurement system (https://www.missouribuys.mo.gov/) in accordance with the instructions for that system. The Owner shall only accept bids submitted through MissouriBUYS. Bids received by the Owner through any other means, including hard copies, shall not be considered and will be discarded by the Owner unopened.

C. To respond to an Invitation for Bid, the Bidder must first register with MissouriBUYS by going through the MissouriBUYS Home Page (https://www.missouribuys.mo.gov/), clicking the "Register" button at the top of the page, and completing the Vendor Registration. Once registered, the Bidder accesses its account by clicking the "Login" button at the top of the MissouriBUYS Home Page. Enter your USERID and PASSWORD, which the Bidder will select. Under Solicitations, select "View Current Solicitations." A new screen will open. Under "Filter by Agency" select "OA-FMDC-Contracts Chapter 8." Under "Filter by Opp. No." type in the State Project Number. Select "Submit." Above the dark blue bar, select "Other Active Opportunities." To see the Solicitation Summary, single click the Opp. No. (Project Number) and the summary will open. Single quick click each blue bar to open detailed information. The Bidder must read and accept the Original Solicitation Documents and complete all identified requirements. The Bidder should download and save all of the Original Solicitation Documents on its computer so that the Bidder can prepare its response to these documents. The Bidder should upload its completed response to the downloaded documents as an attachment to the electronic solicitation response.

D. Step-by-step instructions for how a registered vendor responds to a solicitation electronically are provided in Section 001116 – Invitation For Bid.

E. The Bidder shall submit its bid on the forms provided by the Owner on MissouriBUYS with each space fully and properly completed, including all amounts required for alternate bids, unit prices, cost accounting data, etc. The Owner may reject bids that are not on the Owner's forms or that do not contain all requested information.

F. No Contractor shall stipulate in his bid any conditions not contained in the specifications or standard bid form contained in the contract documents. To do so may subject the Contractor's bid to rejection.

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

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

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

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

9.0 - AWARD OF CONTRACT

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

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

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

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

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

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

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

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

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

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

10.0 - CONTRACT SECURITY

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

11.0 - LIST OF SUBCONTRACTORS

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

12.0 - WORKING DAYS

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

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

13.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

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

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

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

14.0 – ANTI-DISCRIMINATION AGAINST ISRAEL ACT CERTIFICATION:

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

15.0 - MBE/WBE/SDVE INSTRUCTIONS

A. Definitions:

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

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

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

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

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

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

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

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

B. MBE/WBE/SDVE General Requirements:

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

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

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

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

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

1. A Bidder who is a MBE, WBE, or SDVE may count 100% of the contract towards the MBE, WBE or SDVE goal, less any amounts awarded to another MBE, WBE or SDVE. (NOTE: A MBE firm that bids as general contractor must obtain WBE and SDVE participation; a WBE firm that bids as a general contractor must obtain MBE and SDVE participation; and a SDVE firm that bids as general contractor must obtain MBE and WBE participation.) In order for the remaining contract amount to be counted towards the MBE, WBE or SDVE goal, the Bidder must complete the MBE/WBE/SDVE Compliance Evaluation Form (Section 004337) identifying itself as an MBE, WBE or SDVE.

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

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

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

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

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

D. Certification of MBE/WBE/SDVE Subcontractors:

1. In order to be counted towards the goals, an MBE or WBE must be certified by the State of Missouri Office of Equal Opportunity and an SDVE must be certified by the State of Missouri, Office of Administration, Division of Purchasing and Material Management or by the Department of Veterans Affairs.

2. The Bidder may determine the certification status of a proposed MBE or WBE subcontractor or supplier by referring to the Office of Equal Opportunity (OEO)'s online MBE/WBE directory (https://apps1.mo.gov/MWBCertifiedFirms/). The Bidder may determine the eligibility of a SDVE subcontractor or supplier by referring to the Division of Purchasing and Materials Management's online SDVE directory (https://oa.mo.gov/sites/default/files/sdvelisting.pdf) or the Department of Veterans Affairs' directory (https://vetbiz.va.gov/basic-search/).

3. Additional information, clarifications, etc., regarding the listings in the directories may be obtained by calling the Division at (573)751-3339 and asking to speak to the Contract Specialist of record as shown in the Supplementary Conditions (Section 007300).

E. Waiver of MBE/WBE/SDVE Participation:

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

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

   a. The amount of actual participation obtained;

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

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

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

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

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

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

3. If no bidder has obtained any participation in a particular category (MBE/WBE/SDVE) or made a good faith effort to do so, the Director may waive that goal rather than rebid.

F. Contractor MBE/WBE/SDVE Obligations

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

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

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

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

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

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

STATE OF MISSOURI
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION
MBE/WBE/SDVE DIRECTORIES

The MBE/WBE Directory for goods and services is maintained by the Office of Equal Opportunity (OEO) and is located at the following web address:

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

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

https://purch.oa.mo.gov/media/pdf/listing-certified-missouri-service-disabled-veteran-business-enterprises-sdves

https://veterans.certify.sba.gov/#search

State of Missouri Construction Contract

THIS AGREEMENT is made (DATE) by and between:

Contractor Name and Address

hereinafter called the "Contractor,"

and the **State of Missouri**, hereinafter called the **"Owner**", represented by the Office of Administration, Division of Facilities Management, Design and Construction, on behalf of the Department of Natural Resources, Division of State Parks.

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

ARTICLE 1. STATEMENT OF WORK

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

Project Name:	**Upgrade Electric Network** **Camp Rising Sun** **Lake of the Ozarks State Park** **Kaiser, Missouri**
Project Number:	**X2202-01**

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 **March 29, 2024**. 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 $700** per day for each and every day, Sunday and legal holidays excepted, during which the work remains incomplete and unfinished. Any sum which may be due the Owner for such damages shall be deducted and retained by the Owner from any balance which may be due the Contractor when said work shall have been finished and accepted. But such provisions shall not release the Bond of the Contractor from liability according to its terms. In case of failure to complete, the Owner will be under no obligation to show or prove any actual or specific loss or damage.

ARTICLE 4. CONTRACT SUM

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

Base Bid:	$
Alternate No. 1:	$
Alternate No. 2:	$
Alternate No. 3:	$

TOTAL CONTRACT AMOUNT: ($CONTRACT AMOUNT)

UNIT PRICES: The Owner accepts the following Unit Prices:

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

ARTICLE 5. PREVAILING WAGE RATE

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

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

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

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

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

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

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

ARTICLE 7. CONTRACT DOCUMENTS

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

1. Division 0 – Procurement and Contracting Information, including, but not limited to:
    a. Invitation for Bid (Section 001116)
    b. Instructions to Bidders (Section 002113)
    c. Supplementary Instructions to Bidders (if applicable) (Section 002213)

d. The following documents as completed and executed by the Contractor and accepted by the Owner, if applicable:
    i. Bid Form (Section 004113)
    ii. Unit Prices (Section 004322)
    iii. Proposed Contractors Form (Section 004336)
    iv. MBE, WBE, SDVE Compliance Evaluation Form(s) (Section 004337)
    v. MBE, WBE, SDVE Eligibility Determination Form for Joint Ventures (Section 004338)
    vi. MBE, WBE, SDVE Good Faith Effort (GFE) Determination Form (Section 004339)
    vii. Missouri Service Disabled Veteran Business Form (Section 004340)
    viii. Affidavit of Work Authorization (Section 004541)
    ix. Affidavit for Affirmative Action (Section 005414)
e. Performance and Payment Bond, completed and executed by the Contractor and surety (Section 006113)
f. General Conditions (Section 007213)
g. Supplementary Conditions (Section 007300)
h. Supplementary General Conditions for Federally Funded/Assisted Construction Projects (Section 007333)
i. Wage Rate(s) (Section 007346)

2. Division 1 – General Requirements
3. All Drawings identified in the Project Manual
4. All Technical Specifications included in the Project Manual
5. Addenda, if applicable

ARTICLE 8 – CERTIFICATION

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

Further, if the Contractor provides any "personal information" as defined in §105.1500, RSMo concerning an entity exempt from federal income tax under Section 501(c) of the Internal Revenue Code of 1986, as amended, the Contractor understands and agrees that it is voluntarily choosing to enter into a state contract and providing such information for that purpose. The state will treat such personal information in accord with §105.1500, RSMo.

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

APPROVED:

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

_____
Contractor's Authorized Signature

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

_____
Corporate Secretary

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

AFFIDAVIT FOR AFFIRMATIVE ACTION

PROJECT NUMBER

NAME

First being duly sworn on oath states: that

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

NAME

a ☐ sole proprietorship ☐ partnership ☐ limited liability company (LLC)

or ☐ corporation, and as such, said proprietor, partner, or officer is duly authorized to make this affidavit on behalf of said sole proprietorship, partnership, or corporation; that under the contract known as

PROJECT TITLE

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

PRINT NAME & SIGNATURE	DATE

NOTARY INFORMATION

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

MO 300-1401 (05/18) FILE/Construction Contract

Bond No._____

SECTION 006113 - PERFORMANCE AND PAYMENT BOND FORM

KNOW ALL MEN BY THESE PRESENTS, THAT we _____

as principal, and _____

_____as Surety, are held and firmly bound unto the

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

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

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

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

_____

_____

_____

(Insert Project Title and Number)

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

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

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

AS APPLICABLE:

AN INDIVIDUAL

Name: _____

Signature: _____

A PARTNERSHIP

Name of Partner: _____

Signature of Partner: _____

Name of Partner: _____

Signature of Partner: _____

CORPORATION

Firm Name: _____

Signature of President: _____

SURETY

Surety Name: _____

Attorney-in-Fact: _____

Address of Attorney-in-Fact: _____

_____

Telephone Number of Attorney-in-Fact: _____

Signature Attorney-in-Fact: _____

NOTE: Surety shall attach Power of Attorney

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

PRODUCT SUBSTITUTION REQUEST

PROJECT NUMBER

PROJECT TITLE AND LOCATION

CHECK APPROPRIATE BOX

☐ SUBSTITUTION PRIOR TO BID OPENING
(Minimum of (5) working days prior to receipt of Bids as per Article 4 – Instructions to Bidders)

☐ SUBSTITUTION FOLLOWING AWARD
(Maximum of (20) working days from Notice to Proceed as per Article 3 – General Conditions)

FROM: BIDDER/CONTRACTOR (PRINT COMPANY NAME)

TO: ARCHITECT/ENGINEER (PRINT COMPANY NAME)

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

SPECIFIED PRODUCT OR SYSTEM

SPECIFICATION SECTION NO.

SUPPORTING DATA

☐ Product data for proposed substitution is attached (include description of product, standards, performance, and test data)

☐ Sample ☐ Sample will be sent, if requested

QUALITY COMPARISON

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

PREVIOUS INSTALLATIONS

PROJECT	ARCHITECT/ENGINEER	
LOCATION		DATE INSTALLED

SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

REASON FOR SUBSTITUTION

DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?

☐ YES ☐ NO

IF YES, EXPLAIN

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

☐ YES ☐ NO

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

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

BIDDER/CONTRACTOR	DATE

REVIEW AND ACTION

☐ Resubmit Substitution Request with the following additional information:

☐ Substitution is accepted.

☐ Substitution is accepted with the following comments:

☐ Substitution is not accepted.

ARCHITECT/ENGINEER	DATE

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

FINAL RECEIPT OF PAYMENT AND RELEASE

PROJECT NUMBER

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

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

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

DOES HEREBY:

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

DATED this day of , 20 .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents

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

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

MBE/WBE/SDVE PROGRESS REPORT

Remit with **ALL** Progress and Final Payments

(Please check appropriate box) ☐CONSULTANT ☐CONSTRUCTION

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

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

SELECT MBE, WBE, SDVE	TOTAL AMOUNT OF SUBCONTRACT	$ AMOUNT PAID-TO-DATE	CONSULTANT/SUBCONSULTANT OR CONTRACTOR/SUBCONTRACTOR/SUPPLIER COMPANY NAME
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	

Revised 05/21

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

PROJECT NUMBER

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

State of _____ personally came and appeared _____
(NAME)

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

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

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

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

SIGNATURE

NOTARY INFORMATION

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

FILE: Closeout Documents

GENERAL CONDITIONS

INDEX

SECTION 007213 - GENERAL CONDITIONS

A. These General Conditions apply to each section of these specifications. The Contractor is subject to the provisions contained herein.

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

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

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

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

ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

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

architectural drawings shall govern and, in case of conflict between structural and mechanical drawings, structural drawings shall govern.

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

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

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

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

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

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

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

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

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

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

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

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

A. The Contractor and his subcontractors will not discriminate against individuals based on race,

color, religion, national origin, sex, disability, or age, but may use restrictions which relate to bona fide occupational qualifications. Specifically, the Contractor and his subcontractors shall not discriminate:

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

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

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

   1. A written policy statement committing the total organization to affirmative action and assigning management responsibilities and procedures for evaluation and dissemination;
   2. The identification of a person designated to handle affirmative action;
   3. The establishment of non-discriminatory selection standards, objective measures to analyze recruitment, an upward mobility system, a wage and salary structure, and standards applicable to lay-off, recall, discharge, demotion and discipline;
   4. The exclusion of discrimination from all collective bargaining agreements; and
   5. Performance of an internal audit of the reporting system to monitor execution and to provide for future planning.

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

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

ARTICLE 1.5 - ANTI-KICKBACK

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

ARTICLE 1.6 - PATENTS AND ROYALTIES

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

B. If the Contractor uses any design, device or materials covered by letters, patent or copyright,

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

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

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

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

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

ARTICLE 1.8 - COMMUNICATIONS

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

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

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

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

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

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

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

D. Should the Contractor or project associated subcontractors refuse to cooperate with the instructions and reasonable requests of other Contractors or other subcontractors in the overall

coordinating of the work, the Owner may take such appropriate action and issue directions, as required, to avoid unnecessary and unwarranted delays.

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

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

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

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

ARTICLE 1.11 - INDEMNIFICATION

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

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

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

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

ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES

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

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

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

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

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

for correcting such work without additional compensation.

F. The Owner shall have the right to direct the Contractor to uncover any completed work.

1. If the Contractor fails to adequately notify the Construction Representative and/or Designer of an inspection as required by the Contract Documents, the Contractor shall, upon written request, uncover the work. The Contractor shall bear all costs associated with uncovering and again covering the work exposed.

2. If the Contractor is directed to uncover work, which was not otherwise required by the Contract Documents to be inspected, and the work is found to be defective in any respect, no compensation shall be allowed for this work. If, however, such work is found to meet the requirements of this contract, the actual cost of labor and material necessarily involved in the examination and replacement plus 10% shall be allowed the Contractor.

G. The Designer shall give all orders and directions contemplated under this contract relative to the scope of the work and shall give the initial interpretation of the contract documents.

H. The Owner may file a written notice to the Contractor to dismiss immediately any subcontractors, project managers, superintendents, foremen, workers, watchmen or other employees whom the Owner may deem incompetent, careless or a hindrance to proper or timely execution of the work. The Contractor shall comply with such notice as promptly as practicable without detriment to the work or its progress.

I. If in the Owner's judgment it becomes necessary at any time to accelerate work, when ordered by the Owner in writing, the Contractor shall redirect resources to such work items and execute such portions of the work as may be required to complete the work within the current approved contract schedule.

ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES

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

ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS

A. The Contractor may request use of any article, device, product, material, fixture, form or type of construction which in the judgment of the Owner and Designer is equal in all respects to that named. Standard products of manufacturers other than those specified will be accepted when, prior to the ordering or use thereof, it is proven to the satisfaction of the Owner and Designer that they are equal in design, strength, durability, usefulness and convenience for the purpose intended.

B. Any changes required in the details and dimensions indicated on the drawings for the substitution of products other than those specified shall be properly made at the expense of the Contractor requesting the substitution or change.

C. The Contractor shall submit a request for such substitutions in writing to the Owner and Designer within twenty (20) working days after the date of the "Notice to Proceed." Thereafter no consideration will be given to alternate forms of accomplishing the work. This Article does not preclude the Owner from exercising the provisions of Article 4 hereof.

D. Any request for substitution by the Contractor shall be submitted in accordance with SECTION 002113 - INSTRUCTIONS TO BIDDERS.

E. When a material has been approved, no change in brand or make will be permitted unless:

1. Written verification is received from the manufacturer stating they cannot make delivery on the date previously agreed, or

2. Material delivered fails to comply with contract requirements.

ARTICLE 3.2 -- SUBMITTALS

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

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

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

B. All subcontractors' shop drawings and schedules shall be submitted by the Contractor and shall bear evidence that Contractor has received, reviewed, and approved them. Any shop drawings and

schedules submitted without this evidence will be returned to the Contractor for resubmission.

C. The Contractor shall include with the shop drawing, a letter indicating any and all deviations from the drawings and/or specifications. Failure to notify the Designer of such deviations will be grounds for subsequent rejection of the related work or materials. If, in the opinion of the Designer, the deviations are not acceptable, the Contractor will be required to furnish the item as specified and indicated on the drawings.

D. The Designer shall check shop drawings and schedules with reasonable promptness and approve them only if they conform to the design concept of the project and comply with the information given in the contract documents. The approval shall not relieve the Contractor from the responsibility to comply with the drawings and specifications, unless the Contractor has called the Designer's attention to the deviation, in writing, at the time of submission and the Designer has knowingly approved thereof. An approval of any such modification will be given only under the following conditions:

1. It is in the best interest of the Owner
2. It does not increase the contract sum and/or completion time
3. It does not deviate from the design intent
4. It is without prejudice to any and all rights under the surety bond.

E. No extension of time will be granted because of the Contractor's failure to submit shop drawings and schedules in ample time to allow for review, possible resubmission, and approval. Fabrication of work shall not commence until the Contractor has received approval. The Contractor shall furnish prints of approved shop drawings and schedules to all subcontractors whose work is in any way related to the work under this contract. Only prints bearing this approval will be allowed on the site of construction

F. The Contractor shall maintain a complete file on-site of approved shop drawings available for use by the Construction Representative.

ARTICLE 3.3 – AS-BUILT DRAWINGS

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

ARTICLE 3.4 – GUARANTY AND WARRANTIES

A. General Guaranty

1. Neither the final certificate of payment nor any provision in the contract documents nor partial use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with contract requirements.
2. The Contractor or surety shall remedy any defects in the work and pay for any damage to property resulting there from which shall appear within a period of one (1) year from the date of substantial completion unless a longer period is otherwise specified or a differing guaranty period has been established in the substantial completion certificate. The Owner will give notice of observed defects with reasonable promptness.
3. In case of default on the part of the Contractor in fulfilling this part of this contract, the Owner may correct the work or repair the damage and the cost and expense incurred in such event shall be paid by or recoverable from the Contractor or surety.
4. The work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's guaranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment

B. Extended Warranty

Manufacturer's certificates of warranty shall be obtained for all major equipment. Warranty shall be obtained for at least one year. Where a longer

period is offered at no additional cost or called for in the specific equipment specifications, the longer period shall govern.

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

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

1. Start-up and Shut-down Procedures: Provide a step-by-step write up of all major equipment. When manufacturer's printed start-up, trouble shooting and shut-down procedures are available; they may be incorporated into the operating manual for reference.
2. Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.
3. Equipment List: List of all major equipment as installed shall be prepared to include model number, capacities, flow rate, name place data, shop drawings and air and water balance reports.
4. Service Instructions: Provide the following information for all pieces of equipment.
    a. Recommended spare parts including catalog number and name of local supplier or factory representative.
    b. Belt sizes, types, and lengths.
    c. Wiring diagrams.
5. Manufacturer's Certificate of Warranty as described in Article 3.4.
6. Prior to the final payment, furnish to the Designer three (4) copies of parts catalogs for each piece of equipment furnished by him/her on the project with the components identified by number for replacement ordering.

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

1. Manuals shall be in quadruplicate, and all materials shall be bound into volumes of standard 8½" x 11" hard binders. Large drawings too bulky to be folded into 8½" x 11" shall be separately bound or folded and in envelopes, cross referenced and indexed with the manuals.
2. The manuals shall identify project name, project number, and include the name and address of the Contractor, subcontractors and manufacturers who were involved with the activity described in that particular manual.
3. Internally subdivide the binder contents with permanent page dividers, logically organized with tab titles clearly printed under reinforced laminated plastic tabs.
4. Contents: Prepare a Table of Contents for each volume, with each product or system description identified.

ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES

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

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

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

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

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

F. The Contractor shall be responsible for laying out all contract work such as layout of architectural, structural, mechanical and electrical work, which shall be coordinated with layouts of subcontractors

for general construction work. The Contractor is also responsible for unloading, uncrating and handling of all materials and equipment to be erected or placed by him/her, whether furnished by Contractor or others. No extra charges or compensation will be allowed as a result of failure to verify dimensions before ordering materials or fabricating items.

G. The Contractor must notify the Construction Representative at least one working day before placing concrete or burying underground utilities, pipelines, etc.

H. Contractors shall prearrange time with the Construction Representative for the interruption of any facility operation. Unless otherwise specified in these documents, all connections, alterations or relocations as well as all other portions of the work will be performed during normal working hours.

I. The Contractor shall coordinate all work so there will not be prolonged interruptions of existing equipment operation. Any existing plumbing, heating, ventilating, air conditioning or electrical disconnections necessary for the project, which affect portions of this construction or building or any other building must be scheduled with the Construction Representative to minimize or avoid any disruption of facility operations. In no case, unless previously approved in writing by the Construction Representative, shall utilities be left disconnected at the end of a work day or over a weekend. Any interruption of utilities either intentionally or accidentally shall not relieve the Contractor responsible for the interruption from the responsibility to repair and restore the utility to normal service. Repairs and restoration shall be made before the workers responsible for the repair and restoration leave the job.

J. Contractors shall limit operations and storage of materials to the area within the project, except as necessary to connect to existing utilities, and shall not encroach on neighboring property. The Contractor shall be responsible for repair of their damage to property on or off the project site occurring during construction of project. All such repairs shall be made to the satisfaction of the property owner.

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

L. Unless otherwise provided and stipulated within these specifications, the Contractor shall furnish, construct, and/or install and pay for materials, devices, mechanisms, equipment, all necessary personnel, utilities including, but not limited to water, heat, light and electric power, transportation services, applicable taxes of every nature, and all other facilities necessary for the proper execution and completion of the work.

M. Contractor shall carefully examine the plans and drawings and shall be responsible for the proper fitting of his material, equipment and apparatus into the building.

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

O. All temporary shoring, bracing, etc., required for the removal of existing work and/or for the installation of new work shall be included in this contract. The Contractor shall make good, at no cost to the Owner, any damage caused by improper support or failure of shoring in any respect. Each Contractor shall be responsible for shoring required to protect his work or adjacent property and improvements of Owner and shall be responsible for shoring or for giving written notice to adjacent property owners. Shoring shall be removed only after completion of permanent supports.

P. The Contractor shall provide at the proper time such material as is required for support of the work. If openings are required, whether shown on drawings or not, the Contractor shall see that they are properly constructed.

Q. During the performance of work the Contractor shall be responsible for providing and maintaining warning signs, lights, signal devices, barricades, guard rails, fences and other devices appropriately located on site which will give proper and understandable warning to all persons of danger of entry onto land, structure or equipment.

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

S. The Contractor shall be responsible for care of the finished work and shall protect same from damage or defacement until substantial completion by the Owner. If the work is damaged by any cause, the Contractor shall immediately begin to make repairs in accordance with the drawings and specifications. Contractor shall be liable for all damage or loss unless attributable to the acts or omissions of the Owner or Designer. Any claim for reimbursement shall be submitted in accordance with Article 4. After substantial completion the Contractor will only be responsible for damage resulting from acts or omissions of the Contractor or subcontractors through final warranty.

T. In the event the Contractor encounters an unforeseen hazardous material, the Contractor

shall immediately stop work in the area affected and report the condition to the Owner and Designer in writing. The Contractor shall not be required, pursuant to Article 4, to perform, any work relating to hazardous materials.

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

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

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

ARTICLE 3.7 -- SUBCONTRACTS

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

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

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

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

ARTICLE 4 -- CHANGES IN THE WORK

4.1 CHANGES IN THE WORK

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

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

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

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

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

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

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

1. The overhead and profit charge by the Contractor and all subcontractors shall be considered to include, but is not limited to: incidental job burdens, small truck (under 1 ton) expense, mileage, small hand tools,

warranty costs, company benefits and general office overhead. Project supervision including field supervision and job site office expense shall be considered a part of overhead and profit unless a compensable time extension is granted.

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

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

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

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

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

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

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

ARTICLE 4.2 – CHANGES IN COMPLETION TIME

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

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

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

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

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

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

2. Labor strikes or acts of God occur, OR

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

C. No time extension or compensation will be provided for delays caused by or within the control

of the Contractor, subcontractors or suppliers and for concurrent delays caused by the Owner.

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

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT

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

1. Contract;
2. Performance/payment bond as described in Article 6.1;
3. Certificates of Insurance, or the actual policies themselves, showing that the Contractor has obtained the insurance coverage required by Article 6.2.
4. Written Affirmative Action Plans as required in Article 1.4.

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

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

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

ARTICLE 5.2 -- PROJECT CONSTRUCTION

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

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

ARTICLE 5.3 -- PROJECT COMPLETION

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

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

days notice before the inspection shall be performed.

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

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

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

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

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

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

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

A. Payments on account of this contract will be made monthly in proportion to the work which has been completed. Request for payment must be submitted on the Owner's forms. No other pay request will

be processed. Supporting breakdowns must be in the same format as Owner's forms and must provide the same level of detail. The Designer will, within 5 working days from receipt of the contractor's request for payment either issue a Certificate for Payment to the Owner, for such amount as the Designer determines is properly due, or notify the Contractor in writing of reasons for withholding a Certificate. The Owner shall make payment within 30 calendar days after the "Application and Certification for Payment" has been received and certified by the Designer. The following items are to be attached to the contractor's pay request:

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

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

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

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

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

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

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

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

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

1. Defective work not remedied. When a notice of noncompliance is issued on an item or items, corrective action shall be undertaken immediately. Until corrective action is completed, no monies will be paid and no additional time will be allowed for the item or

items. The cost of corrective action(s) shall be borne by the Contractor.

2. A reasonable doubt that this contract can be completed for the unpaid balance.

3. Failure of the Contractor to update as-built drawings monthly for review by the Construction Representative.

4. Failure of the Contractor to update the construction schedule.

When the Construction Representative is satisfied the Contractor has remedied above deficiencies, payment shall be released.

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

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

2. The final payment shall not become due until the Contractor delivers to the Construction Representative:

a) A complete file of releases, on the standard form included in the contract documents as "Final Receipt of Payment and Release Form", from subcontractors and material suppliers evidencing payment in full for services, equipment and materials, as the case may require, if the Owner approves, or a consent from the Surety to final payment accepting liability for any unpaid amounts.

b) An Affidavit of Compliance with Prevailing Wage Law, in the form as included in this contract specifications, properly executed by each subcontractor, and the Contractor

c) Certified copies of all payrolls

d) As-built drawings

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

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

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

ARTICLE 6 -- INSURANCE AND BONDS

ARTICLE 6.1 -- BOND

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

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

ARTICLE 6.2 – INSURANCE

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

B. Minimum Scope and Extent of Coverage

1. General Liability

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

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

2. Automobile Liability

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

3. Workers' Compensation and Employer's Liability

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

4. Builder's Risk or Installation Floater Insurance

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

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

C. Minimum Limits of Insurance

1. General Liability

Contractor

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

2. Automobile Liability

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

3. Workers' Compensation and Employers Liability

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

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

D. Deductibles and Self-Insured Retentions

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

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

E. Other Insurance Provisions and Requirements

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

1. General Liability

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

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

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

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

2. Automobile Insurance

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

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

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

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

3. Workers' Compensation/Employer's Liability

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

4. All Coverages

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

F. Insurer Qualifications and Acceptability

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

G. Verification of Insurance Coverage

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

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

ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

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

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

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

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

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

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

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

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

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

ARTICLE 7.3 -- FOR CONVENIENCE

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

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

B. Upon receipt of notification, the Contractor shall:

1. Cease operations when directed.

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

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

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

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

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

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

SECTION 007300 - SUPPLEMENTARY CONDITIONS

1.0 GENERAL:

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

2.0 CONTACTS:

Designer:

Barry Freiner, P. E.
Rogers-Schmidt Engineering Co., P.C.
1736 West Park Center Drive, Suite 204
Saint Louis, Missouri 63026
Telephone: (636) 600-1551
Email: Bfreiner@rogers-schmidt.com

Construction Representative:

Ken Stevens
Division of Facilities Management, Design and Construction
709 Missouri Blvd (Upper Level)
Jefferson City, MO 65109
Telephone: (573) 526-5768
Email: Ken.Stevens@oa.mo.gov

Project Manager:

Scott Zeller
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: (573) 751-2668
Email: Scott.Zeller@oa.mo.gov

Contract Specialist:

Paul Girouard
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65102
Telephone: 573-751-4797
Email: Paul.Girouard@oa.mo.gov

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

4.0 FURNISHING CONSTRUCTION DOCUMENTS:

A. The Owner will furnish the Contractor with approximately 5 complete sets of drawings and specifications at no charge.

B. The Owner will furnish the Contractor with approximately 5 sets of explanatory or change drawings at no charge.

C. The Contractor may make copies of the documents as needed with no additional cost to the Owner.

5.0 SAFETY REQUIREMENTS

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

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MICHAEL L. PARSON, Governor

Annual Wage Order No. 29

Section 015
CAMDEN COUNTY

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

Original Signed by
Todd Smith, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2022**

Last Date Objections May Be Filed: **April 11, 2022**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$23.58*
Boilermaker	$23.58*
Bricklayer	$23.58*
Carpenter	$50.94
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$23.58*
Plasterer	
Communications Technician	$23.58*
Electrician (Inside Wireman)	$60.51
Electrician Outside Lineman	$23.58*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$23.58*
Glazier	$23.58*
Ironworker	$23.58*
Laborer	$45.39
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$23.58*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$23.58*
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$23.58*
Plumber	$65.18
Pipe Fitter	
Roofer	$23.58*
Sheet Metal Worker	$23.58*
Sprinkler Fitter	$23.58*
Truck Driver	$23.58*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

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

Heavy Construction Rates for
CAMDEN County

Section 015

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$23.58*
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$23.58*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$42.43
General Laborer	
Skilled Laborer	
Operating Engineer	$48.49
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$23.58*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

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

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

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

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

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

OVERTIME
and
HOLIDAYS

OVERTIME

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

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

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

HOLIDAYS

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

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

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Project consists of upgrading of the electrical network at the Camp Rising Sun group camp at the Lake of the Ozarks State Park.

1. Project Location: 403 Hwy 134, Kaiser, Missouri 65047-0170.
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 March 28, 2023 were prepared for the Project by Rogers-Schmidt Engineering Co., P.C., 1736 West Park Center Drive, Suite 204, Saint Louis, Missouri 63026.

C. The Work consists of replacing and upgrading the electrical outdoor main service equipment, underground power distribution feeders, the main electrical panels in seventeen buildings and the outdoor amphitheater and the site lighting.

1. The Work includes, but is not limited to:

a. Demolition of existing electrical service equipment, including power feeder conductors, panelboards, disconnect switches, enclosed circuit breakers and underground feeder wiring.
b. Installation of new electrical service equipment, underground power feeder conductors and junction boxes, panelboards, enclosed circuit breakers and site lighting fixtures.

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

1.3 WORK SEQUENCE

A. The Work will be conducted under in one phase under a single prime contract.

B. The Contractor shall provide a work sequence plan and schedule indicating phasing of work for review and approval by the Construction Representative prior to commencing with any of the Work.

C. No existing functional item shall be removed until the replacement item, along with all related materials required to install the item and make it fully functional, has been received on site.

D. The Owner has allowed for lead time of materials for this project and General Conditions Article 4 – CHANGES IN THE WORK, permit additional time to procure materials if the allotted time proves insufficient.

E. All on-site work shall begin no earlier than October 16, 2023 and shall be completed no later than March 29, 2024.

1.4 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.
3. Coordinate all deliveries with the Owner.
4. Park only in Owner-designated spaces.

C. Use of Existing Buildings: Maintain the existing buildings in a weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the buildings during the construction period.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 011000

SECTION 012200 – UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

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

1.2 SUMMARY

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

B. Related Sections include the following:

1. First Division 1 Section below contains requirements that relate directly to Unit Prices.
2. Division 1 Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Contract Changes.

1.3 DEFINITIONS

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

1.4 PROCEDURES

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

B. Single Unit Price Cost: A single unit price cost shall be provided for both increasing and decreasing estimated base bid quantities; separate unit price cost for increased quantity versus decreased quantity will not be accepted

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

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

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 **LIST OF UNIT PRICES**

A. Unit Price No. 1: Rock Removal

1. Description: Rock removal for underground electrical feeder trenching
2. Unit of Measurement: Cubic Yard (CY)
3. Base Bid Quantity: 10 CY

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost for each alternate is the net addition to the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

B. No additional time will be allowed for alternate work unless the number of work days is so stated on the bid form.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate the Alternate Work into the Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. Notification: The award of the Contract will indicate whether alternates have been accepted or rejected.

C. Execute accepted alternates under the same conditions as other Work of this Contract.

D. Schedule: A “Schedule of Alternates” is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1:

1. Replace existing load centers at Buildings B1, B2, B3, B4, B5, B6, B7 and B8 with new panelboards in accordance with Specification Section 262416 – Panelboards.
2. Replace all existing site lighting and wooden poles with new LED site lighting fixtures and steel poles in accordance with Specification Section 265613 – Exterior Lighting Fixtures and Lamps, the installation details on Drawing E-502 and lighting fixture schedule on Drawing E-604 in the locations indicated on Drawings ES-103 and ES-104.

B. Alternate No. 2: Provide all new underground feeders using Type XHHW-2 single conductors in accordance with Specification Section 260519 – Low-Voltage Electrical Power Conductors and Cables installed in direct buried Schedule 40 PVC conduit in accordance with Specification Section 260533.13 – Conduit for Electrical Systems, using the excavated soil as backfill, in lieu of using direct buried, factory plexed secondary URD cable with Type USE-2 conductors in accordance with Specification Section 260519 – Low-Voltage Electrical Power Conductors and Cables, backfilled with sand as indicated in the details on Drawing E-501.
NOTE: The main feeders from the Ameren Missouri transformer pole to the Ameren Missouri CT cabinet and feeder cables at all road/drive crossings are required to be installed in PVC conduit as part of the Base Bid work per the details on Drawing E-501.

C. Alternate No. 3: Provide a bus mounted, surge protective device (SPD) in accordance with Specification Section 262416 – Panelboards factory installed in the following new panelboards:

1. Panelboard MP-CRS
2. Panelboard DH
3. Panelboard B8 (Replacement of this panel is part of Alternate No. 1)

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Division 0, Section 006325 "Product Substitution Request" for the required form to be completed and submitted to request approval of a product substitution.
2. Division 1, Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

A. *Substitutions*: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. *Substitutions for Cause*: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. *Substitutions for Convenience*: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. *Substitution Requests*: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. *Substitution Request Form*: Use Owner provided form in Section 006325 – Product Substitution Request.
2. *Documentation*: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product, fabrication or installation cannot be provided, if applicable.
b. Coordination information, including a list of changes or revisions needed to other parts of the Work that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of Designers and Owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. *Designer's Action*: If necessary, Designer will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Designer will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. *Forms of Acceptance*: Change Order, Construction Change Directive, or Designer's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Designer does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. *Compatibility of Substitutions*: Investigate and document compatibility of proposed substitution with related products and materials. Contractor shall engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. *Coordination*: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. *Substitutions for Cause*: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. *Conditions*: Designer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Designer will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    b. Substitution request is fully documented and properly submitted.
    c. Requested substitution will not adversely affect Contractor's construction schedule.
    d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    e. Requested substitution is compatible with other portions of the Work.
    f. Requested substitution has been coordinated with other portions of the Work.
    g. Requested substitution provides specified warranty.
    h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. *Substitutions for Convenience*: Designer will consider requests for substitution if received within 30 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Designer.

1. *Conditions*: Designer will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Designer will return requests without action, except to record noncompliance with these requirements:

    a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Designer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
    b. Requested substitution does not require extensive revisions to the Contract Documents.
    c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    d. Substitution request is fully documented and properly submitted.
    e. Requested substitution will not adversely affect Contractor's construction schedule.
    f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    g. Requested substitution is compatible with other portions of the Work.
    h. Requested substitution has been coordinated with other portions of the Work.
    i. Requested substitution provides specified warranty.
    j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012500

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 Division 01 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 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
2. Division 0, Section 007213, Article 4.0 "Changes in the Work" for Contract Change requirements.
3. Division 1, Section 012200 "Unit Prices" for administrative requirements for using Unit Prices.

1.3 REQUESTS FOR INFORMATION

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

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

C. Responses from the Designer will not change any requirement of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change to the requirements of the Contract Document, the Contractor shall give written notice to the Designer requesting a 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 Applicable)

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 Division 01 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. Related Sections include the following:

1. Division 0, Section 007213 "General Conditions", Articles 1.8.B and 1.8.C for coordinating meetings onsite.
2. Division 0, Section 007213 "General Conditions", Article 5.4.H for coordinating Closeout of the Contract.
3. Division 1, Section 013200 "Schedules" for preparing and submitting Contractor's Construction Schedule.

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.

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.

B. 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.

C. 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

D. 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 Division 0, Section 007213 “General Conditions”, Articles 1.8.B and 1.8.C.

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013100

SECTION 013115 - PROJECT MANAGEMENT COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Division 1, Section 012600 – Contract Modification Procedures

C. Division 1, Section 013300 – Submittals

1.2 SUMMARY

A. Project Management Communications: The Contractor shall use the Internet web based project management communications tool, E-Builder® ASP software, and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.

1. Project management communications is available through E-Builder® as provided by "e-Builder®" in the form and manner required by the Owner.

2. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited

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

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

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

E. Authorized Users: Access to the web site will be by individuals who are authorized users.

1. Individuals shall complete the E-Builder New Company/User Request Form located at the following web site: https://oa.mo.gov/facilities/vendor-links/contractor-forms. Completed forms shall be emailed to the following email address: OA.FMDCE-BuilderSupport@oa.mo.gov.

2. Authorized users will be contacted directly and assigned a temporary user password.

3. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.

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

G. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using E-Builder® to send messages. Communication functions are as follows:

1. Document Integrity and Revisions:

a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.

b. The system shall make it easy to identify revised or superseded documents and their predecessors.

c. Server or Client side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.

2. Document Security:

a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties communication except for Administrative Users. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!

3. Document Integration:

a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.

4. Reporting:

a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.

5. Notifications and Distribution:

a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document

distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.

6. Required Document Types:

   a. RFI, Request for Information

   b. Submittals, including record numbering by drawing and specification section

   c. Transmittals, including record of documents and materials delivered in hard copy

   d. Meeting Minutes

   e. Application for Payments (Draft or Pencil)

   f. Review Comments

   g. Field Reports

   h. Construction Photographs

   i. Drawings

   j. Supplemental Sketches

   k. Schedules

   l. Specifications

   m. Request for Proposals

   n. Designer's Supplemental Instructions

   o. Punch Lists

H. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents shall be submitted by transmission in electronic form to the E-Builder® web site by licensed users.

   a. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier shall respond to documents received in electronic form on the web site, and consider them as if received in paper document form.

   b. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.

   c. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.

I. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:

1. Providing suitable computer systems for each licensed user at the user's normal work location[1] with high-speed Internet access, i.e., DSL, local cable company's Internet connection, or T1 connection.

2. Each of the above referenced computer systems shall have the following minimum system[2] and software requirements:

   a. Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)

      1) Operating System: Windows XP or newer

      2) Internet Browser: Internet Explorer 6.01SP2+ (Recommend IE7.0+)

      3) Minimum Recommend Connection Speed: 256K or above

      4) Processor Speed: 1 Gigahertz and above

      5) RAM: 512 mb

      6) Operating system and software shall be properly licensed.

      7) Internet Explorer version 7 (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.

      8) Adobe Acrobat Reader (current version is a free distribution for download).

      9) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013115

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

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

SECTION 013200 – SCHEDULE – BAR CHART

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

PART 2 - PRODUCTS – (Not Applicable)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

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

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

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

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

   b. Close Out Documents

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

   c. General Conditions

      1) No more than 10%

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

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

3.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE

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

1. The Contractor shall provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.
    a. If practical, use the same Schedule of Values breakdown for schedule time bars.
2. The Contractor shall provide a base activity time bar showing duration for each construction activity. Each bar is to indicate start and completion dates for the activity. The Contractor is to place a contrasting bar below each original schedule activity time for indicating actual progress and planned remaining duration for the activity.
3. The Contractor shall prepare the Schedule on a minimal number of separate sheets to readily show the data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on schedule with other construction activities. Include minor elements involved in the overall sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.
5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other required schedules and reports.
6. Indicate the Intent to Award and the Contract Substantial Completion dates on the schedule.

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

1. Requirement for Phased completion
2. Work by separate Contractors
3. Pre-purchased materials
4. Coordination with existing construction
5. Seasonal variations
6. Environmental control

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

1. Subcontract awards
2. Submittals
3. Purchases
4. Deliveries
5. Installation
6. Testing
7. Adjusting
8. Curing
9. Startup and placement into final use and operation

3.3 SCHEDULE OF SUBMITTALS

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

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

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

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

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

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

3.4 SCHEDULE OF INSPECTIONS AND TESTS

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

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

1. Specification Section number
2. Description of the test
3. Identification of applicable standards
4. Identification of test methods
5. Number of tests required
6. Time schedule or time span for tests
7. Entity responsible for performing tests
8. 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 and Division 01 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 01 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 Division 0, Section 007213 “General Conditions”, Article 3.2 “Submittals”.

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 24”x36”.

1.5 PRODUCT DATA

A. The Contractor shall comply with Division 0, Section 007213 “General Conditions”, Article 3.2 “Submittals”.

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 Division 0, Section 007213 "General Conditions", Article 3.2 "Submittals".

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

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

    a. Specification Section number and reference
    b. Generic description of the Sample
    c. Sample source
    d. Product name or name of the Manufacturer
    e. Compliance with recognized standards
    f. Availability and delivery time

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

    a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show approximate limits of the variations.
    b. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
    c. Refer to other Sections for samples to be returned to the Contractor for incorporation in the Work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.

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

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

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

1.7 QUALITY ASSURANCE DOCUMENTS

A. The Contractor shall comply with Division 0, Section 007213 "General Conditions", Article 3.2 "Submittals".

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

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

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

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

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

   1. The Contractor shall submit digital photographs. The Construction Representative shall determine the quality and naming convention at the preconstruction meeting.
   2. The Contractor shall identify each photograph with project name, location, number, date, time, and orientation.
   3. The Contractor shall submit progress photographs monthly unless specified otherwise. Photographs shall be taken one (1) week prior to submitting.
   4. The Contractor shall take four (4) site photographs from differing directions and a minimum of five (5) interior photographs indicating the relative progress of the Work.

1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

A. The Contractor shall submit all required manufacturer's operating instructions, maintenance/service manuals, and warranties in accordance with Division 0, Section 007213 "General Conditions", Article 3.5 "Operation and Maintenance Manuals", and Division 0, Section 007300 "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.

END OF SECTION 013300

SPEC SECTION	TITLE	CATEGORY
011000	Work Sequence Plan and Schedule Indicating Phasing of Work	Construction Schedule
012500	Substitution Requests	Product Data
013100	Coordination - Coordination Drawings	Shop Drawings
013100	Coordination - Key Personnel Names	List of Subcontractors
013200	Schedules - Bar Chart	Construction Schedule
013200	Schedules - Bar Chart	Schedule of Values
013200	Schedules - Bar Chart - Schedule of Inspections and Tests	Construction Schedule
013200	Schedules - Bar Chart	Major Material Suppliers
013300	Submittals - Record Drawings	As-Builts
013300	Submittals - Notifications & Permits	Certification
013300	Submittals - Quality Control	Certification
013300	Submittals	Certification
013300	Submittals - Inspection & Test Reports	Certification
013300	Submittals - Construction Photographs	Certification
013300	Submittals - O&M Manuals	Operation / Maintenance Manual
013513.31	Site Security and Health Requirements (DNR) - MSDS	Product Data
013513.31	Site Security and Health Requirements (DNR) - Schedule of Proposed Shutdowns	Construction Schedule
015000	Construction Facilities and Temporary Controls - Temporary Utilities	Test Report
015000	Construction Facilities and Temporary Controls - Temporary Utilities Schedule	Construction Schedule
016000	Product Requirements - Comparable Product Requests	Product Data
017823	Operation and Maintenance Manual Data	Operation / Maintenance Manual
032000	Concrete Reinforcing	Shop Drawings
032000	Concrete Reinforcing	Product Data
032000	Concrete Reinforcing	Certification
033000	Cast-in-Place Concrete	Product Data
033000	Cast-in-Place Concrete	Shop Drawings
033000	Cast-in-Place Concrete	Certification
033000	Cast-in-Place Concrete	As-Builts
033000	Cast-in-Place Concrete	Test Report
260505	Selective Demolition for Electrical - Schedule of Selective Demolition Activities	Construction Schedule
260505	Selective Demolition for Electrical - Inventory of Items to be Salvaged	Shop Drawings
260505	Selective Demolition for Electrical - Pre-Demolition Photographs	Shop Drawings
260505	Selective Demolition for Electrical - Disposal Records	Certification
260519	Low-Voltage Electrical Power Conductors and Cables - 600-volt Single Conductor Building Wire	Product Data
260519	Low-Voltage Electrical Power Conductors and Cables - 600-volt Secondary URD Cable	Product Data
260519	Low-Voltage Electrical Power Conductors and Cables - Test Reports	Test Report

SPEC SECTION	TITLE	CATEGORY
260526	Grounding and Bonding for Electrical Systems - Grounding Conductors	Product Data
260526	Grounding and Bonding for Electrical Systems - Exothermic Welds	Product Data
260526	Grounding and Bonding for Electrical Systems - Grounding Clamps	Product Data
260526	Grounding and Bonding for Electrical Systems - Grounding Connectors	Product Data
260526	Grounding and Bonding for Electrical Systems - Grounding Lugs	Product Data
260526	Grounding and Bonding for Electrical Systems - Grounding Rods	Product Data
260526	Grounding and Bonding for Electrical Systems - Grounding Rod Resistance Test Report	Test Report
260529	Hangers and Supports for Electrical Equipment - Expansion Anchors	Product Data
260529	Hangers and Supports for Electrical Equipment - U-Channel Supports & Accessories	Product Data
260533.13	Conduit for Electrical Systems - Each Type of Conduit	Product Data
260533.13	Conduit for Electrical Systems - Conduit Hubs	Product Data
260533.13	Conduit for Electrical Systems - Conduit Expansion Fittings	Product Data
260533.13	Conduit for Electrical Systems - Intumescent Silicone Sealant	Product Data
260533.13	Conduit for Electrical Systems - Conduit Bodies	Product Data
260533.13	Conduit for Electrical Systems - Conduit Mounting Clamps	Product Data
260533.13	Conduit for Electrical Systems - Fire-Stopping Materials	Product Data
260533.13	Conduit for Electrical Systems - Protective Coating for Direct Buried Metal Conduit	Product Data
260533.13	Conduit for Electrical Systems - Underground Conduit Warning Tape	Product Data
260533.13	Conduit for Electrical Systems - Conduit Pull Tape	Product Data
260533.16	Boxes for Electrical Systems - Outlet and Non-Dimensioned Junction and Pull Boxes	Product Data
260533.16	Boxes for Electrical Systems - Device Boxes	Product Data
260533.16	Boxes for Electrical Systems - Dimensioned Junction and Pull Boxes	Product Data
260533.16	Boxes for Electrical Systems - Junction Boxes for Underground Conduit	Product Data
260533.16	Boxes for Electrical Systems - Ameren Missouri CT Enclosure	Product Data
260553	Identification for Electrical Systems - Nameplate Type Product Data	Product Data
260553	Identification for Electrical Systems - Nameplate Engraving Schedule	Shop Drawings
260553	Identification for Electrical Systems - Wire and Cable Identification Labels	Product Data
260553	Identification for Electrical Systems - Arc Flash Hazard Warning Labels	Product Data
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - Software IEEE 399 Compliance	Certification
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - Study Specialist Qualifications	Certification
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - References for Arc Flash Studies	Certification
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - Demonstrate of Capabilities	Certification
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - Equipment Label Qualifications	Certification
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - Single-Line Diagram	Shop Drawings
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - Fault Current Study Report	Shop Drawings
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - Coordination Study Report	Shop Drawings

SPEC SECTION	TITLE	CATEGORY
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - Equipment Evaluation Report	Shop Drawings
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - OCPD Settings Report	Shop Drawings
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - Arc Flash Risk Assessment Report	Shop Drawings
260573	Protective Device Coordination Study & Arc Flash Risk Assessment - Final Report & Electronic Data Files	Shop Drawings
260583	Wiring Connections - 600-Volt Connectors	Product Data
260583	Wiring Connections - 600-Volt Terminations	Product Data
260583	Wiring Connections - 600-volt Pin Adapters	Product Data
262416	Panelboards	Product Data
262416	Panelboards - SPDs (Alternate Bid No. 3)	Product Data
262416	Panelboards	Shop Drawings
262416	Panelboards	Certification
262416	Panelboards	Test Report
262416	Panelboards - SPDs Warranty (Alternate Bid No. 3)	Warranty
262416	Panelboards	Operation / Maintenance Manual
262726	Wiring Devices	Product Data
262816.13	Enclosed Circuit Breakers	Product Data
262816.13	Enclosed Circuit Breakers	Shop Drawings
265613	Exterior Lighting Fixtures and Lamps (Alternate Bid No. 3)	Product Data
265613	Exterior Lighting Fixtures and Lamps - Photometric Plot (Alternate Bid No. 3)	Shop Drawings
265613	Exterior Lighting Fixtures and Lamps (Alternate Bid No. 3)	Operation / Maintenance Manual
265613	Exterior Lighting Fixtures and Lamps (Alternate Bid No. 3)	Warranty
265613	Exterior Lighting Fixtures and Lamps (Alternate Bid No. 3)	As-Builts
ES-103	General Note M - Proposed UG Feeder Routing Plan	Shop Drawings
ES-104	General Note L - Proposed UG Feeder Routing Plan	Shop Drawings
310000	Earthwork	Product Data
310000	Earthwork	Test Report
310000	Earthwork - Pre-Excavation Photographs	Shop Drawings
311000	Site Clearing - Pre-Site Clearing Photographs	Shop Drawings
311000	Site Clearing	As-Builts
321216	Asphalt Paving	Product Data
321216	Asphalt Paving	Certification
321216	Asphalt Paving	Test Report
329200	Turfs and Grasses	Product Data
C-501	Segmental Block Retaining Wall	Shop Drawings
C-501	Segmental Block Retaining Wall	Sample
C-501	Segmental Block Retaining Wall	Product Data

SPEC SECTION	TITLE	CATEGORY
END OF SECTION 013300.10		

SECTION 013513.31 – SITE SECURITY AND HEALTH REQUIREMENTS

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 01 Specification Sections, apply to this Section.

1.2 SUBMITTALS

A. List of required submittals:

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

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ACCESS TO THE SITE

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

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

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

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

3.2 FIRE PROTECTION, SAFETY, AND HEALTH CONTROLS

A. The Contractor shall take all necessary precautions to guard against and eliminate possible fire hazards.

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

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

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

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

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

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

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

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

3.3 DISRUPTION OF UTILITIES

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

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

END OF SECTION 013513.31

SECTION 015000 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for construction facilities and temporary controls including temporary utilities, support facilities, security, and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Water service and distribution
2. Temporary electric power and light
3. Temporary heat
4. Ventilation
5. Telephone service
6. Sanitary facilities, including drinking water
7. Storm and sanitary sewer

C. Support facilities include, but are not limited to, the following:

1. Field offices and storage sheds
2. Temporary roads and paving
3. Dewatering facilities and drains
4. Temporary enclosures
5. Hoists and temporary elevator use
6. Temporary project identification signs and bulletin boards
7. Waste disposal services
8. Rodent and pest control
9. Construction aids and miscellaneous services and facilities

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

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

1.3 SUBMITTALS

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

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

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations including, but not limited to, the following:

1. Building code requirements
2. Health and safety regulations
3. Utility company regulations
4. Police, fire department, and rescue squad rules
5. Environmental protection regulations

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations". ANSI A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities".

1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electrical 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 3/8" (9.5mm) thick exterior plywood.
4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8" (16mm) thick exterior plywood.

C. Gypsum Wallboard: Provide gypsum wallboard on interior walls of temporary offices.

D. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary office, shops, and shed.

E. Paint:

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

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

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

H. Open-Mesh Fencing: Provide open mesh, orange plastic fencing with tee-posts driven into the earth at maximum intervals of 15-feet on center.

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 3/4" (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, compact fluorescent or LED 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: Water service to Camp Rising Sun is turned off from October 15 through April 15. The Contractor must make provisions for water to be used for washing and construction needs.

C. Temporary Electric Power Service: The Contractor will be permitted to obtain temporary electric service from the existing 120/240V, 1-phase, 3-wire electric service equipment located on the west side of the camp's main access drive near the south west corner of Barracks B2 for construction needs. Once the existing electric service is disconnected for replacement under the scope of this project, the Contractor must make provisions for electric service for construction needs until such time as the new permanent electric service equipment is installed, approved by the Osage Beach Fire Department and connected for service by Ameren Missouri.

1. If temporary electric service is obtained from Ameren Missouri, the Contractor shall provide a temporary electric service installation that is acceptable to Ameren Missouri and the Osage Beach Fire Department and shall pay all costs for the temporary electric service directly to Ameren Missouri. All temporary electric equipment shall be removed when the new permanent service is energized.

D. Temporary Lighting: Provide temporary lighting with local switching if/as needed.

1. Provide temporary lighting that will provide adequate illumination for construction operations.

E. Temporary Heating and Cooling: Utility services to Camp Rising Sun are turned off from October 15 through April 15 and none of the building have heating systems. Since the majority of the work is outdoors, no heating or cooling should be required.

F. Temporary Telephones: Provide Superintendent cell phone number to the Construction Representative to serve as Contractor's jobsite telephone.

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.

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.

2. Equip with a water cooler and private toilet complete with water closet, lavatory, and medicine cabinet unit with a mirror.

C. Storage Facilities: Limited areas for storage of building materials are available onsite. The Contractor shall provide his own security. Specific locations for storage and craning operations will be discussed at the Pre-Bid Meeting and the Pre-Construction Meeting.

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

E. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.

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. Install tarpaulins securely with incombustible wood framing and other materials. Close openings of 25SqFt (2.3SqM) or less with plywood or similar materials.
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. 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.

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

I. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven (7) days during normal weather or three (3) days when the temperature is expected to rise above 80°F (27°C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

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

1. Locate fire extinguishers where convenient and effective for their intended purpose.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires.
4. Provide supervision of welding operations and similar sources of fire ignition.
5. Smoking is prohibited anywhere on the project site.

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

D. Enclosure Fence: Before excavation begins, install an enclosure fence. 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, orange plastic fencing with tee-posts driven into the earth at maximum intervals of 15-feet on center.
2. 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. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

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

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:

a. Replace significantly worn parts and parts subject to unusual operating conditions.
b. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Division 1, Section 012500 "Substitution Procedures" for requests for substitutions.
2. Division 1, Section 013300 “Submittals” for submittal requirements.
3. Refer to Division 26, Section 260500 “Common Work Results for Electrical”, Article 1.8 "Reference Standards" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. *Products*: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. *Named Products*: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. *New Products*: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. *Comparable Product*: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. *Basis-of-Design Product Specification*: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. *Comparable Product Requests*: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. *Designer's Action*: If necessary, Designer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Designer will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. *Form of Approval*: As specified in Division 1, Section 013300 "Submittals."
    b. Use product specified if Designer does not issue a decision on use of a comparable product request within time allocated.

3. Comparable product requests for products indicated in these specifications as “no substitutions” will not be considered.

B. *Basis-of-Design Product Specification Submittal*: Comply with requirements in Division 1, Section 013300 "Submittals." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. *Compatibility of Options*: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Designer will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. *Delivery and Handling*:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. *Storage*:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.

3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. *Manufacturer's Warranty*: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. *Special Warranty*: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. *Special Warranties*: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. *Manufacturer's Standard Form*: Modified to include Project-specific information and properly executed.
2. *Specified Form*: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See Divisions 2 through 26 Sections for specific content requirements and particular requirements for submitting special warranties.

C. *Submittal Time*: Comply with requirements in Division 0, Section 007213 "General Conditions."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. *General Product Requirements*: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. *Standard Products*: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Designer will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. *Or Equal*: For products specified by name and accompanied by the term "or equal," or "or approved equal," or “or engineer approved equal”, or “or designer approved equal”, or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. *Product Selection Procedures*:

1. *Products*:

a. *Restricted List*: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

2. *Manufacturers*:

a. *Restricted List*: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.

3. *Basis-of-Design Product*: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

2.2 COMPARABLE PRODUCTS

A. *Conditions for Consideration*: Designer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Designer may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 016000

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes 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.

C. Structures

1. Daily, inspect the structures and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
2. Weekly, sweep all interior spaces clean. "Clean" for the purposes of this paragraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom.
3. In preparation for installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.

3.2 FINAL CLEANING

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

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

1. Clean the Project Site, yard, and grounds, in areas disturbed by construction activities including landscape development areas, of rubbish, waste material, litter, and foreign substances.
2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
3. Remove petrochemical spills, stains, and other foreign deposits.
4. Remove tools, construction equipment, machinery, and surplus material from the site.
5. Remove snow and ice to provide safe access to the building.
6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
8. Broom clean concrete floors in unoccupied spaces.
9. Vacuum clean carpet and similar soft surfaces removing debris and excess nap. Shampoo, if required.
10. Clean transparent material, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
11. Remove labels that are not permanent labels.
12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

    a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

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

14. Clean plumbing fixtures to a sanitary condition free of stains, including stains resulting from water exposure.
15. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
16. Clean ducts, blowers, and coils if units were operated without filters during construction.
17. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out lamp modules and defective drivers in LED fixtures.
18. 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 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation manuals for systems, subsystems, and equipment.
2. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Division 0, Section 007213 “General Conditions”, Article 3.3 “As-Built Drawings”
2. Division 0, Section 007213 “General Conditions”, Article 3.5 “Operation and Maintenance Manuals”
3. Division 1, Section 013300 "Submittals" for submitting copies of operation and maintenance manual submittals
4. Divisions 2 through 26 Specification Sections for specific operation and maintenance manual requirements for the Work in those Sections

1.3 DEFINITIONS

A. *System*: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. *Subsystem*: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. *Operation and maintenance manual content*: See Division 0, Section 007213 “General Conditions”, Article 3.5 “Operation and Maintenance Manuals” and Division 0 through 26 Specification Sections. Submit manual content formatted and organized as required by this Section.

1. Designer will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. *Format*: Submit operation and maintenance manuals in the following format:

1. *For Review and Comments*: PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Designer.
2. *For Final Submission*:

    a. PDF Electronic File
    b. *Printed Hard Copies*: See Division 0, Section 007213 “General Conditions”, Article 3.5 “Operation and Maintenance Manuals” for hard copy count and requirements.

C. *Manual Submittal*:

1. Submit manuals for review in a sufficient time before final submission is required as per Division 0, Section 007213 “General Conditions”, Article 3.5 “Operation and Maintenance Manuals”. Designer shall review submission and return copy with comments.
2. Correct or revise manual to comply with Designer's comments. Submit revised copy of manual for review.
3. *Final Submission*: See Division 0, Section 007213 “General Conditions”, Article 3.5 “Operation and Maintenance Manuals” for requirements.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS

A. *Organization*: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page
2. Table of contents
3. Manual contents

B. *Title Page*: Include the following information:

1. Subject matter included in manual
2. Name and address of Project
3. Name and address of Owner
4. Date of submittal
5. Name and contact information for Contractor
6. Name and contact information for Designer
7. Names and contact information for major consultants to the Designer that designed the systems contained in the manuals
8. Cross-reference to related systems in other operation and maintenance manuals

C. *Table of Contents*: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. *Manual Contents*: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. *Manuals, Electronic Files*: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. *Electronic Files*: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.

2.2 OPERATION MANUALS

A. *Content*: In addition to requirements in this Section, include operation data required in Division 0 through 26 Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria
3. Operating standards
4. Operating procedures
5. Operating logs
6. Wiring diagrams
7. Control diagrams
8. Precautions against improper use
9. License requirements including inspection and renewal dates

B. *Descriptions*: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name
3. Equipment identification with serial number of each component
4. Equipment function
5. Operating characteristics
6. Limiting conditions
7. Performance curves
8. Engineering data and tests
9. Complete nomenclature and number of replacement parts

C. *Operating Procedures*: Include the following, as applicable:

1. Startup procedures
2. Equipment or system break-in procedures
3. Routine and normal operating instructions
4. Regulation and control procedures
5. Instructions on stopping
6. Normal shutdown instructions
7. Seasonal and weekend operating instructions
8. Required sequences for electric or electronic systems
9. Special operating instructions and procedures

D. *Systems and Equipment Controls*: Describe the sequence of operation, and diagram controls as installed.

2.3 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. *Content*: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. *Source Information*: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. *Manufacturers' Maintenance Documentation*: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly
3. Identification and nomenclature of parts and components
4. List of items recommended to be stocked as spare parts

D. *Maintenance Procedures*: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions
2. Troubleshooting guide
3. Precautions against improper maintenance
4. Disassembly; component removal, repair, and replacement; and reassembly instructions
5. Aligning, adjusting, and checking instructions
6. Demonstration and training video recording, if available

E. *Maintenance and Service Schedules*: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. *Scheduled Maintenance and Service*: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. *Maintenance and Service Record*: Include manufacturers' forms for recording maintenance.

F. *Spare Parts List and Source Information*: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. *Warranties and Bonds*: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. *Operation and Maintenance Manuals*: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. *Manufacturers' Data*: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

C. *Drawings*: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information noted on As-Built Drawings to ensure correct illustration of completed installation.

1. Do not use original project As-Built Drawings as part of operation and maintenance manuals.
2. Comply with requirements of Division 0, Section 007213 “General Conditions”, Article 3.3 “As-Built Drawings”.

END OF SECTION 017823

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes formwork for cast-in-place concrete.

1.3 RELATED SECTIONS

A. Section 032000 – Concrete Reinforcement

B. Section 033000 – Cast-In-Place Concrete

1.4 REFERENCES

A. ACI 117 - Tolerances for Concrete Construction and Materials.

B. ACI 301 - Structural Concrete for Buildings.

C. ACI 318 - Building Code Requirements for Reinforced Concrete.

D. ACI 347 - Recommended Practice for Concrete Formwork.

E. AF&PA - National Design Specifications for Wood Construction.

F. ASTM D 1752 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.

G. SPIB - 1994 Standard Grading Rules for Southern Pine Lumber (and Supplements).

H. WCLIB Rule No. 17 - Standard Grading and Dressing Rules.

1.5 DESIGN REQUIREMENTS

A. The design, engineering, and construction of all form work shall be the responsibility of Contractor.

B. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements with resultant concrete conforming to required shape, line and dimension.

C. All formwork shall be designed for the loads, lateral pressures, and allowable stresses outlined in ACI 347, “Recommended Practice for Concrete Formwork” and for design considerations, wind loads, allowable stresses and other applicable requirements of the controlling local building code.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347, ACI 301 and ACI 318.

B. For wood products furnished for Work of this Section, comply with applicable provisions of AF&PA National Design Specifications for Wood Construction.

C. Maintain one copy of each document on site.

1.7 COORDINATION

A. Coordinate this Section with other sections of work, which require attachment of components to formwork.

B. Place formwork to obtain sufficient concrete cover over reinforcement.

C. Coordinate this Section with other sections of the work, which require application of finishes or waterproofing to formed concrete surfaces.

1. Verify that formwork and accessories are compatible with concrete finishes, coatings, waterproofing systems, etc.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Exposed Concrete: Unless otherwise shown or specified, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faces or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces.

B. Unexposed Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material.

C. Steel forms, if used, shall be flat and smooth, without dents, free of rust and shall be tight fitting for all exposed surfaces.

D. Provide form material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.

2.2 WOOD FORM MATERIALS

A. Lumber Forms: Use for edge forms and unexposed finish concrete. Boards shall be 6 inches or 8 inches in width, shiplapped or tongue and groove, “Standard” Grade Douglas Fir, conforming to WCLIB Standard Grading and Dressing Rule No. 17. Surface boards on four sides.

B. Plywood Forms: Use for exposed finish concrete. Forms shall conform to PS-1. Each panel shall carry the grade trademark of the APA/EWA and shall be full size 4-foot by 8-foot panels.

1. Plywood for surfaces to receive membrane waterproofing shall be a minimum of 5/8-inch thick and shall be APA “B-B Plyform Structural I Exterior” grade.
2. Plywood where “Smooth Finish” is required, as shown on Drawings, shall be “HD Overlay Plyform Structural I Exterior” grade, minimum of 3/4-inch thick.

2.3 PREFABRICATED FORMS

A. Manufacturers:

1. Aluma-Systems Inc., Burke Co.
2. Economy Forms Corp.
3. Molded Fiber Glass Concrete Forms Co.
4. Perma Tubes.
5. Sonoco Products Co.
6. Symons Corp.
7. Western Forms, Inc.

B. Preformed Steel Forms: Minimum 16 gage matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

C. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

D. Pan Type: Steel of size and profile required.

E. Steel Forms: Sheet steel, suitably reinforced, and designed for the particular use shown on Drawings.

F. Form Liners: Smooth, durable, grainless and non-staining hardboard, unless otherwise shown on Drawings.

G. Framing, Studding and Bracing: Stud or No. 3 structural light framing grade.

2.4 FORMWORK ACCESSORIES

A. Form accessories to be partially or wholly embedded in the concrete shall be of a suitable commercially manufactured type.

B. Form Ties: Removable type, metal, adjustable length, cone type with waterproofing washer.

1. Ties shall have no metal within 1” of finished surface.
2. Ties shall leave holes not less than 1/2” nor more than 1” in depth.
3. Ties shall leave holes no larger than 1” diameter in concrete surface.

C. Spreaders: Standard, noncorrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. No wire ties, wood spreaders or through bolts will be permitted.

D. Form Release Agent: Colorless non-staining agent which will not absorb moisture or impair natural bonding or color characteristics of waterproofing or coating intended for use on concrete.

E. Corners: Chamfer; 1 inch by 1-inch size; maximum possible lengths.

F. Waterproofing Membranes: Where shown on drawings, as specified in Division 7.

G. Joint Filler: ASTM D 1752.

H. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and centers before proceeding with formwork. Ensure that dimensions agree with Drawings.

3.2 INSTALLATION

A. All footings and foundations shall be formed.

B. Pouring concrete against soil on the sides of the excavation will not be permitted unless shown on the Drawings.

C. Formwork – General: Sloped surfaces steeper than 1.5 horizontal to 1 vertical should be provided with a top form to hold the shape of the concrete during placement, unless it can be demonstrated that top forms can be omitted.

D. Construct forms to the correct shape and dimensions, mortar-tight, of sufficient strength, and so braced and tied together that movement of workers, equipment, materials, or the placing and vibrating of concrete shall not affect formwork and finished construction. Forms shall be strong enough to maintain their shape under all imposed loads.

E. Provide positive means of adjustment (wedges or jacks) of shores and struts.

F. Camber where necessary to assure level finished soffits unless otherwise shown on Drawings.

G. Verify horizontal and vertical positions of forms and correct inaccuracies before placing concrete in any form.

H. Complete wedging and bracing before placing concrete.

I. Take up all settlement during the concrete placing operations.

J. Framing, Studding and Bracing: Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood.

1. Framing, bracing, centering, and supporting members shall be of adequate size and strength to carry safely, without deflection, all dead and live loads to which forms may be subjected and shall be spaced sufficiently close to prevent any bulging or sagging of forms.
2. Soffits of all beam forms shall be constructed of material a minimum of 2 inches thick.
3. Distribute bracing loads over base area on which bracing is erected.
4. When placed on ground, protect against undermining, settlement or accidental impact.

K. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.

L. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

M. Forms shall be constructed so that they can be removed without hammering or prying against concrete.

N. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.3 APPLICATION – FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Excess material shall not be allowed to stand in puddles in the forms nor allowed to come in contact with concrete against which fresh concrete will be placed.

D. Do not apply form release agent where concrete surfaces will receive applied coverings such as a waterproof membrane that are affected by agent.

1. Soak inside surfaces of untreated forms with clean water.
2. Keep surfaces coated prior to placement of concrete.

E. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse.

1. For exposed work, do not reuse any form which cannot be reconditioned to "like new" condition.
2. Apply form coating to all forms in accordance with the manufacturer's specifications, except where "scored finish" is required as shown on the Drawings.
3. Do not coat forms for concrete that is to receive a "scored finish".
4. Apply form coatings before placing reinforcing steel.

3.4 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required.

B. Accurately locate, set in place, and securely fasten items that will be cast directly into concrete.

C. Voids in sleeves, inserts, anchor slots, etc., shall be filled temporarily with readily removable material to prevent entry of concrete into the voids.

D. All embedded items shall be clean and free of oil and other foreign matter such as loose coatings of rust, paint, and scale. The embedding of wood in concrete shall be avoided except where specifically shown on the Drawings.

E. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

F. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.

G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

I. Form Ties: Use sufficient strength and sufficient quantity to prevent spreading of the forms. Place ties at least 1 inch away from the finished surface of the concrete.

1. Leave inner rods in concrete when forms are stripped.
2. Space all form ties to be equidistant, and symmetrical and lined up both vertically and horizontally unless otherwise shown on Drawings.

J. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

K. Construction Joints: Provide a surfaced pouring strip where construction joints intersect exposed surfaces to provide a straight line at joints. Just prior to subsequent concrete placement, remove strip and tighten forms to conceal shrinkage. Show no overlapping of construction joints, as closely as possible, to present the same appearance as butted plywood joints. Joints in a continuous line shall be straight, true and sharp.

L. Embedded Items: Make provisions for pipes, sleeves, anchors, inserts, reglets, anchor slots, nailers, waterstops, and other features. No wood or uncoated aluminum shall be embedded in concrete. Obtain any required information pertaining to embedded items to be furnished for the work specified in other sections. Securely anchor all embedded items in correct location and alignment prior to placing concrete. Conduits and pipes, including those made of coated aluminum, must meet the requirements of ACI 318.

M. Openings for Items Passing Through Concrete: Frame openings in concrete where shown on the Drawings. Establish exact locations, sizes, and other conditions required for openings and attachment of work specified under other sections. Coordinate all work of this nature in order that there shall be no unnecessary cutting and patching of concrete. Perform any cutting and repairing of concrete required as a result of failure to provide for such openings.

N. Screeds: Set screeds and establish levels for tops of concrete slabs and levels for finish on slabs. Slope slabs to drain where required or as shown on the Drawings. Before depositing concrete, remove all debris from the space to be occupied by the concrete and thoroughly wet all forms. Remove freestanding water.

3.5 FIELD QUALITY CONTROL

A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

B. Inspect erected formwork to ensure that work will provide a concrete surface suitable for exposure or for application of concrete finishes, coatings, waterproofing, etc.

C. Notify Construction Representative after placement of reinforcing steel in the forms, but prior to placing concrete, so that inspection may be made.

3.6 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and the removal has been approved by Construction Representative.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Forms shall be left in place for not less than the total number of days as specified in ACI 347.

E. The Contractors registered professional engineer will determine the time and sequence of formwork and shoring removal for formwork supporting weight of concrete, such as beams, roof slabs, and self-supporting walls.

1. Contractor shall consider temperature, deadload, construction live loads, etc., in timing of formwork removal.
2. In any event, formwork supporting weight of concrete shall not be removed until concrete has reached compressive strength no less than 75% of the specified minimum 28-day compressive strength, and no sooner than seven (7) days.

3.8 ERECTION TOLERANCES

A. Formwork shall be constructed such that the finished concrete surfaces are free of any abrupt dimensional changes requiring extensive corrective work such as patching or grinding, and that formed concrete will conform to dimensional tolerances as follows.

B. Construct formwork to maintain tolerances required by ACI 301.

C. Tolerances: Construct formwork so that concrete surfaces shall be within construction tolerances specified in ACI 117.

D. Above tolerances do not relieve Contractor from responsibility of adhering to closer tolerances where required to coordinate concrete work with work of various trades or to achieve special architectural details.

END OF SECTION 031000

SECTION 032000 – CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish and place reinforcing bars, stirrups, ties, bar supports, spacers, accessories, chairs, welded wire fabric, etc., as shown on the Drawings and as specified herein and as required to complete the work.

1.3 RELATED SECTIONS

A. Section 031000 – Concrete Forming and Accessories

B. Section 033000 – Cast-In-Place Concrete

1.4 QUALITY ASSURANCE

A. All work shall comply with provisions contained in the following documents (latest editions):

1. ACI 301 – Specifications for Structural Concrete
2. ACI 315 – Manual of Standard Practice for Detailing Reinforced Concrete Structures
3. ACI 318 – Building Code Requirements for Structural Concrete
4. ACI SP-66 – ACI Detailing Manual
5. CRSI – Manual of Standard Practice of the Concrete Reinforcing Steel Institute
6. ASTM A 615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
7. ASTM A 1035 – Standard Specification for Deformed and Plain Low-Carbon, Chromium Steel Bars for Concrete Reinforcement
8. ASTM A 185 – Standard Specification for Steel Welded Wire Reinforcements, Plain, for Concrete
9. ASTM A 775 – Standard Specification for Epoxy-Coated Steel Reinforcing Bars

1.5 SUBMITTALS

A. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting spacing devices.

B. Manufacturer's Certificate: Certify that products meet or exceeded specified requirements.

C. Certified copies of mill test reports of reinforcement material analysis.

1.6 COORDINATION

A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS

A. The form and size of bars shall be as shown on the Drawings.

B. Reinforcing steel shall conform to ASTM A 615. Bars shall be Grade 60, unfinished unless noted otherwise.

C. If required, epoxy coated reinforcement shall conform to ASTM A 775.

D. Wire fabric for reinforcement shall conform to ASTM A 185. Wire fabric shall be furnished in flat sheets not rolls.

2.2 ACCESSORIES

A. Tie wire for unfinished reinforcement shall be minimum 16-gauge, annealed type, epoxy coated.

B. Tie wire for epoxy coated reinforcement shall be plastic coated 16-gauge black annealed wire.

C. Provide spacers, chairs, bolsters, supports, and other devices to properly space and support reinforcing bars and welded wire fabric, which are compatible with the waterproofing system.

D. Use plastic tipped accessories at exposed surfaces.

E. Epoxy coated reinforcing bars supported from formwork shall rest on coated wire bar supports or on bar supports made of dielectric material or other acceptable materials.

1. Wire bar supports shall be coated with dielectric material, compatible with concrete, for a minimum distance of 2 inches from the point of contact with the epoxy coated reinforcing bars.
2. Reinforcing bars used as support bars shall be epoxy coated.
3. In walls reinforced with epoxy coated bars, spreader bars shall be epoxy coated.
4. Proprietary combination bar clips and spreaders used in walls with epoxy coated reinforcing bars shall be made of corrosion-resistant material or coated with dielectric material.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Reinforcing steel shall be stored off the ground and protected from oil, or other deleterious materials. Epoxy coated reinforcing bars shall be stored on protective cribbing.

B. Clean oil, mud, loose rust, and scale from reinforcing steel before concrete is placed.

C. Place in strict accordance with Drawings. Locate accurately in forms and hold firmly with approved supports and spacers to secure against displacement.

D. Use metal accessories to keep reinforcing clear distance from finish face of concrete surface as indicated on Drawings or required by applicable standards.

E. Do not displace or damage waterproofing membrane.

F. Accommodate placement of formed openings.

G. Cutting of bars shall be with mechanical saw only. Torch cutting will not be allowed.

H. Do not weld reinforcement unless noted on the Drawings.

I. Locate reinforcement splices not indicated on the Drawings, at point of minimum stress. Review location of splices with Designer.

J. Any epoxy coated bars cut or welded such that coating is damaged shall be field coated with epoxy to match shop coat.

K. Coating damage to epoxy coated reinforcing bars due to handling, shipment, and placing need not be repaired where the damaged area is 0.1 square inches or smaller; damaged areas larger than 0.1 inches shall be field coated with epoxy to match shop coat. The maximum amount of damage including repaired and unrepaired areas shall not exceed 2 percent of the total surface area in each linear foot of the bar.

L. Provide supervision during placing of concrete to watch reinforcing and reset any bars displaced by pouring operation.

M. For welded wire fabric lap adjoining pieces one full mesh and lace splices with 16-gauge wire. Offset end laps in adjacent widths to prevent continuous laps.

N. The Contractor shall notify the Construction Representative at least 36 hours before commencing to place concrete for any major portion of the work in order to permit inspection of the reinforcing.

END OF SECTION 032000

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. Cast-in-place concrete for equipment pads, outdoor slabs on grade, concrete filled steel pipe bollards, pole mounted lighting fixture foundations (Alternate Bid No. 1), patches for walkways and drives and accessories associated with concrete work.

1.3 RELATED SECTIONS

A. Section 031000 – Concrete Forming and Accessories

B. Section 032000 – Concrete Reinforcing

1.4 REFERENCES

A. ACI 301 – Structural Concrete for Buildings

B. ACI 302 – Concrete Floor and Slab Construction

C. ACI 304R – Measuring, Mixing, Transporting and Placing Concrete

D. ACI 305R – Hot Weather Concreting

E. ACI 306.1 – Cold Weather Concreting

F. ACI 308 – Curing Concrete

G. ACI 318 – Building Code Requirements for Structural Concrete and Commentary

H. ASTM C 31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field

I. ASTM C 33 – Concrete Aggregates

J. ASTM C 39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

K. ASTM C 94 – Ready-Mixed Concrete

L. ASTM C 150 – Portland Cement

M. ASTM C157 – Change of Hardened Hydraulic-Cement Mortar and Concrete

N. ASTM C 260 – Air Entraining Admixtures for Concrete

O. ASTM C 295 – Guide for Petrographic Examination of Aggregates for Concrete

P. ASTM C 309 – Liquid Membrane Forming Compounds for Curing Concrete

Q. ASTM C 457 – Microscopial Determination of Parameters of the Air-Void System in Hardened Concrete

R. ASTM C 494 – Chemicals Admixtures for Concrete

S. ASTM C 595M – Blended Hydraulic Cements (Metric)

T. ASTM C 618 – Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

U. ASTM C 989 – Ground Granulated Blast-Furnace Slag for use in Concrete and Mortar

V. ASTM D 994 – Preformed Expansion Joint Filler for Concrete (Bituminous Type)

W. ASTM C 1017 – Chemical Admixtures for Use in Producing Flowing Concrete

X. ASTM C 1107 – Packaged Dry, Hydraulic Cement Grout (Nonshrink)

Y. ASTM C 1202 – Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration

Z. ASTM C 1240 – Silica Fume Used in Cementitious Mixtures

AA. ASTM C 1260 – Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)

BB. ASTM D 1752 – Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

CC. ASTM C 1567 – Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar Bar Method)

DD. ASTM D 6690 – Concrete Joint Sealer, Hot-Poured Elastic Type

1.5 SUBMITTALS

A. Product Data: Submit data for bonding agent, joint devices, attachment accessories, form release agents, curing compounds, etc.

B. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent work.

C. Material Certificates: Submit mill certificates for the cement, supplementary cementitious materials, and admixtures intended for inclusion in the concrete mixtures.

1. Cement: Submit certification of compliance with ASTM C 150 for cement manufactured within 3 months of submittal date.
2. Fly Ash and Pozzolan: Submit certification of compliance with ASTM C 618 performed within 6 months of submittal date.
3. Ground Granulated Blast-Furnace Slag: Submit certification of compliance with ASTM C 989 performed within 6 months of submittal date.
4. Chemical Admixtures: Submit certificate of compliance with ASTM C 494 Level 1 or Level 2, performed within one year of the submittal date. If a chemical admixture does not fit into a defined C 494 type, admixture certificate shall provide documentation that the

admixture has no detrimental effect on strength development, time of setting, shrinkage, air entrainment, scaling, and freeze-thaw resistance (ASTM C 666 Procedure A).

D. Aggregates: Submit test results for each aggregate intended for use in the concrete mixtures, showing conformance to ASTM C 33 and additional requirements as follows:

1. Aggregate source and identification
2. Maximum nominal aggregate size, gradation size number
3. Gradation analysis, including percentage retained and passing each sieve, and a graph of individual percentage retained versus sieve size
4. Quantity and identification of deleterious substances in the aggregates

    a. The limits for deleterious materials contained in coarse aggregate as defined in ASTM C 33 – Table 3 Class 4S.

5. Submit complete data regarding concrete aggregates prior to any change in aggregate source.

E. Concrete Mixture Submittal: At least 30 days minimum prior to concrete placement, submit mixture proportions and prequalification test data for each type of concrete along with material certifications. Submit complete list of ingredients including type, brand, source, and amount of cement, fly ash, ground-granulated blast-furnace slag, aggregates, and admixtures.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Maintain one copy of each document on site.

C. Acquire cementitious materials and aggregate from same source contained in the submittals for all Work.

D. Conform to ACI 305R when concreting during hot weather.

E. Conform to ACI 306.1 when concreting during cold weather.

1.7 COORDINATION

A. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Portland cement shall conform to ASTM C-150, and shall be Type I. High Early Strength Cement, Type III may be used only when authorized by Construction Representative.

B. Water shall be potable, clean, fresh, and free from oil, alkali, organic matter, or other impurities.

C. Fine aggregate shall be clean, coarse, washed river channel sand, free from loam, clay, lumps, or other deleterious material, conforming to ASTM C33 "Specifications for Concrete Aggregate".

D. Coarse aggregate shall be clean, hard, washed, and screened river gravel or clean, hard limestone free from dust, flat friable or laminated particles and fine materials. Aggregate shall conform to ASTM C33. Coarse aggregate shall be well graded from fine to coarse. Size of coarse aggregate shall not exceed 3/4".

E. Flint and chert will be limited to 1% maximum, by weight of the coarse aggregate, in all exposed concrete (cast-in-place or precast). Lignite will be limited to 0.07%, by weight of the fine aggregate in all exposed concrete.

2.2 ADMIXTURES

A. Air Entrainment: ASTM C 260

B. Chemical: ASTM C 494, Type A - Water Reducing, Type B – Retarding, Type C – Accelerating, Type F - Water Reducing, High Range. Calcium chloride or accelerating admixtures containing calcium chloride shall not be used.

C. Fly Ash and Calcined Pozzolan: ASTM C 618

D. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 80, 100 or 120

E. Plasticizing: ASTM C 1017

2.3 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion or Latex emulsion.

B. Non-Shrink Grout: ASTM C 1107, premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 pounds per square inch in 48 hours and 5,000 pounds per square inch in 28 days.

2.4 CONCRETE MIX

A. Comply with the concrete proportioning and test requirements included in Paragraph 3.14.

B. Mix concrete in accordance with ACI 301. Deliver concrete in accordance with ASTM C 94.

C. Select proportions for normal weight concrete in accordance with ACI 301 trial mixtures.

D. Optimize the combined aggregate gradation to minimize the paste content required to make workable concrete.

E. Use accelerating admixtures in cold weather only when approved by Construction Representative. Use of admixtures will not relax cold weather placement requirements.

F. Admixtures containing ingredients corrosive to reinforcing steel such as chloride ion, bromide ion, or thiocyanate are not permitted.

G. Use set retarding admixtures during hot weather only when approved by the Owners Representative.

H. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify requirements for concrete cover over reinforcement.

B. Verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete surfaces by abrasive blast cleaning, to remove debris and laitance and expose aggregate. Thoroughly wet the substrate prior to placement of fresh concrete against prepared surface.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels in an approved grout, epoxy, or adhesive.

3.3 PROPORTIONING

A. Concrete shall be proportioned in accordance with ACI 211.1, "Standard Practice for Selecting Proportions for Normal and Heavyweight Concrete".

B. Provide a concrete mix having not less than the specified minimum 28 days compressive strength using Type I cement and a consistency that can be worked into corners and angles of the forms and around joints, waterstops, dowels, tie bars, and reinforcement without excessive spading or vibration, segregation or undue accumulation of water or laitance on the surface.

C. Concrete mixtures which have been designed, approved and tested shall be adjusted in the field from time to time when required to meet the varying conditions encountered during construction and to maintain the specified strength, air, and slump requirements. Only water reducing admixtures or super plastics may be added. Addition of water is <u>not</u> permitted.

D. The strength level of the concrete shall be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the compressive strength requirements specified and no individual strength test result falls below the specified compressive strength by more than 500 psi. Each compressive strength test result shall be determined by finding the average compressive strength of three cylinders tested at the age of 28 days.

3.4 MIXING

A. Only ready mixed concrete shall be used. Ready mixed concrete shall be mixed and transported to the job site in accordance with ASTM C94 "Specifications for Ready Mixed Concrete".

B. Discharge of the concrete from truck shall be completed within 90 minutes after the introduction of water to the cement. Discharge of concrete from a stationary truck body shall be within 45 minutes. The limitations above may be extended as approved by Construction Representative if the concrete can be placed without addition of water to the batch to meet slump and placing requirements. In hot weather, or under conditions contributing to quick stiffening of the concrete, the limitations above may be reduced as directed by Construction Representative.

C. Any concrete developing a set before being placed or requiring additional water to restore its consistency shall not be used.

3.5 PLACING CONCRETE

A. Place and consolidate concrete in accordance with ACI 301 and ACI 318.

B. Notify Construction Representative and testing agency a minimum of 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, and formed expansion and contraction joints are not disturbed during concrete placement.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Place concrete continuously between predetermined expansion, control, and construction joints.

F. Do not interrupt successive placement; do not permit cold joints to occur.

G. Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit the installation of their work; cooperate with other trades in setting such work, as required.

H. Water, wood scraps, paper and all foreign material shall be removed from the place of deposit before concrete is poured.

I. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.

J. While the concrete is being poured, it shall be spaded, tamped and vibrated so as to thoroughly work it around all reinforcement and embedded items and into corners of forms and leave a dense smooth surface when the forms are removed. Vibrators shall not be used to move or transport the concrete inside the forms.

K. Special precautions shall be taken to avoid segregation of the concrete during handling and placing operations. Concrete shall be deposited through suitable chutes or in such manner as to avoid a drop of more than 5' at any point.

L. Do not place concrete on frozen ground. Do not place concrete during rain, sleet, or snow unless adequate protection is provided, and the Construction Representative approves.

M. Walking on concrete shall not be permitted for at least 24 hours after it has been placed in the forms and for such additional hours thereafter as the Construction Representative may direct.

3.6 HOT WEATHER PLACING

A. When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

B. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. Mixing water may be chilled or chopped ice may be used to control the concrete temperature, provided that the water equivalent of the ice is calculated to the total amount of mixing.

C. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

D. Wet forms thoroughly before placing concrete.

E. Do not use retarding admixtures unless otherwise accepted in mix designs.

3.7 COLD WEATHER PLACING

A. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures in compliance with ACI 306 and as herein specified.

B. When air temperature has fallen to, or is expected to fall below 40°F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50°F and not more than 80°F, at point of placement.

C. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

D. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

3.8 CONCRETE FINISHING

A. Formed surfaces shall have the following finishes unless otherwise noted on the Drawings.

1. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work and not receiving waterproofing membrane. This is the concrete surface having the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
2. Smooth Form Finish: For formed concrete surfaces exposed to view, or that are to be covered with a coating, or covering material applied directly to the concrete, such as waterproofing, dampproofing, painting or other similar system. This is the as-cast concrete surface as obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with all fins or other projections completely removed and smoothed. Finish shall be Class A in accordance with ACI 347.
3. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and plane and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise shown. Hand trowel tops of walls supporting precast concrete to a smooth, plane finish.

3.9 SLAB FINISHES

A. Slabs shall have following finishes unless otherwise noted on the Drawings:

1. Trowel Finish: Apply trowel finish to slab surfaces that are to be exposed to view and slab surfaces that are to be covered with resilient flooring, paint, or other thin film finish coating system. Surface plane tolerance shall not exceed 1/8" in 10' when tested with a 10'

straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

2. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete sidewalks, platforms, steps and ramps, equipment pads, and elsewhere as shown on Drawings. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route.

3.10 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Contractor shall have all equipment and material needed for curing and protection of the concrete on hand before actual concrete placement begins. The curing medium used shall be applied as soon as possible after placing to prevent checking and cracking and loss of moisture from all exposed surfaces of the concrete. Unhardened concrete shall be protected from heavy rains, flowing water, and mechanical injury (such as load stresses, heavy shocks, excessive vibration, and construction equipment, materials, or methods).

D. Concrete surfaces not in contact with forms shall be cured by one of the following methods:

1. Ponding or continuous sprinkling.
2. Application of absorptive mats or fabric kept continuously wet.
3. Application of waterproof sheet materials conforming to ASTM C171.
4. Application of a curing compound conforming to ASTM C309 in accordance with the recommendations of the manufacturer. Curing compounds shall be compatible with waterproofing system.

E. Moisture loss from surfaces placed against wooden forms or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After removal of the forms the concrete shall be cured until the end of the curing period specified below by one of the methods specified above.

F. Curing shall be continued for at least 7 days in the case of all concrete except high-early-strength concrete for which the period shall be at least 3 days. Alternately, if tests are made on cylinders kept adjacent to the structure and cured by the same methods, curing may be terminated when the average compressive strength has reached 70% of the specified strength. The cost of molding and testing the cylinders to determine this time shall be borne by Contractor.

G. Cold Weather: When the mean daily outdoor temperature is less than 40°F, the temperature of the concrete shall be maintained between 50°F and 70°F for the required curing period specified above. When necessary, arrangements for heating, covering, insulating, or housing the concrete work shall be made in advance of placement and shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide. Contractor shall provide a temperature recording device indicating the high and low temperatures within the enclosure during the entire curing period.

H. Hot Weather: When conditions are such that the rate of evaporation is greater than the rate at which water rises to the surface of recently placed concrete (i.e., high concrete temperature, high air temperature, high wind, and low humidity, or combinations thereof), provision for wind breaks, shading, fog spraying, sprinkling, ponding, or wet covering with a light-colored material shall be made in advance of placement to prevent plastic shrinkage cracking. Such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.

I. Rate of Temperature Change: Changes in temperature of the air immediately adjacent to the concrete during the curing period shall be kept as uniform as possible and shall not exceed 5°F per hour or 20°F in any 24-hour period. After the curing period, changes in air temperature adjacent to the concrete shall not exceed 5°F per hour or 50°F in any 24-hour period.

J. Remove any curing materials containing waxes or other products that may interfere with adhesion of waterproofing membranes or coatings.

3.11 FIELD QUALITY CONTROL

A. Contact Construction Representative a minimum of 24 hours prior to pouring concrete for inspection of rock base under concrete equipment pad, formwork and concrete reinforcement.

B. No water other than the incidental water used to prewet the delivery chute and fins shall be added to the concrete after the truck leaves the batch plant, unless directed in writing by the Owners Representative.

C. Adjustment of slump on site shall only be accomplished by the addition of water reducing or plasticizing admixture. Admixture shall be placed directly onto the concrete and the revolving drum mixer shall mix at high speed for 5 minutes, or 100 revolutions, before discharge.

3.12 PATCHING

A. Allow Construction Representative to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Construction Representative upon discovery.

C. Repair surface defects immediately after form removal. Surface defects include color and texture irregularities, honeycomb, rock pockets, voids over 1/4" in any dimension, spalls, ridges, and stains or discoloration that cannot be removed by cleaning.

D. Clean and thoroughly dampen tie holes and fill with patching mortar.

E. Remove ridges, honeycomb, rock pockets, voids, etc., down to solid concrete. Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar or proprietary patching compound, thoroughly clean, dampen with water and brush-coat the area to be patched with neat cement grout, or proprietary bonding agent.

F. For surfaces exposed to view blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Compact mortar in place and strike-off slightly higher than surrounding surface.

G. If defects cannot be repaired, remove and replace concrete.

H. Use epoxy-based mortar for structural repairs.

I. Patch imperfections in accordance with ACI 301.

3.13 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances, or specified requirements.

B. Remedy for defective concrete (payment penalty, repair, or replacement) will be determined by Construction Representative.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Construction Representative for each individual area. Repairs made shall be in accordance with ACI 301.

3.14 SCHEDULE - CONCRETE TYPES

Concrete shall be Class A as specified below.

Table 1 – Concrete Proportioning and Testing Requirements

Concrete Class	A
Materials and Proportions	
Cement, ASTM C 150	Type I/II
Supplementary Cementitious Materials, *cm*	50% max†
Maximum Aggregate Size	3/4 inch
Water-cementitious materials ratio, *w/cm*	0.40 max
Prequalification Requirements	
Aggregates	ASTM C 1260
Slump - ASTM C 143	6 to 8 in.
Chloride Content – ASTM C 1152	< 0.20% wt of cement
Air Content - ASTM C 231	6% to 8%
Hardened Air Content - ASTM C457	>6%
28-day Strength - ASTM C 39	4000 psi
Drying Shrinkage - ASTM C 157	Not Required
28-day Permeability – ASTM C 1202 Permeability	Not Required

† Maximum combined supplementary materials content of ternary or quaternary blends. Limitations on supplementary materials shall include quantities contained in blended cement. Fly ash content shall not exceed 25%. Ground granulated blast-furnace slag content shall not exceed 45%.

END OF SECTION 033000

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 01 Specification Sections, apply to this Section.

1.2 SCOPE

A. The requirements of this section are applicable to all work performed under Division 26 – Electrical.

1.3 RELATED SECTIONS

A. Division 3 – Concrete

B. Division 31 – Earthwork

1.4 COORDINATION

A. It is the intent of the Electrical Division of these Specifications that all electrical work specified herein be coordinated as required with the work of all other Divisions of the Specifications and Drawings so that all installations shall operate as designed.

B. Provide a complete operational electrical system. Route conduit and install equipment to avoid conflicts with other trades and to enhance maintainability of system.

C. All construction work shall be carried on in a manner so as not to interfere with operation of the Owner's facilities.

D. The Owner intends to make continued use of existing facilities. Utilities and services to existing facilities shall not be interrupted without the Owner's approval as to the time and duration. The Owner will continue to occupy the existing facilities throughout the construction operations, and the Contractor shall so organize his work as to cause a minimum of interference with the normal routine activities of the facilities. All interruptions shall be scheduled at the convenience of the Owner.

E. The Contractor shall coordinate his work so there shall be no prolonged interruptions of existing equipment and all interruptions of utilities must be scheduled with the Owner. In no case shall any utilities be left disconnected at the end of a work day or over the weekend.

F. Any interruptions of any utilities either intentionally or accidentally shall not relieve the Contractor responsible from repairing and restoring the utility to normal service. Repairs and restoration shall be made before the workmen responsible for the repair and restoration leave the job on the day such interruptions occur.

G. The Contractor's area for construction shall be as shown on the Drawings.

H. The Contractor shall maintain access to the Owner's facilities during construction by keeping clear the drives in the construction area. Any blockage of the drives shall be scheduled with the Owner.

I. This project will involve several contractors in addition to this Contractor. There may also be contractors not associated with this project working in the vicinity.

J. This Contractor shall cooperate fully with the other contractors in the conduct of the work. Such cooperation with regard to work schedules, area of work, etc., is to be a normal part of this type of project and no extra compensation will be allowed for it.

1.5 DEFINITIONS

A. Concealed: Where the word “concealed” is used in conjunction with raceways, equipment, and the like, the word shall be understood to mean hidden from sight as in chases, furred spaces, or above suspended ceilings.

B. Exposed: Where the word “exposed” is used, the word shall be understood to mean open to view.

C. Provide: Where the word "provide" is used, in the Specifications or on the Drawings, it shall mean "furnish and install" unless otherwise noted or specified.

D. Related Work: The sections referenced under RELATED SECTIONS shall be understood to include provisions which directly affect the work being specified in the section where RELATED SECTIONS occurs.

E. The Work: Where the words “the Work” are used together, they shall be understood to mean the work under contract that is governed by these Specifications and the Drawings.

1.6 SUBMITTALS

A. The Contractor shall submit to the Designer for approval, prior to fabrication and in accordance with the procedures outlined in Section 013300 – Submittals, all submittals as required by each Section in this Division of these Specifications.

B. Each submittal shall be properly identified as to the specific equipment to which it relates. Identification on the submittal shall be by reference to equipment identification numbers as shown on the Drawings and, if applicable, by reference to the appropriate Article of the Specifications in which the equipment is specified.

C. Shop drawings, brochures, or manufacturer's product data sheets showing more than one size or model shall be marked to indicate the size or model proposed for the particular application.

D. All submittals shall be certified by the Contractor as being correct for the proposed work.

E. Submittals in the form of shop drawings shall include complete data on the equipment to be provided, including physical dimensions and other information required for installation, performance capabilities and limitations, and schedules indicating locations when more than one type of an item is to be used.

F. Prior to submittal, shop drawings shall be coordinated with the work of all other trades.

G. Any and all submittals that do not comply with all of the above requirements will be rejected and returned without review.

H. Provide operating instructions and maintenance manuals in accordance with Section 013300 – Submittals, Section 007213 – General Conditions and 007300 – Supplementary Conditions.

1.7 RECORD (AS-BUILT) DRAWINGS

A. The Contractor shall update a complete set of the construction drawings, shop drawings and schedules of all work daily 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 in accordance with Section 007213 – General Conditions. 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 or structures. All concealed items both inside and outside shall be accurately located 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.

B. No deviations from the Contract Drawings or approved shop drawings shall be made without prior approval from the Designer or Owner's Representative.

1.8 REFERENCE STANDARDS

A. Included as a basic part of these Specifications are the applicable regulations of the standards listed below. Portions of all of certain recognized industry or association standards referred to herein as being a requirement of these Specifications shall be considered as binding as though reproduced in full herein. Unless otherwise stated, the reference standard shall be the latest edition of the standard which is current as of the date of issuance of the Contract Documents. Where conflicts exist from one code to another, the more stringent requirement shall apply.

B. Referenced Codes and Standards constitute minimum requirements and strict compliance is required therewith unless supplemented and/or modified by more stringent requirements in these Specifications.

C. Reference may be made to standards either by full name or by letter designation as follows:

1.	ACI	American Concrete Institute
2.	AEIC	Association of Edison Illuminating Companies
3.	AHDGA	American Hot Dip Galvanizers Association, Inc.
4.	AISC	American Institute of Steel Construction
5.	ANSI	American National Standards Institute
6.	ASA	American Standards Association
7.	ASTM	American Society for Testing & Materials
8.	AWS	American Welding Society
9.	BOCA	Building Officials and Code Administrators International, Inc.
10.	CSA	Canadian Standards Association
11.	EEI	Edison Electric Institute
12.	EIA	Electronics Industries Association
13.	ETL	Electrical Testing Laboratories, Inc.
14.	FMRC	Factory Mutual Research Corp
15.	IACS	International Annealed Copper Standard
16.	IBC	International Building Code
17.	IBEW	International Brotherhood of Electrical Workers
18.	ICC	International Code Council
19.	ICEA	Insulated Cable Engineers Association
20.	IEC	International Electrotechnical Commission
21.	IEEE	Institute of Electrical and Electronics Engineers
22.	IESNA	Illuminating Engineering Society of North America

23.	IFC	International Fire Code
24.	JIC	Joint Industrial Council
25.	NBFU	National Board of Fire Underwriters
26.	NEC	National Electrical Code (NFPA 70)
27.	NECA	National Electrical Contractors Association
28.	NEMA	National Electrical Manufacturers Association
29.	NESC	National Electrical Safety Code
30.	NETA	InterNational Electrical Testing Association
31.	NFPA	National Fire Protection Association
32.	NIST	National Institute of Standards and Technology (formerly National Bureau of Standards, NBS)
33.	OSHA	Occupational Safety and Health Administration
34.	UL	Underwriters' Laboratories, Inc.

1.9 REGULATORY LAWS, ORDINANCES, CODES AND STANDARDS

A. The governing federal, state, and local laws, codes and standards in effect at the project site constitute the minimum requirements for all electrical work, and strict compliance therewith is required unless supplemented and/or modified by more stringent requirements of the Contract Documents.

B. All work under this Contract shall be performed in full compliance with the 2020 edition of the National Electrical Code (NEC) NFPA-70 and the latest version of the National Electrical Safety Code (NESC).

C. The Contractor shall keep a copy of the 2020 NEC on the project site for his reference at all times.

D. Requirements in reference specifications and standards are a minimum for equipment, material, and work. In instances where capacities, size, or other features of equipment, devices, or materials exceed these minimums, meet specified or scheduled capacities.

E. Resolve code interpretations discovered in Contract Documents with Designer prior to Contract award. After Contract award, make corrections or additions necessary for compliance with applicable codes.

1.10 CONTRACT DRAWINGS

A. The Contract Drawings indicate in general the character, arrangement, and construction of equipment and materials called for in these Specifications.

B. Drawings are generally diagrammatic and are intended to encompass a system that will not interfere with the structural and architectural design of the building. Coordinate work to avoid interferences between conduit, equipment, architectural, and structural work.

C. Coordinate with work indicated on the drawings with site conditions.

D. Drawings are based on equipment specified. Make adjustments, modifications, or changes required, due to use of other equipment.

1.11 WORKMANSHIP

A. All work shall be done under the supervision of the Contractor who shall provide competent foremen to lay out all work. All work shall be laid out with due regard for proper working

clearances about electrical equipment in accordance with NEC Article 110 and the space requirements of other contractors. The Contractor shall immediately report to the Construction Representative any conflict or difficulties with regard to the installation.

B. The Contractor shall be completely responsible for all work installed by him and shall employ only competent and experienced personnel of proper trades to perform the work.

C. All work shall be installed so as to be accessible for operation, maintenance, adjustment, replacement, and repair with particular attention given to locating controls and other items requiring periodic lubrication, cleaning, adjusting, or servicing of any kind.

D. Local disconnect switches, control stations, conduit drops, panelboards, enclosed switches, variable-frequency motor controllers, electrical enclosures, etc. shall be located so as not to interfere with access required for the necessary service and operation of equipment and shall meet the working clearance requirements of Article 110 of the National Electrical Code.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Only NEW, clean and perfect equipment, apparatus, materials, and supplies of latest design and manufacture shall be incorporated in the work in order to assure an electrical system of high quality.

B. All materials shall be new, shall be installed according to manufacturer's specifications or as directed by the Designer, and shall be listed and labeled by Underwriters' Laboratories, Inc. (UL) or other nationally recognized testing laboratory.

C. All materials and equipment furnished under these Specifications shall be standard products of the various manufacturers except where special construction or performance features are called for. Where more than one of the specific items is required, all shall be of the same type and by the same manufacturer.

D. The product of a manufacturer shall be acceptable only when that product complies with or is modified as necessary to comply with all specified and indicated requirements in the Contract Documents.

E. Materials and equipment not herein specified or indicated as to manufacturer but necessary for complete functioning systems shall be provided from sources conforming to the quality levels and functional requirements for corresponding materials and equipment set forth herein.

2.2 MANUFACTURER'S EQUIPMENT NAMEPLATES

A. All equipment shall have factory applied permanent nameplates indicating the manufacturer's name, model and serial numbers, and any other data necessary to conform to specified requirements.

2.3 PAINTING AND FINISHES

A. All purchased equipment shall have a factory applied standard finish of the manufacturer's standard color unless otherwise specified.

B. Finishes which are marred during shipping, handling, or installation shall be touched up by the Contractor to match the original finish.

2.4 EQUIPMENT TAGGING

A. All equipment and materials shipped under these Specifications shall be properly tagged with the name of the item, name of the project and project address, and shall bear the Contractor's name.

PART 3 - EXECUTION

3.1 SCOPE OF THE WORK

A. The Contractor shall provide all labor, materials, equipment, tools, supervision, and services required for the complete installation of all electrical work as shown on the Drawings and described in these Specifications.

B. The work under Divisions 26 of the Specifications includes, but is not limited to, the following items:

1. Demolition of existing power and branch circuit conductors, cables, raceways, boxes, and equipment
2. Disconnection, handling, relocation and/or reconnection of existing equipment and electric power and rerouting of existing circuits and feeders as required and as shown on the Drawings
3. Removal and disposal off site of the existing equipment and materials to be removed
4. All feeder and branch circuit wiring and raceways
5. Grounding and bonding
6. Junction and pull boxes
7. Protective device coordination study and arc flash risk assessment
8. Panelboards and circuit breakers
9. Wiring devices and cover plates
10. Enclosed circuit breakers

3.2 SHIPMENT AND DELIVERY

A. The Contractor shall be responsible for the furnishing and safe delivery of all materials and equipment required for the project and for the safekeeping of all material and equipment until final acceptance by the Construction Representative.

B. The Contractor shall be responsible for protecting all electrical equipment intended exclusively to function indoors. Such equipment must be stored indoors and protected against exposure to or accumulation of dust, moisture, freezing, flooding, corrosion or other form of damage. The Contractor shall clean and restore damaged finishes as required to place the installation in a "like new" condition before acceptance by the Owner.

3.3 SAFETY MEASURES

A. The Contractor shall arrange his work in such a manner that a minimum of interference will be experienced with the operations of the Owner or with traffic, both pedestrian and vehicular, either in the vicinity of or on the project site.

B. The blocking of thoroughfares shall be kept to a minimum and shall be coordinated with the Construction Representative and authorities have jurisdiction.

C. The Contractor shall comply with the U.S. Department of Labor-Occupational Safety and Health Administration (OSHA) - Occupational Safety and Health Standards, all local and state public

safety regulations and provide such safety measures as signs, signals, road blocks, safety lights, railings, guards, temporary walkways, crossings and similar safety equipment as may be required for the adequate protection of the public, the Owner's personnel, workmen engaged on the project, and property.

3.4 WORK VERIFICATION AND FIELD MEASUREMENTS

A. The Contractor shall verify the voltage, phase, full-load current and exact location of all electrical equipment before rough-in.

B. The Contractor shall note that the configuration and dimensions of actual equipment may vary from that shown on the Drawings depending on the equipment supplied. The Contractor shall be responsible for making the necessary modifications to connecting conduit, bases, etc. required by the equipment supplied.

C. All dimensions and clearances affecting the installation of work shall be verified at the project site in relation to established datum, to existing items and conditions, and to the work of other trades.

D. The Contractor shall assume responsibility for proper installation of materials in the space available.

E. The location of all equipment and systems shall be coordinated to preclude interferences with other construction.

F. Should interferences occur which will necessitate deviations from layout or dimensions shown on the Drawings, the Construction Representative and/or Designer shall be notified, and any changes shall be approved before proceeding with the Work.

G. Where crowded locations exist and where there is a possibility of conflict between the trades, the Contractor shall make composite drawings showing the exact locations of the items in question (pipes, ducts, conduits, equipment, etc.). Drawings shall be based on actual measurements, after consultation and agreement between the trades, and shall be approved by the Designer before installation of the Work.

H. The Contractor shall provide all necessary offsets, raises or drops in conduits and fixtures as required by existing conditions at no additional cost to the Owner.

I. The location of all items shall be obtained from the Drawings. The Construction Representative and/or the Designer shall be allowed to relocate any item within a 10-foot radius from the scaled location on the plans without additional cost to the Owner, provided this is done prior to or during rough-in and before finish installation.

3.5 ELECTRICAL WORK DEMOLITION AND RELOCATION OF EXISTING EQUIPMENT

A. See Section 260505 – Selective Demolition for Electrical in these Specifications.

3.6 MOUNTING HEIGHTS

A. Unless otherwise indicated elsewhere in these Specifications or Drawings, mounting heights of wiring devices and equipment shall be in accordance with the following schedule.

B. The following item mounting heights shall be above finish grade to the horizontal centerline of the item.

	Item	Mounting Height
1.	Exterior receptacles	2 feet 0 inches min to 3 feet 0 inches max

C. The following item mounting heights shall be above finish floor/grade to the top of the enclosure.

	Item	Mounting Height
1.	Enclosed circuit breakers	6 feet 0 inches
2.	Panelboards	
	a. Interior, < 6'-0" high enclosure	6 feet 0 inches
	b. Interior, ≥ 6'-0" high enclosure	Bottom mounted to 13/16" U-channel supports bolted to floor
	c. Exterior, ≤ 100A Main	As indicated on the Drawings
	d. Exterior, > 100A Main	6 feet 0 inches min to 7 feet 6 inches max, subject to compliance with NEC 404.8(A)

3.7 FASTENING TO BUILDING STRUCTURES

A. The methods of attaching or fastening equipment, equipment supports, raceways, or hangers to building structures shall be subject to approval by the Construction Representative at all times.

B. Support of electrical equipment and raceways shall be provided in accordance with Section 260529 – Hangers and Supports for Electrical Equipment.

3.8 EQUIPMENT PADS AND ANCHOR BOLTS

A. Concrete equipment pads shall be provided for all outdoor, grade-mounted equipment in accordance with Section 033000 – Cast-In-Place Concrete.

B. The size and configuration of the equipment pad(s) and anchor bolt or other fastening requirements shall coordinate with and shall be suitable for the equipment to be installed. The Contractor shall be responsible for coordinating all requirements prior to forming and pouring the concrete.

C. All concrete work shall conform to the requirements of Division 3 of these Specifications.

D. Unless otherwise indicated, outdoor equipment pads shall be 4 inches larger all around than the equipment base. Equipment pads shall have a 1-inch chamfer all around the top edge.

E. Equipment pads shall be poured level and shall have a smooth finish.

F. Equipment pads shall have steel reinforcing and shall be doweled to the floor slab in accordance with the requirements of Section 032000 – Concrete Reinforcing.

G. Unless otherwise indicated, all equipment shall be properly anchored to the equipment pad using an approved means of fastening, meeting all seismic requirements of the latest edition of the International Building Code.

H. Anchor bolts shall be provided where necessary and shall be Type 304 stainless steel. Installation of anchor bolts shall be in accordance with Section 260529 – Hangers and Supports for Electrical Systems.

3.9 CUTTING, PATCHING AND REPAIRING

A. The Contractor shall be responsible for all cutting required for and resulting from the installation of his work, except where noted otherwise. The Contractor shall patch and repair the holes and restore the surface finish.

B. The Contractor shall place sleeves for conduits that must pass through foundations, walls, and slabs ahead of concrete pouring. Failing in this, the Contractor shall do the necessary cutting and sealing thereafter in an approved manner.

C. Under no circumstances shall any structural members, load bearing walls, building columns or footings be cut without first obtaining written permission from the Designer.

D. Cutting shall be in accordance with the following.

1. Concrete and Masonry: All openings for conduit shall be core drilled. Square or rectangular openings shall be saw cut.

E. Patching shall be in accordance with the following.

1. Non-fire Rated Concrete and Masonry: Patch the opening with Sika Top 122 Plus (Sika Corp.) non-shrink grout or approved equal, finished smooth with adjacent surface.
2. Fire-rated Construction: In accordance with Section 260533.13 - Conduit for Electrical Systems requirements.

3.10 ELECTRICAL TESTS

A. The Contractor shall, after the installation is completed, visually inspect all items to ascertain that each item is not damaged and is in proper working condition, and shall test all circuits and demonstrate to the satisfaction of the Construction Representative and/or Designer, the following:

1. That all power and control circuits are continuous and free from short circuits and unspecified grounds.
2. That the resistance to ground of all ungrounded circuits operating below 600 volts is 50 megohms or greater at a test voltage of 1000 VDC.
3. That all circuits are properly connected to the correct phase and in accordance with the Drawings and applicable wiring diagrams. Circuits shall be numbered as shown on the Drawings and connected to equalize the loading on all phases.
4. That all circuits and equipment are operable. Demonstration shall include the proper functioning and operation of each unit to the Owner's satisfaction, and the continuous operation of all power circuits for not less than 24 hours.
5. That all equipment requiring calibration and adjustment has been properly calibrated and adjusted in accordance with its intended function and the manufacturer's recommendations.
6. That all equipment and systems function properly.

7. That the phasing sequence and synchronization is the same throughout the entire electrical system. The Contractor shall be responsible for the correct phase rotation on all motors and devices. Any item that is damaged as a result of improper rotation or phasing shall be replaced by the Contractor at no additional cost to the Owner.

B. All tests shall be made after notification to and in the presence of the Construction Representative and/or Designer and the authorities having jurisdiction, if required.

C. The cost of labor, materials, instruments and supplies of any kind required for testing shall be borne by the Contractor.

D. Before starting up any system, each piece of equipment comprising a part of the system shall be checked for proper lubrication, drive rotation, continuity of controls, and any other condition which could cause damage to equipment or endanger personnel.

E. Test runs shall be made over the full design load range where possible, or simulated to the satisfaction of the Construction Representative for other conditions. During test runs all necessary adjustments shall be made, controls checked for proper operation, motors checked for possible overload, and the entire system checked by the Contractor for any abnormal condition.

F. During the test runs and prior to acceptance of any system, the Owner's designated operating personnel shall be instructed in the operation and maintenance of the system.

G. Material and equipment damaged or shown to be defective during tests, unable to perform at design or rated capacity, or not in accordance with the Specifications shall be repaired or replaced by the Contractor to the full satisfaction of the Construction Representative at no cost to the Owner.

3.11 START UP

A. All systems shall be completely assembled, tested, adjusted and demonstrated to be ready for operation to the satisfaction of the Construction Representative.

B. The Contractor shall provide qualified personnel to perform start up assistance and final acceptance testing of all equipment after it has been completely installed and is ready to be energized, prior to applying voltage.

C. The Contractor shall be responsible for the operation and maintenance, including all costs thereof, for systems or equipment temporarily placed in operation for testing and adjusting purposes, or for the convenience or necessity of the Contractor prior to final acceptance by the Owner.

D. The Contractor shall instruct the Owner's operating personnel in the operation and maintenance of the electrical equipment during energization but prior to acceptance by the Owner.

3.12 TEMPORARY POWER

A. Adequate lighting shall be maintained in the areas of construction at all times. The Contractor shall provide, maintain, and remove temporary lighting, minimum of one (1) 100 W incandescent lamp equivalent for every 100 square feet as required.

B. Obtain temporary power from existing electrical service or from temporary electrical service provided by Ameren Missouri. Provide load center with 120 VAC, 20A ground fault circuit interrupter receptacles if/as required.

C. All temporary power and lighting shall be in compliance with the NEC and applicable OSHA regulations and shall be maintained and removed by the Contractor when no longer required.

END OF SECTION 260500

SECTION 260505 – SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DESCRIPTION OF WORK

A. Furnish all materials, labor, equipment and services necessary to perform all electrical demolition work.

B. Work included in this Section includes all demolition work as shown on the Electrical Drawings and as specified herein and as required to complete the Work.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

1.4 DEFINITIONS

A. Demolish: Completely remove and legally dispose of off-site.

B. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

C. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.

D. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

E. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

F. Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.5 SUBMITTALS

A. Schedule of Selective Electrical Demolition Activities: Indicate detailed sequence of selective electrical demolition and removal work, with starting and ending dates for each activity and interruption of electric power services.

B. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

C. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements/conditions, including landscaping, that might be misconstrued as damage caused by selective electrical demolition operations. Submit before the Work begins.

D. Disposal Records: If hazardous wastes are removed by Contractor, submit the following:

1. Hazardous Waste Transporter license
2. Permit or license for hazardous waste treatment or disposal facilities
3. Completed Uniform Hazardous Waste Manifest for all shipments
4. Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI A10.6 and NFPA 241, latest editions.

C. Prior to beginning demolition, arrange a conference with the Construction Representative to review electrical demolition scope, procedures, schedule and items to be salvaged for the Owner.

1.7 PROJECT CONDITIONS

A. Owner will occupy building during construction. Localized areas to be demolished will be vacated during demolition work. Conduct selective electrical demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Construction Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: Hazardous materials are not know to be present in the interior of the any of the buildings within the boundaries of this project.

1. If materials suspected of containing hazardous materials are encountered, do not disturb: immediately notify Designer and Construction Representative.
2. Hazardous material remediation will be completed as a portion of this contract. This work is anticipated to be sequenced with the proposed phasing of construction activities.

E. On-site storage or sale of removed items or materials is not permitted.

F. Utility Service: Maintain electrical service to building during selective electrical demolition operations.

1. Disconnect electrical power only to the items of equipment or the panelboard that is identified for removal under the selective electrical demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

1.9 MATERIALS OWNERSHIP

A. Except for items or materials to be reused, salvaged, reinstalled or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option but in compliance with ordinances and regulations related to the materials being disposed.

1.10 COORDINATION

A. Arrange demolition schedule so as not to interfere with Owner's on-site operations and the operations of adjacent occupied buildings.

B. Review and finalize selective electrical demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

C. Review requirements of General Demolition Contractor and work performed by other trades that rely on demolition of electrical circuitry or equipment to allow for structural demolition or removal of equipment.

D. Review areas where existing electrical circuitry and/or equipment is to remain in place and requires protection.

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

PART 3 - EXECUTION

3.1 EXAMINATION & RECORDING OF CONDITIONS

A. Verify that utilities have been disconnected and capped before starting selective electrical demolition operations.

B. Survey existing conditions and coordinate and identify the extent of the electrical demolition work required. Record existing conditions using preconstruction photographs.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged. Use photographs to document conditions.

D. When unanticipated site, mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Construction Representative and Designer.

E. Perform surveys as the work progresses to detect hazards resulting from the execution of the work.

3.2 COORDINATION

A. No electrical demolition work shall be performed without prior approval of the Construction Representative.

B. Electrical demolition work shall be carried on in a manner so as not to interfere with operation of the Owner's facilities.

C. Any electrical demolition work which interferes with Owner's operation shall be scheduled with the Construction Representative and be subject to the Owner's approval.

D. Maintain existing services required to avert disruption to the Owner's on-going operations and protect them against damage during the performance of the work.

E. Do not interrupt existing electrical service to occupied facilities except when authorized in writing by the Construction Representative.

F. Provide temporary electrical service during interruptions to existing electrical systems, as acceptable to the Construction Representative.

G. Unless noted otherwise, provide not less than two weeks notice to the Owner if shutdown of electrical service is required during the execution of the work.

H. The Contractor shall not remove any material beyond the limits indicated on the Drawings unless given permission to do so by the Construction Representative. Any such material removed shall be replaced by the Contractor at his expense. If the items removed are damaged and/or cannot be satisfactorily reinstalled, new material of like construction shall be furnished and installed by the Contractor at his expense.

I. All damages to buildings and utilities to remain in place shall be promptly repaired at no cost to the Owner. Repairs and restoration of accidental utility interruptions shall be made before the workmen responsible for the repair and restoration leave the job on the day such interruptions occur.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective electrical demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

D. Existing building openings may be used to remove material. No new openings may be made without approval of the Construction Representative.

3.4 PROTECTION

A. Comply with governing laws, codes, and regulations governing fire protection and environmental protection during electrical demolition operations.

B. Provide dust control and ventilation as required in areas of electrical demolition.

C. Execute electrical demolition work, so as to insure adjacent areas against damage which might occur from falling debris or other causes; do not interfere with the use of, operations in, or around adjacent areas; maintain free and safe passage of persons around the areas of electrical demolition.

D. Provide temporary handrail, barricades, floor plates, etc. as required to provide protection for open elevated platforms, holes, etc. created by the electrical demolition work.

E. Premises shall be maintained and protected from all unsafe or hazardous conditions at all times.

F. Protect existing surfaces, active utility services, and equipment which are to remain in place.

G. Protect lighting fixtures, exit signs, fire alarm devices, wireless routers, and cellular phone boosters that are to remain in place from damage during demolition and construction operations. Exposed fixtures and devices shall have a plastic bag or other suitable covering affixed over the item to protect from dust and paint splatters.

3.5 DUST CONTROL

A. Contractor shall use temporary enclosures and other suitable methods as necessary to limit the amount of dust and dirt carrying over to other parts of the Owner's property.

B. Adequacy of the dust control methods shall be subject to the approval of the Construction Representative.

C. Areas of major electrical demolition inside the Owner's property shall be enclosed by means of temporary walls constructed of wood framing with plywood or 6 mil polyethylene sheets.

D. Temporary enclosures shall be removed by the Contractor upon completion of the electrical demolition work unless otherwise directed by the Construction Representative.

3.6 ELECTRICAL DEMOLITION - GENERAL

A. Remove all work indicated on the Drawings and as required to complete the new work indicated.

B. During electrical demolition operations, keep areas adjacent to electrical demolition work free of dust and debris.

C. During electrical demolition operations, if suspected hazardous materials or conditions are uncovered, stop work in that area, and inform the Construction Representative.

D. At concealed spaces, such as hollow walls, ducts, and pipe interiors, verify condition and contents of hidden space before starting electrical demolition operations.

E. Neatly cut openings and holes plumb, square and true to dimensions, required.

F. Use cutting methods least likely to damage construction to remain or adjoining construction.

G. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.

H. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

I. Do not use cutting torches until work area is cleared of flammable materials.

J. Maintain portable fire-suppression devices during flame-cutting operations.

K. Contractor shall take care when using a torch to cut steel welded or bolted to structural members so as to cut flush with but not damage the structural members.

L. All hanger and support material for demolished piping and conduit shall be removed back to the primary structural support member. Grind connection to primary member smooth and touch up with paint to match adjacent surface.

M. All elevated equipment and materials to be demolished shall be carefully lowered (not dropped) by means of temporary riggings. Contractor shall not overload any elements of existing structure during the rigging operation.

N. Locate selective electrical demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

O. Dispose of demolished items and materials promptly.

3.7 ELECTRICAL DEMOLITION

A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality and functionality.

B. The Contractor shall use caution in the demolition of electrical systems and shall inform himself of the status (active, inactive) of all electrical systems to be demolished prior to proceeding.

C. Prior to breaking or cutting conduit within the demolition area, the Contractor shall ascertain that the system has been identified or shown on the Drawings to be wrecked under this Contract. Contact the Construction Representative for clarification prior to demolishing or wrecking questionable items.

D. The Contractor shall remove, cap and/or relocate equipment, outlets, lighting fixtures, conduit, wire, etc., as specified or as shown on the Drawings and as may become necessary because of existing field conditions at no additional cost to Owner.

E. All existing lighting fixtures, switches, receptacles, outlets, etc., shall be removed as required to complete the work and blank covers provided over the outlets, unless otherwise noted.

F. Properly dispose of all lighting fixture lamps and ballasts in accordance with all applicable Federal, State, and local laws and regulations.

G. All concealed conduit for circuits which are partially or completely abandoned may remain in place. Remove all wiring for concealed circuits that are to be completely abandoned and cut and remove concealed conduit 2 inches below the surface of adjacent construction. Cap conduits and patch surface to match existing finish and fire rating. Exposed conduit for abandoned circuits shall be removed, unless otherwise noted.

H. Exposed conduit containing circuits which are to be retained shall remain in place, unless otherwise indicated or required.

I. Wiring for existing circuits which must be rerouted, or which are partially abandoned, shall be reconnected to service the outlets/loads remaining on the circuit.

J. All wiring for a circuit which is to be removed or abandoned shall be removed back to the panel which supplied the circuit.

K. Completely remove all hangers and supports to building structure. Grind off stubs without damaging parent material (steel, concrete, etc.) and touch up paint as required.

L. All abandoned or remaining empty conduit with open ends resulting from demolition work shall be promptly capped, plugged, or sealed.

M. All open conduit knockouts, holes or unused hubs in electrical boxes and enclosures shall be properly plugged with suitable blanking devices that maintain the NEMA rating of the box or enclosure.

N. Remove all conductors for circuits that are installed in underground conduits that are to be abandoned.

O. Remove conductors for direct buried circuits which are to be abandoned to a minimum of 24" below finish grade.

P. Remove all conduit extending above grade from underground circuits that are to be abandoned to a minimum of 24" below finish grade.

3.8 CONCRETE AND MASONRY DEMOLITION

A. Demolish concrete and masonry in small sections.

B. Cut concrete and masonry at junctures with construction to remain, using power driven masonry saw or hand tools. Do not use power-driven impact tools.

3.9 PATCHING

A. All holes or openings in floors, walls or ceilings resulting from electrical demolition shall be properly sealed with material similar to the adjacent surface/finish. Patch holes in concrete floors and ceilings where conduits are removed using non-shrink epoxy grout or concrete material to match existing surfaces and construction. Patch holes in walls and partitions where conduits are removed to match existing construction and finish.

B. All rough edges of openings created by electrical demolition shall be promptly patched to create a finished surface.

C. Openings in concrete shall be patched with cement mortar.

D. Openings in masonry shall be patched by toothing in masonry units to match existing.

E. Maintain the fire rating of all floors, walls, partitions and ceilings when patching.

3.10 REMOVED AND SALVAGED ITEMS

A. Carefully remove and clean salvaged items.

B. Pack or crate items after cleaning. Identify contents of containers.

C. Store items in a secure area until delivery to Owner.

D. Transport items to Owner's storage area as directed by Construction Representative.

E. Protect items from damage during transport and storage.

3.11 REMOVED AND REINSTALLED ITEMS

A. Carefully remove items to be reinstalled.

B. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.

C. Pack or crate items after cleaning and repairing. Identify contents of containers.

D. Protect items from damage during transport and storage.

E. Reinstall items in locations indicated.

F. Comply with installation requirements for new materials and equipment.

G. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

H. If the items removed are damaged and/or cannot be satisfactorily reinstalled, new material of like construction shall be furnished and installed by the Contractor at his expense.

3.12 EXISTING ITEMS TO REMAIN

A. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective electrical demolition.

B. When permitted by Construction Representative, items may be removed to a suitable, protected storage location during selective electrical demolition and reinstalled in their original locations after selective electrical demolition operations are complete.

3.13 DISPOSAL

A. All debris resulting from electrical demolition operations shall become the property of the Contractor and shall be removed daily from the Owner's property unless otherwise permitted by the Construction Representative.

B. Storage of removed materials on site will not be permitted.

C. Sale of removed materials on-site will not permitted.

D. Transport demolished materials off Owner’s property and dispose of legally in accordance with Federal, State, and local laws and regulations.

E. Upon completion of work, remove tools, materials, apparatus, and rubbish. Leave area clean, neat, and orderly.

3.14 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective electrical demolition operations.

B. Return adjacent areas to condition existing before selective electrical demolition operations began.

3.15 HAZARDOUS MATERIALS

A. The Owner is not aware of any hazardous materials such as friable asbestos or lead based paint in any of the work areas.

B. Should the Contractor discover any material requiring removal which is suspected to contain hazardous materials, do not disturb.

C. Contact and consult with the Construction Representative prior to proceeding. The Construction Representative shall direct the Contractor how to proceed.

END OF SECTION 260505

SECTION 260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish and install all conductors, wiring, and cables as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260526 – Grounding and Bonding for Electrical Systems

C. Section 260533.13 – Conduit for Electrical Systems

D. Section 260533.16 – Boxes for Electrical Systems

E. Section 260553 – Identification for Electrical Systems

F. Section 260583 – Wiring Connections

1.4 SUBMITTALS

A. Manufacturer's product data sheets shall be submitted for each of the following items:

1. 600-volt single conductor building wire
2. 600-volt secondary URD cable

B. Submit test report indicating results for copper wire and cable continuity and resistance testing.

PART 2 - PRODUCTS

2.1 GENERAL

A. All cable and wire shall have copper conductors; aluminum shall not be substituted nor permitted.

B. All conductors shall be new, shall be approved and listed by Underwriters' Laboratories, Inc., (UL), shall bear UL identification, and shall have been manufactured within six months from date of the Contract. If requested by the Designer, the Contractor shall supply authenticated data from the wire manufacturer stating the manufacturing date of the wire.

C. All wire sizes are expressed in American Wire Gauge (AWG) or in circular mils. Unless otherwise indicated, all conductors shall have 90ºC rated insulation (wet or dry). The current rating of all conductor sizes shall be calculated using the correction factors and ambient temperature adjustment factors in NEC Article 310-15(B) but under no circumstance shall exceed the values listed in the

60°C temperature column of the tables for circuits 100 amps and below or the 75°C temperature column for circuits over 100 amps.

D. Conductors for all branch circuits and feeders shall be color coded in accordance with the National Electrical Code (NEC) and correctly phased throughout the electrical system.

2.2 600-VOLT SINGLE CONDUCTOR BUILDING WIRE

A. All conductors installed in conduit, including equipment grounding conductors shall meet the following requirements:

1. Conductor: ASTM B3 and ASTM B8, Class B stranded annealed copper, size 12 AWG minimum unless size 14 AWG is specifically called for on the Drawings
2. Insulation: 600-volt, Flame Retardant, thermoset Cross-linked Polyethylene (XLPE) per ICEA S-95-658/NEMA WC70 Section 3; thickness per UL 44 and ICEA S-98-658/WC70, Table 3-4, Column B
3. Temperature Rating, Continuous Use: 90°C wet or dry locations
4. UL Listed: Type XHHW-2
5. Testing: All cables shall be tested in accordance with the applicable requirements of ICEA S-95-658/NEMA WC70.
6. Certification: All cables shall be certified to be in conformance with all applicable requirements of ICEA S-95-658/NEMA WC70.
7. Identification: Surface printing on the cable shall show manufacturer's name, conductor size and metal, voltage rating, UL symbol, insulation type, date of manufacture and color per NEC Article 310-110 – Conductor Identification and Section 260553 – Identification for Electrical Systems.
8. Manufacturer: General Cable Company, Prysmian Cable Company, Service Wire Company or approved equal

2.3 600-VOLT SECONDARY URD CABLE

A. Direct burial cable shall be copper, 600-volt, factory plexed meeting the following requirements:

1. Conductor: ASTM B3 and ASTM B8, Class B stranded annealed copper, size 6 AWG minimum.
2. Insulation: 600-volt, Flame Retardant, thermoset Cross-linked Polyethylene (XLPE) per ICEA S-95-658/NEMA WC70 Section 3; thickness per UL 44 and ICEA S-98-658/WC70, Table 3-4, Column B.
3. Temperature Rating, Continuous Use: 90°C wet or dry locations
4. UL Listed: Type USE-2
5. Testing: All cables shall be tested in accordance with the applicable requirements of ICEA S-95-658/NEMA WC70.
6. Certification: All cables shall be certified to be in conformance with all applicable requirements of ICEA S-95-658/NEMA WC70.
7. Identification: Surface printing on the cable shall show manufacturer's name, conductor size and metal, voltage rating, UL symbol, insulation type, date of manufacture and color per NEC Article 310-110 – Conductor Identification and Section 260553 – Identification for Electrical Systems.
8. Suitable for installation in ducts or direct burial.
9. Manufacturer: CME Wire and Cable, General Cable Company, Prysmian Cable Company, Service Wire Company or approved equal

2.4 600-VOLT CONNECTIONS AND TERMINATIONS

A. Provide connections and terminations for 600-volt wire and cable in accordance with Section 260583 – Wiring Connections.

2.5 CABLE PULLING LUBRICANT

A. Cable pulling lubricant shall be compatible with all cable jackets. The lubricant shall be UL Listed. The lubricant shall contain no greases, silicones, or polyalkylene glycol oils or waxes.

B. A 200-gram sample of the lubricant, when placed in a one-foot, split metal conduit and fully dried for 24 hours at 105°C, shall not spread a flame more than three inches beyond a point of ignition at a continued heat flux of 40 KW/M^2. Total time of test shall be one-half hour.

C. Cable pulling lubricant shall meet the following minimum specifications:

1. Lubricity at 200 lbs/ft Normal Pressure:

   a. PVC or XLP jacketed cable/PVC conduit
      Coefficient of dynamic friction……≤ 0.15
   b. PVC or XLP jacketed cable/HDPE duct
      Coefficient of dynamic friction……≤ 0.15

2. Percent Non-Volitle Solids……...≤ 5.5%
3. Temperature Use Range……..20°F to 110°F
4. pH……≥ 6.5, ≤ 9.0
5. Flammability……..…..……No Flash Point
6. Polyethylene Stress Cracking……....None/ASTM D1693
7. Temperature Stability:

   a. < 10% change in Brookfield viscosity from 40°F to 100°F
      No separation after five freeze/thaw cycles or 24-hour exposure at 120°F

D. Cable pulling lubricant shall be:

1. POLYWATER® J
2. 3M WL
3. Approved equal by Ideal

PART 3 - EXECUTION

3.1 GENERAL

A. Store all conductors and cable indoors, protected from moisture.

B. Provide power feeder conductors of continuous length without joint, splice, or tap for their entire length.

C. Conductors shall be continuous from source to destination without splices or taps, except where indicated on the Drawings to compensate for voltage drop.

D. Install conductors and cable with adequate bending radius in accordance with the National Electrical Code and the conductor and cable manufacturer's recommendations:

1. Greater than six (6) times the conductor outside diameter for 600-volt single conductor wire

E. Swab the inside of conduit and raceways to insure they are dry and clean before conductors or cables are pulled. Care shall be exercised in pulling to avoid damage to the conductors or cables. Pull all conductors into a conduit at the same time. An approved type of wire pulling lubricant, UL Listed for the application, shall be used.

F. All conductors and cables shall be installed directly from reels or coils. Conductors and cables shall not be pulled along the ground or subjected to treatment that may cause abrasion or other damage to conductor and cable insulation.

G. Use pulling means; including fish tape, cable, rope, and basket weave wire/cable grips that do not damage the conductor, cable or raceway.

H. All conductors and cables shall be installed as recommended by the manufacturer. The manufacturer's recommended maximum pulling tension and minimum bending radius shall be adhered to during installation. Utilize the necessary guides, pulleys, sleeves, and pulling aids to prevent abrasion and damage to the conductors or cables during installation. Monitor pulling tensions and associated sidewall pressures to prevent damage to conductors and cables.

I. Provide individual dedicated full size neutral for every circuit.

J. Neatly train and lace wiring inside boxes, panelboards, current transformer cabinets, and equipment enclosures. Provide supplemental structural members and materials as required to support wire and cable without transmitting strain to connection points. Wire and cable shall be supported at 2-foot intervals as a minimum.

K. Group and tie single conductors of a circuit together at a minimum of 2-foot intervals in boxes, panelboards, current transformer cabinets, and equipment enclosures.

L. Remove and discard conductors and cables cut too short or installed in wrong raceway. Do not install conductors or cables which have been removed from a raceway.

M. Do not install conductors or cables in conduit which contains wiring already in place.

N. Do not exceed NEC limits on conduit fill.

O. Conductors terminating in outlet or device boxes shall have at least 8 inches of free conductor left inside the box.

3.2 WIRING SEGREGATION

A. Isolate and segregate power wiring circuits from control wiring circuits in conduit runs, boxes, panels, and equipment.

B. Isolate and segregate "normal" power circuits from "emergency" power circuits in conduit runs, boxes, panels, and equipment.

C. Isolate and segregate lighting and convenience receptacle wiring circuits from power and control wiring circuits in conduit and boxes.

D. In boxes, provide isolation and segregation by rigid conduit chase through box interior or continuous metal dividers of same material as the box.

3.3 WIRING CONNECTIONS AND TERMINATIONS

A. Provide connections and terminations for 600-volt wire and cable in accordance with Section 260583 – Wiring Connections.

3.4 FIELD QUALITY CONTROL

A. General:

1. Testing shall be performed in the presence of Construction Representative. Contractor must provide 48 hours notice prior to conducting tests.
2. Prepare a test report upon completion of testing activities. Report format shall include the following information:

    a. Summary of test results
    b. Test equipment summary (model number, accuracy, calibration date)
    c. Test personnel names and signoffs
    d. Completed data sheets
    e. Test log and observations
    f. Certificate of Compliance

B. Inspect wire and cable for physical damage and proper connection.

C. Torque test conductor connections and terminations to manufacturer's recommended values.

D. Perform continuity tests.

E. Perform and record results of megger tests for each phase and neutral conductor for each feeder. Include actual recorded megaohm value for each conductor of each feeder in the feeder conductor insulation test report.

F. Provide testing for connections and terminations for 600-volt wire and cable in accordance with Section 260583 – Wiring Connections in conjunction with the testing specified herein.

END OF SECTION 260519

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish, install, and test the grounding systems as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260519 – Low-Voltage Electrical Power Conductors and Cables

C. Section 260533.13 – Conduit for Electrical Systems

D. Section 260533.16 – Boxes for Electrical Systems

E. Section 260583 – Wiring Connections

F. Section 262416 – Panelboards

G. Section 262726 – Wiring Devices

H. Section 262816.13 – Enclosed Circuit Breakers

1.4 SUBMITTALS

A. Manufacturer's product data sheets shall be submitted for the following items:

1. Grounding conductors
2. Exothermic welds
3. Grounding clamps
4. Grounding connectors
5. Grounding lugs
6. Grounding rods

B. Grounding rod resistance test report.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. All grounding conductors shall be insulated, stranded copper, and unless otherwise indicated, shall meet the same specifications, in accordance with Section 260519 – Low-Voltage Electrical Power Conductors and Cables, as the accompanying circuit conductors.

B. Aluminum shall not be substituted for copper in grounding conductors.

2.2 EXOTHERMIC WELDS

A. Grounding wire connections to building steel or grounding rods shall be welded using an exothermic process, unless otherwise indicated. Approved exothermic processes shall be either:

1. Cadweld
   Manufactured by Erico Products, Inc.; Cleveland, Ohio
2. Harger; Grayslake, Illinois
3. Thermoweld
   Manufactured by Continental Industries, Inc.; Tulsa, Oklahoma

B. Where welded electrical connections are referred to elsewhere in the Drawings or Specifications as being "cadwelded," it shall be understood that the process shall be exothermically welded by means of one of the above three manufactured methods.

2.3 GROUNDING CONNECTORS

A. Grounding conductor connections to equipment frames, equipment enclosures, and equipment ground lugs shall be made using corrosion resistant compression, bolted, or split-bolt connections. Bolts for equipment ground lugs shall be copper alloy terminal with a twin clamping element. Bolts for equipment enclosures shall be silicon bronze with lock washers. Split-bolt connectors shall be copper. Use products by Blackburn, Burndy Corp., O-Z/Gedney, Penn-Union or approved equal.

B. Split-bolts shall be UL Listed for connection of two (2) conductors within a listed range for each connector catalog number and the tap and run conductors shall not be required to be the same size.

2.4 GROUNDING RODS

A. Grounding rods shall be 3/4-inch diameter, 10 feet long or 5/8-inch diameter, 8 feet long (as indicated on the Drawings), high strength solid steel rod with a bonded copper jacket, and UL listed.

B. Grounding rods shall be manufactured by Copperweld Steel Company, ITT Weaver; Thomas & Betts; Blackburn; Joslyn Mfg. and Supply Co.; or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The entire electrical system and all electrical equipment shall be grounded in strict accordance with Article 250 of the National Electrical Code and as shown on the Drawings.

B. The grounding system shall be continuous throughout the electrical system.

C. Insulated grounding conductors shall be identified with green colored insulation or marking tape in accordance with Section 260553 – Identification for Electrical Systems and NEC Article 250-119.

D. Install grounding conductors using as few joints as possible.

E. Protect grounding conductors against unraveling, caging, and abrasion by several wrappings of plastic tape on all ends, where cable leaves concrete, and at necessary intermediate points.

F. Suitably protect grounding conductors against damage during construction. Replace or suitably repair at the discretion of the Designer or Construction Representative if cable is damaged by anyone before final acceptance.

G. Install individual grounding conductors so as not to be entirely encircled or closely encircled by magnetic material unless it is properly bonded as specified herein.

H. When a conduit, which is fabricated of magnetic materials (e.g., steel conduit), contains only grounding conductors, the grounding conductors shall be bonded to the conduit at both ends of the conduit run, using grounding bushings with a bonding jumper installed between each grounding conductor and the bushing.

I. All neutral conductors shall be continuous throughout the electrical system.

J. Power system neutral conductors shall be grounded only at the service entrance main circuit breaker in accordance with NEC Article 250.

K. All metallic conduits shall be properly grounded.

L. A properly sized green insulated copper equipment grounding conductor shall be installed in each and every conduit.

M. The grounding pole of all receptacles shall be electrically bonded to the conduit system.

N. All electrical enclosures, panelboards, boxes, conduits, equipment frames and other non-current-carrying metallic objects shall be grounded and bonded as required by the NEC.

O. *Connections:* All grounding conductor connections shall be made in accordance with the manufacturer's written instructions. Chemically degrease and dry completely before exothermically welding. Make up bolted connections clean and tight. All connections shall be low resistance with a resistance drop of less than 1 ohm. Do not cover connections until they have been inspected by the Designer or Construction Representative.

P. Grounding conductors and bonding jumper connection devices or fittings that depend on solder shall not be used.

Q. Split-bolt type connectors are only UL Listed for the connection of two (2) conductors. Main and tap conductor sizes shall be in accordance with the UL listing as indicated by the manufacturer. Connections of more than two (2) grounding conductors require the use of a different type of UL Listed connector in accordance with Specification Section 260583 – Wiring Connections.

R. Bond all metal conduits to the ground bus bar conductor of the control panel, terminal box, panelboard, enclosed circuit breaker or frame of the equipment to which they are connected by terminating each conduit with a threaded galvanized steel insulated grounding bushing or insulated throat, grounding type conduit hub having a solderless lug with a bonding jumper sized in accordance with NEC Table 250-66 attached to the ground bus conductor or equipment frame. Where the enclosure does not contain a ground bus bar, bond to the enclosure using a mechanical lug. Scrape away paint at grounding lug attachment location.

S. Equipment grounds shall be made where indicated on the Drawings. Total resistance to ground shall not exceed five (5) ohms.

3.2 METALLIC RACEWAY SYSTEM GROUNDING

A. Ground/bond metallic conduits at all termination points by means of a grounding type conduit bushing or conduit hub with grounding screw/lug on the locknut and a NEC sized insulated stranded copper bonding jumper.

B. Where extending metallic conduit into floor or grade mounted equipment from below, provide a threaded galvanized steel insulated grounding bushing on the end of the conduit and bond to the equipment ground bus or frame using a NEC sized bonding jumper.

3.3 GROUNDING RODS

A. Driven grounding rods shall be installed in areas wherever required and where shown on the Drawings.

B. Unless otherwise indicated, grounding rods located outdoors shall be installed vertically with the top of the grounding rod 3 feet below finish grade.

C. Grounding conductor connections to grounding rods shall be exothermically welded.

3.4 GROUNDING ROD TESTING

A. The resistance to ground at all ground rod locations shall be tested by an independent testing firm, approved by the Engineer, using an AVO Biddle DET 2/2 Ground Tester, Catalog No. 250202 or approved equal using the "Fall of Potential Method." The total resistance to ground shall not exceed five (5) ohms. If it does, the Contractor shall install additional ground rods and re-test until the resistance is below five (5) ohms.

B. Acceptable independent testing firms:

1. ABB Services
   Kansas City, KS
   (913) 286-8028
   Roger Andrews
2. Eaton Electrical Services and Systems (EESS)
   62 Soccer Park Rd.
   Fenton, MO 63026
   (262) 309-3440
   Brad Gilmer
3. Frank Sager & Son, Inc.
   4754 Theiss Road
   St. Louis, MO 63128-2349
   Mark Rodgers
   (314) 892-7550
4. Schneider Electric Services
   1101 Jefferson Street
   Pacific, MO 63069
   (314) 378-2407
   Michael Berra

C. Provide written report of test results including date and time of testing, test equipment used, test equipment calibration date, and names of individuals performing the testing.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish and install all supports and fastening devices for mounting and anchoring all raceways and electrical equipment as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260533.13 – Conduit for Electrical Systems

C. Section 260533.16 – Boxes for Electrical Systems

D. Section 262416 – Panelboards

E. Section 262816.13 – Enclosed Circuit Breakers

1.4 SUBMITTALS

A. Manufacturer's product data sheets shall be submitted for the following items:

1. Expansion anchors
2. U-channel steel supports including associated hardware and accessories

PART 2 - PRODUCTS

2.1 GENERAL

A. *Weld Rod:* Use E70 electrodes for shielded metal arc welding.

B. Provide materials, sizes, and types of supports, anchors, and fasteners to carry the loads of conduit, boxes, and equipment. Include weight of wire and cable when selecting products for conduit, equipment and box supports.

2.2 ANCHORS AND FASTENERS

A. Provide anchors and fasteners as required to install all conduit, boxes, electrical enclosures, and equipment.

B. *Expansion Anchors:* Utilize expansion anchors for attachment of electrical equipment, boxes, and raceways to concrete and solid masonry surfaces.

1. Expansion anchors shall be stud type expansion anchor with a single-piece, three-section wedge, Hilti Kwik Bolt TZ2 or approved equal installed per the manufacturer's written recommendations. The anchors shall meet the description in Federal Specification FF-S-

325, Group II, Type 4, Class 1, for concrete expansion anchors and shall comply with ASTM 153. All bolts shall have length identification.
2. Indoors: Galvanized steel
3. Outdoors: Type 304 stainless steel

C. Provide adequate corrosion resistance for all fastening systems.

D. *Bolts and Nuts:* ANSI regular series, semi-finished, hexagon

1. Indoors: Cadmium plated steel
2. Outdoors: Type 304 stainless steel

E. *Flat Washers:*

1. Indoors: Cadmium plated steel
2. Outdoors: Type 304 stainless steel

F. *Lock Washers:* ANSI medium, spring type

1. Indoors: Cadmium plated steel
2. Outdoors: Type 304 stainless steel

G. *Beam Clamps:* Steel beam and angle clamps by B-Line or Thompson

1. Indoors: Cadmium, zinc plated or hot-dipped galvanized
2. Outdoors: Type 304 stainless steel

H. *U-Bolts:* 1/4" minimum size

1. Indoors: Cadmium or zinc plated steel or hot-dipped galvanized steel
2. Outdoors: Type 304 stainless steel furnished with Type 304 hardware

2.3 STRUCTURAL SUPPORT SYSTEMS

A. *Steel Supports:* Brackets, frames and hangers shall be fabricated from standard cold rolled structural steel shapes or prefabricated structural systems, as manufactured by B-Line Systems, Inc., Unistrut Corporation, Kindorf Electrical Products Co., or approved equal.

1. Steel supports and accessories used indoors shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS Grade 33, then electro-plated with zinc per ASTM B633. Fittings shall be manufactured from steel meeting the minimum requirements of ASTM A907 SS, Grade 33. All fittings and hardware shall be zinc plated in accordance with ASTM B633 (SC3 for fittings, SC1 for threaded hardware).
2. Steel supports and accessories used outdoors or in indoor wet areas shall be hot-dipped galvanized steel after fabrication per ASTM A123 with a minimum coating thickness of 2.5 mils or Type 304 stainless steel.
3. Steel supports shall be 14-gauge or 12-gauge and either 1-5/8" x 13/16" or 1-5/8" x 1-5/8" as required based on equipment to be supported or as indicated on the Drawings.

B. *Hanger Supports:* Threaded rods

1. Indoors: Electro-galvanized steel
2. Outdoors: Type 304 stainless steel

PART 3 - EXECUTION

3.1 GENERAL

A. The methods of attaching or fastening equipment or equipment supports or hangers to a building structure shall be subject to the approval of the Construction Representative.

B. Do not drill or cut any structural steel members.

C. Do not cut any structural concrete members.

D. Welding on any structure shall require prior written approval from the Construction Representative for each type of application except where specifically shown on the Drawings. Weld in accordance with AWS.

E. Do not use piping, ductwork, raceways, or equipment as structural members for support.

F. Equipment or raceways shall not be attached to or supported from the roof deck, from removable or knockout panels, or temporary walls or partitions unless specifically indicated on the Drawings.

G. A minimum of four (4) anchor points shall be provided for electrical equipment enclosures and dimensioned boxes.

H. Outdoor supports shall be installed to provide a minimum of 11/16" air space between electrical equipment enclosures and mounting surface.

I. Provide corrosion resistant spacers, minimum 1/4"-thick, behind all equipment enclosures mounted on indoor concrete or masonry walls such that the back of the enclosure is not in direct contact with the wall.

3.2 ANCHORS AND FASTENERS

A. Unless noted otherwise on the Drawings, expansion anchor minimum embedment shall be as follows:

1.

Bolt Diameter, in.	Embedment, in.
1/4	2
3/8	2-1/2
1/2	3-1/2
5/8	4

B. Utilize welded fasteners or beam clamps for attachment of electrical equipment and raceways to structural steel surfaces in accordance with the requirements of the Designer or Construction Representative. Weld in accordance with AWS.

C. Utilize toggle bolts, hollow wall fasteners or through-wall bolt fasteners for attachment of electrical equipment, boxes, and raceways to hollow masonry surfaces.

D. Utilize machine screws for attachment of electrical equipment, boxes, and raceways to metal surfaces.

E. Utilize wood screws for attachment of electrical equipment, boxes, and raceways to wood surfaces.

F. Nails shall not be used as a means of fastening.

G. Do not use spring steel clips.

H. Do not use powder-actuated anchors.

3.3 STRUCTURAL SUPPORT SYSTEMS

A. Weld in accordance with AWS.

B. Any galvanizing damaged by welding or erection shall be repaired with cold galvanizing per ASTM A780. Surface preparation shall include power disk sanding the abraded or welded area to bright metal.

C. Do not use chain.

D. Do not use perforated strap or wire.

END OF SECTION 260529

SECTION 260533.13 – CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish and install all raceways and fittings as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260519 – Low-Voltage Electrical Power Conductors and Cables

C. Section 260526 – Grounding and Bonding for Electrical Systems

D. Section 260529 – Hangers and Supports for Electrical Equipment

E. Section 260533.16 – Boxes for Electrical Systems

F. Section 260553 – Identification for Electrical Systems

G. Division 31 – Earthwork

1.4 SUBMITTALS

A. Manufacturer's product data sheets shall be submitted for the following items:

1. Each type of conduit (galvanized rigid steel, rigid aluminum, electrical metallic tubing, rigid non-metallic, HDPE)
2. Conduit hubs
3. Conduit expansion fittings
4. Intumescent silicone sealant
5. Conduit bodies
6. Conduit mounting clamps
7. Fire-stopping materials
8. Protective coating for direct buried metal conduit
9. Underground conduit warning tape
10. Conduit pull tape

PART 2 - PRODUCTS

2.1 CONDUIT

A. All conduit shall be new and shall be approved and listed by Underwriters' Laboratories, Inc. (UL) and shall bear the UL label of approval.

B. All conduit shall be one of the following:

1. Galvanized rigid steel conduit, "Heavywall" (GRC), shall be Schedule 40 steel conduit, hot dipped galvanized on both the outside and the inside. Conduit as obtained from the manufacturer shall have been cut and threaded before galvanizing, thereby insuring the galvanizing of these areas. Conduit shall conform to the latest editions ANSI Standard C80.1 and UL Standard No. 6 and shall meet the requirements of NEC Article 344.

    a. Minimum conduit size shall be 3/4-inch.
    b. Running threads are not permitted.
    c. GRC shall be used outdoors above grade down to 18" below grade.

2. Rigid aluminum conduit (RAC), heavywall, copper-free threaded aluminum in accordance with ANSI C80.5 and shall meet the requirements of NEC Article 344.

    a. Minimum conduit size shall be 1-1/2-inch.
    b. Running threads are not permitted.
    c. Rigid aluminum conduit shall be used outdoors above grade.

3. Electrical metallic tubing (EMT) shall be thin wall steel conduit, hot dipped galvanized on both the outside and the inside. EMT shall conform to ANSI Standard C80.3 and U.L. Standard 797 and shall meet the requirements of NEC Article 358.

    a. Minimum conduit size shall be 3/4-inch.
    b. All connectors and couplings shall be zinc plated steel. Die cast zinc type are not acceptable.

        1) Size 2-1/2" and smaller compression type
        2) Size 3" and larger set-screw type

    c. Connectors up to and including size 1-1/2" shall be insulated throat type. All connectors shall be terminated with a bonding type locknut. Threaded steel insulated grounding bushings having solderless lugs shall be used where required.
    d. EMT shall be used indoors in dry locations.

4. Rigid non-metallic conduit shall be heavy wall Schedule 40 (NEMA EPC-40 PVC, Type II-III) polyvinyl chloride (PVC) electrical plastic conduit and shall meet the requirements of NEC Article 352. Rigid non-metallic conduit shall be as manufactured by Carlon Electrical Products; CanTex Industries; Prime Conduit; or approved equal.

    a. Minimum conduit size shall be 1-inch.
    b. Rigid non-metallic conduit (PVC) shall be used below grade
    c. Adhesive for PVC conduit shall be as recommended by the manufacturer of the PVC conduit

5. Non-metallic conduit for directional boring shall be Schedule 40 (NEMA EPEC-40-HDPE) UL Listed high density polyethylene (HDPE) smooth wall coilable electrical plastic conduit. HDPE conduit shall be listed per UL 651-B for continuous length HDPE coiled conduit and shall meet the requirements of NEMA TC 7, UL 746A, ASTM D 638, ASTM D 2447, ASTM D 3350 and NEC Article 353. UL Listed HDPE conduit shall be as manufactured by ARNCO Corporation; Carlon Electrical Products; Duraline or approved equal.

    a. Conduit size shall be as indicated on the Drawings. The minimum conduit size shall be 1-inch.

b. HDPE conduit shall only be used for below grade, directional boring as indicated on the Drawings or in these Specifications.
c. HDPE conduit shall be installed from reels or coils in one continuous length. All joints in HDPE conduit shall be fusion welded.

2.2 CONDUIT HUBS

A. Conduit hubs shall be insulated throat, liquid-tight "copper-free" aluminum for aluminum conduit and zinc plated steel or malleable iron for rigid galvanized steel conduit, grounding type with ground lug/screw on the lock nut.

B. Conduit hubs shall be Myers Type STAG or STG Scru-Tite or approved equal.

2.3 CONDUIT EXPANSION FITTINGS

A. Expansion fittings for galvanized rigid steel conduit shall be weatherproof, fabricated from hot dipped galvanized malleable iron or electrogalvanized steel with phenolic or Teflon insulating bushings, providing for 4 inches of conduit movement (2 inches in either direction), and shall be O-Z/Gedney Type AXB-4; Cooper Crouse-Hinds Type XJG; or approved equal by Appleton Electric.

B. Expansion fittings for Schedule 40 PVC conduit shall be 2-piece type with internal rubber O-ring(s), fabricated from Schedule 40 PVC with a solvent welded bell at both ends or a male adaptor at the receiving (fixed) end and a solvent welded bell at the "moving" end.

C. Conduit expansion fittings shall be of sufficient length to allow for a minimum of 4" of movement of the soil where underground conduit connects to outdoor equipment above grade or enters a building above grade without inflicting any damage to either the conduit or the conductors inside the conduit.

D. GRC expansion fittings shall be UL Listed and internally grounded with a tinned copper bonding jumper or electrogalvanized phosphor bronze ground springs to maintain electrical continuity through the fitting.

E. PVC conduit expansion fittings shall be UL Listed.

2.4 INTUMESCENT SILICONE SEALANT

A. Intumescent silicone sealant shall meet UL Water Leakage Test – Class 1 requirements and shall be re-enterable and repairable; 3M Fire Barrier Water Tight Silicone Sealant 3000WT or approved equal.

B. Utilize 6 psf mineral wool as packing material behind the 3M UL listed 3000WT intumescent silicone sealant.

2.5 CONDUIT BODIES

A. Conduit bodies shall be provided as required or where indicated on the Drawings and shall be hot-dipped galvanized malleable iron with galvanized steel gasketed covers or cast, "copper-free" aluminum having threaded hubs and stainless steel or "copper-free" aluminum, neoprene gasketed covers fastened with stainless steel screws, rain-tight, suitable for wet locations, Crouse-Hinds, Appleton or O-Z Gedney Form 35, Form 8, Mark 9, or Mogul. Die-cast aluminum types are not acceptable.

B. Conduit body cover screws shall thread directly into the conduit body. Conduit body covers with wedge-clamp type covers are not acceptable.

C. Conduit body hub configuration shall be as required based on conduit routing for the cover to be readily accessible for easy removal.

D. Conduit bodies enclosing size 6 AWG or smaller conductors shall have a cross-sectional area not less than twice the cross-sectional area of the largest conduit to which the conduit body is attached.

E. Only those conduit bodies that are durably and legibly marked by the manufacturer with their cubic inch capacity shall be permitted to contain splices, taps, or devices. The maximum number of conductors shall be computed in accordance with NEC Article 314-16(C).

2.6 CONDUIT MOUNTING CLAMPS

A. Conduit mounting clamps for securing conduits inside buildings shall be galvanized steel one-hole, two-hole or H-Type (mini's). Conduit mounting clamps used outdoors shall be Type 304 stainless steel.

B. Conduit mounting clamps for securing rigid metal conduits to concrete or masonry surfaces inside buildings shall be one piece "copper-free" aluminum or zinc plated malleable iron one hole type, Crouse-Hinds Cat. No. 5XX or approved equal with Crouse-Hinds Cat. No. CBX or approved equal "copper-free" aluminum or zinc plated malleable iron clamp backs/spacers.

C. Conduit mounting clamps for mounting conduits to channel supports shall be electro-plated zinc, hot-dipped galvanized steel after fabrication per ASTM A123 with minimum coating thickness of 2.5 mils, or Type 304 stainless steel to match channel support material, B-Line B2000 Series or approved equal.

2.7 FIRE-STOPPING MATERIALS

A. The following fire-resistant penetration sealing materials are approved for use in indoor dry areas:

1. 3M Caulk CP 25
2. 3M Wrap/Strip FS-195
3. Damming materials – 3M Composite Sheet CS-195
4. SpecSeal Series 100 sealant
5. Rector Seal Corporation, Metacaulk 835 fire stopping sealant
6. Dow Corning 3-6548 silicone RTV foam
7. General Electric GE RTV850 or GE RTV6428
8. Chase Technology Corporation CTC PR-855 fire-resistant silicone foam

2.8 PROTECTIVE COATING FOR DIRECT BURIED METAL CONDUIT

A. Protective coating for direct buried metallic conduit shall be Kop-Coat, Inc. Bitumastic No. 50 or two coats of 3M Scotchrap pipe primer over wrapped in accordance with the manufacturer's written instructions with 3M No. 51, 20 mil thick tape.

2.9 UNDERGROUND CONDUIT WARNING TAPE

A. Warning tape shall be fabricated from polyethylene film and shall be 6 inches wide and not less than 6 mils thick.

B. Warning tape for all directly buried electrical conduit shall be high visibility red in color and imprinted at frequent intervals with black letters having the following wording:

CAUTION BURIED ELECTRIC LINE BELOW

C. Warning tape shall be Terra-Tape "Extra Stretch" manufactured by Reef Industries, Inc., or approved equal, by EMED Co., Inc., Seton, W. H. Brady Co., or Allen Systems, Inc.

2.10 CONDUIT PULL TAPE

A. Low-stretch polyester flat, woven tape with minimum 2500 lb. rating.

B. Rot and mildew resistant.

C. Permanently printed sequential measurements at one-foot increments.

D. Pull tape shall be Neptco Muletape WP2500P or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. CONDUIT

1. Verify routing and termination locations of conduit runs prior to rough-in.
2. Conduit routing shown on Drawings is approximate. Route as required to complete wiring.
3. Design, layout, and detail conduit runs to permit installation.
4. Coordinate conduit routing with the Construction Representative to avoid equipment operational and maintenance interferences and to permit easy removal of all conduit body and box covers.
5. Conduit or fittings having any type of defects shall not be used in the work.
6. Exposed conduit shall be run perpendicular or parallel to building walls. Where more than one conduit in a bank of exposed conduit changes direction, all bends shall be concentric.
7. The Contractor shall consult all the other trade drawings to ascertain where conflicts may occur and install all conduit to avoid conflicts.
8. Conduits shall be continuous from outlet to outlet, from outlet to junction or pull boxes, from source panel to equipment, and shall be terminated to all boxes and enclosures in such a manner that the conduit system is mechanically and electrically continuous throughout the system.
9. The Contractor shall furnish and install NEC sized pull boxes or conduit bodies wherever necessary in order that a run of conduit between conductor/cable pulling points does not contain more than the equivalent of four quarter (90 degree) bends (360 degrees total).
10. Conduit bends shall not be less than the standard radius, unless otherwise indicated.
11. A minimum clearance of nine inches (9") shall be maintained between all conduits and pipes carrying steam, hot liquids, or hot gases, except at points of cross over, in which case the clearance may be reduced to six inches (6"). Any exceptions to this shall be presented to the Designer for approval on an individual case by case basis.
12. Maintain adequate clearance between conduit and piping, allowing for the maintenance of insulation and outer protective covering on piping.
13. Couplings for conduits in a group shall be staggered at least six (6) inches.
14. Conduit shall not be routed along floors.
15. Conduits shall be concealed in finished spaces and exposed in unfinished spaces.

16. In unfinished spaces, arrange conduit to maintain minimum 7'-6" headroom above floors, unless otherwise approved by the Construction Representative.
17. All rigid metal conduit, threaded joints and couplings shall be made up wrench tight with at least five full threads engaged. The use of running threads at conduit couplings and terminations is prohibited. All cut ends of conduits shall be reamed to remove rough edges and shall be free of burrs and sharp edges. An approved aluminum lubricant shall be used with rigid aluminum conduit.
18. Coat all field cut threads, scars, or wrench abrasions in rigid galvanized steel conduit with an approved organic zinc rich primer equivalent to Koppers' "Organic Zinc."
19. Conduit shall be supported on approved types of steel brackets, channels, ceiling trapeze, pipe straps or hangers secured by means of toggle bolts, hollow wall fasteners or through wall bolt fasteners on hollow masonry or clay tile blocks; or expansion anchors in concrete or brick; or machine screws on metal surfaces; or wood screws on wood construction. Nails or powder-actuated anchors shall not be used as a means of fastening. Perforated flat steel straps or wire shall not be used for supporting conduit. All conduit shall be properly supported in accordance with Section 260529 – Hangers and Supports for Electrical Equipment in order to deter any possible vibration, noise, or chatter.
20. Conduit shall be supported from building structures. Do not use piping, ductwork, other raceways, or equipment for supporting conduits. Support all conduit runs at a minimum of every 10 feet and within 3 feet of all terminations.
21. Where possible, group conduits on U-channel conduit racks.
22. Utilize U-channel supports and associated fittings and hardware for conduit support in accordance with Section 260529 – Hangers and Supports for Electrical Equipment.
23. Terminate rigid metal conduits at all NEMA Type 1 junction and pull boxes and equipment enclosures inside buildings with a minimum of two (2) locknuts, one inside and one outside the enclosure, and a steel or malleable iron insulated throat, grounding bushing having a solderless lug and a copper bonding jumper, sized in accordance with NEC Article 250, to connect the conduit to the equipment grounding bus bar located inside the enclosure. Provide a grounding lug where the enclosure does not contain an equipment grounding bus bar.
24. Provide insulated throat, liquid tight, grounding type conduit hubs to terminate rigid metal conduits at all NEMA Type 3, 3R, 4, 4X, 12 and 13 enclosures without integral cast threaded hubs. Provide a copper bonding jumper, sized in accordance with NEC Article 250, to connect the conduit hub locknut to the equipment grounding bus bar located inside the enclosure. Provide a grounding lug where the enclosure does not contain an equipment grounding bus bar.
25. Grounding and bonding of conduit shall be in accordance with Section 260526 – Grounding and Bonding for Electrical Systems.
26. Identify all conduit runs; both new conduit and existing that is reused, in accordance with Section 260553 – Identification for Electrical Systems.
27. Prior to installing any cables in any existing conduit that is to be reused, demonstrate to the Construction Representative that the conduit is clear of obstructions by pulling a mandrel 1/2-inch smaller than the nominal size of the conduit through the entire length of the conduit.

B. CONDUIT EXPANSION FITTINGS

1. All underground conduits extending above grade and connecting to outdoor equipment shall be provided with a conduit expansion fitting between finished grade or concrete pad at grade and the bottom of the equipment.
2. Expansion fittings shall be installed with the initial pull-out distance adjusted as directed by the fitting manufacturer.

3. Provide adequate service loop in all conductors inside the equipment enclosure to allow for movement of the conduit without damage to conductors or strain on equipment terminations.
4. Do not clamp the moving side of the conduit expansion joint above grade.

C. CONDUIT BODIES

1. Conduit bodies shall be sized for the conductor fill of the conduits to which it is connected. Use Mogul type conduit bodies if/as required.
2. Conduit body sizing shall be based on the maximum number of conductors permitted accordance with NEC Article 314-16(C).
3. Conduit bodies enclosing size 6 AWG or smaller conductors shall have a cross-sectional area not less than twice the cross-sectional area of the largest conduit to which the conduit body is attached.
4. Conduit bodies are not permitted to contain splices, taps, or devices.
5. Conduit bodies shall be supported in a rigid and secure manner.

D. CONDUIT MOUNTING CLAMPS

1. Conduit shall not be mounted in direct contact with any concrete or masonry wall or ceiling. Utilize U-channel supports or clamp backs/spacers to hold conduits a minimum of 3/16 inch away from concrete or masonry surfaces. Clamp backs/spacers shall be stackable to allow the conduit to be spaced further away from the mounting surface as required.
2. Only Type 304 stainless steel U-channel support conduit clamps shall be used outdoors.

E. CONDUIT OPENINGS

1. Provide conduit openings in floors, walls, and ceilings as required to install conduit runs. Openings shall be kept to a minimum, as small as possible, and installed in a neat manner. All damage to existing surrounding surfaces when installing openings shall be repaired to original condition.
2. Locations of all openings shall be approved by the Construction Representative before beginning work.
3. Core drill all openings in existing concrete or masonry surfaces using a dustless method.
4. After installation of conduit, openings in concrete or masonry shall be formed, grouted, and caulked to provide a moisture and fire barrier that is equivalent to the fire rating of the wall or floor.
5. All openings and sleeves through which a conduit passes in walls, floors, and ceilings shall be properly sealed after the conduit is installed to prevent transmission or leakage of liquids, dust, fire, smoke, or sound. Openings in non-fire rated concrete or masonry construction through which conduit passes shall be sealed, after the conduit is installed, with material similar to that which surrounds the opening. Openings in fire-rated construction through which conduit passes shall be sealed, after the conduit is installed, with an APPROVED fire-resistant penetration seal. All fire-resistant penetration seals shall be installed in accordance with the manufacturer's instructions.
6. Seal exterior side of above grade exterior wall penetrations with intumescent silicone sealant as specified herein.

F. UNDERGROUND CONDUIT

1. Unless otherwise indicated, all underground conduit located outside building areas shall have a minimum slope of 1/2% toward the drainage point or as shown on the Drawings and shall be a minimum of two feet (2'-0") below finish grade to the top of the conduit.

2. Trenching, excavation, and backfilling for all underground conduit shall be accomplished as hereinafter specified or shown on the Drawings.
3. Trench widths shall be kept to a minimum and bottoms shall be graded to a uniform slope. The bottom of the trench shall be kept free of water. If required to protect the excavation or personnel, shoring and sheeting of a design and materials suitable to maintain the trench in a safe and workable condition shall be provided. Adequate barricades shall be installed around excavations to protect workmen and the public during the construction. Provide temporary supports for all underground utilities crossing an excavation.
4. Conduit in trenches shall be supported throughout the entire length on solid earth.
5. All metallic conduit directly buried in earth shall be completely coated with two 15- to 18-mil thick coats of an approved bitumastic coal tar protective coating or two coats of 3M Scotchrap pipe primer overwrapped in accordance with the manufacturer's written instructions with 3M No. 51 tape before the conduit trench is backfilled. Rigid metal conduit shall extend 18-inches below grade before converting to Schedule 40 PVC conduit.
6. Backfill for trenches containing direct buried conduit shall be in accordance with Section 310000 – Earthwork. Any settlement shall be corrected by refilling and retamping. No puddling will be permitted.
7. Underground conduits shall be at least 12 inches away from gas, water, or other pipelines.
8. Conduits shall have long swept elbows.

    a. Size 2" and below – 18" minimum radius for vertically oriented elbows and 24" minimum radius for horizontally oriented elbows
    b. Size 2-1/2" and above – 24" radius for vertically oriented elbows and 36" minimum radius for horizontally oriented elbows

9. Protect all direct buried cables at connections to outdoor electrical enclosures with a below grade long sweep Schedule 40 PVC 90° elbow and vertical Schedule 40 PVC conduit between the below grade elbow and the connection to the equipment.
10. Factory elbows for underground conduits in sizes 2 inches and larger shall be rigid galvanized steel Schedule 40 or fiberglass.
11. Couplings for conduits in a common trench shall be staggered at least 6 inches. All joints shall have watertight seals.
12. All PVC conduit couplings, connectors and fittings shall be properly glued to the conduit, pushing the conduit all the way into the stop on the coupling, and using the adhesive recommended by the manufacturer of the PVC conduit.
13. Seal all around the cables or conductors inside all conduits entering underground junction boxes and outdoor electrical enclosures with intumescent silicone sealant to prevent entry of water, vermin, or debris in the conduit.
14. Push underground feeders under concrete walks. Obtain permission from Construction Representative for any cases where Contractor prefers to saw cut and patch concrete walks for installation of underground feeders.

G. UNDERGROUND CONDUIT WARNING TAPE

1. Unless otherwise indicated, the location of all directly buried cables and electrical conduits shall be marked by burying a warning tape below grade in the backfill. The warning tape shall be placed 6" inches minimum to 12" maximum above the top of the cable(s)/conduit(s) and shall be parallel along the full length of the run.

2. Contractor shall exercise care to ensure that the warning tape is properly located.

3.2 UNDERGROUND UTILITIES

A. All underground utilities at the project site are privately owned. Before any excavations are begun, the Contractor shall have all underground utilities in the area to be excavated located and marked with colored paint and flags by a private utility locate company acceptable to the Construction Representative.

B. The Contractor shall use extreme care and caution during excavation and backfilling to avoid damage to any existing underground structures and utility lines. Prior to and during excavation, the Contractor shall use every means to determine the exact location of all underground structures, electrical conduit, pipe lines, telephone cables, water lines, gas lines, sewer lines, conduit duct banks, etc., in the immediate vicinity of the excavation.

C. The Contractor shall be solely responsible for the protection, repairs, or replacement of any existing underground item which was broken or otherwise damaged by the Contractor, including any consequential damage resulting therefrom, either above or below ground.

D. All conduit, water, gas, and sewer pipes adjacent to or crossing excavations shall be properly supported and protected by the Contractor.

END OF SECTION 260533.13

SECTION 260533.16 – BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish and install all electrical boxes as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260519 – Low-Voltage Electrical Power Conductors and Cables

C. Section 260526 – Grounding and Bonding for Electrical Systems

D. Section 260529 – Hangers and Supports for Electrical Equipment

E. Section 260533.13 – Conduit for Electrical Systems

F. Section 260553 – Identification for Electrical Systems

G. Section 262726 – Wiring Devices

1.4 SUBMITTALS

A. Manufacturer's product data sheets shall be submitted for the following items:

1. Outlet and non-dimensioned junction and pull boxes and device boxes
2. Dimensioned junction and pull boxes
3. Junction boxes for underground conduit
4. Ameren Missouri CT enclosure

PART 2 - PRODUCTS

2.1 GENERAL

A. All electrical boxes, including extension rings, covers and other accessories, shall be UL Listed and Labeled.

B. All outlet, device and nondimensioned junction and pull boxes shall be sized in accordance with the allowable wiring fill permitted by the National Electrical Code (NEC).

C. Junction boxes and pull boxes shall be sized as per the NEC or as shown on the Drawings.

D. Outlet boxes shall be of the size and type to accommodate the structural conditions, the size and number of raceways, conductors or cables entering, and the wiring device with which the box is

intended to be used. Install blank plates on all outlet boxes where apparatus is installed which does not, in itself, provide a cover for the box. Raised device covers (plaster rings) for flush boxes shall be provided as required.

E. Unless otherwise indicated, all junction or pull box covers shall be fastened with cadmium plated or galvanized steel screws or bolts for indoor applications and stainless-steel screws or bolts for outdoor applications. The removable cover shall be fabricated from the same material as the box, and the cover shall be on the largest accessible side of the box unless otherwise indicated. The cover of the box shall be designed for quick removal.

F. Boxes for concealed indoor work shall be galvanized drawn steel. Boxes shall be provided with a blank galvanized steel cover or extension ring, as required.

G. Boxes shall be as manufactured by Appleton Electric Company, Eaton Crouse-Hinds, Steel City, Raco, Killark Electric Manufacturing Company, O-Z/Gedney Company, Hoffman Engineering Company, Wiegmann or approved equal.

2.2 BOXES FOR NONHAZARDOUS AREAS

A. Nondimensioned junction and pull boxes and device boxes located indoors shall be hot-dipped galvanized drawn steel, 4-inch square, 4-11/16-inch square or octagon, 1-1/2 inch minimum depth, NEMA Type 1 with plaster ring, if/as required. Sectional boxes and boxes with spot welded seams are not acceptable.

B. Nondimensioned junction boxes located outdoors shall be cast, cadmium or zinc plated malleable iron or "copper-free" aluminum, having threaded hubs and neoprene gasketed covers fastened with four (4) stainless steel screws, NEMA Type 4, Crouse-Hinds Type GRFX, or GS, or approved equal, or Crouse-Hinds, Appleton Electric or Killark 2-1/8 inch deep Type FD, or approved equal.

C. Dimensioned junction and pull boxes located indoors shall be painted steel, galvanized steel, or code gauge sheet aluminum, NEMA Type 1 having removable neoprene gasketed covers fastened with cadmium plated or galvanized steel screws, and continuously welded seams (ground smooth) with no holes or knockouts.

D. Dimensioned junction and pull boxes located outdoors, above grade shall be Type 304 stainless steel, NEMA Type 4X having hinged, neoprene gasketed covers fastened with Type 304 stainless steel screws, and continuously welded seams (ground smooth) with no holes or knockouts.

E. Pull and junction boxes shall be sized in accordance with NEC Article 314-16 or 314-28 as a minimum. Larger boxes may be provided.

F. Provide hinged cover enclosures for any box larger than 12 inches in any dimension.

2.3 JUNCTION BOXES FOR UNDERGROUND CONDUIT AND LOW VOLTAGE CONDUCTORS

A. Grass and Sidewalks: High strength, heavy duty, stackable composite box and cover with 15,000# minimum design rating. Removable cover shall be skid resistant with hex-head stainless steel cover screws. Junction box shall be suitable for sidewalks or grass areas. Junction boxes shall be PC or PG style, stackable, without bottom, as manufactured by Quazite, or approved equal.

B. Boxes containing low voltage ($\leq$ 600 volts) conductors shall have the word "ELECTRIC" cast into the top surface of the cover.

C. Size boxes in accordance with NEC Article 314-28. Minimum dimensions shall be as indicated on the Drawings.

2.4 AMEREN MISSOURI CURRENT TRANSFORMER ENCLOSURE

A. Provide outdoor rated, UL or ETL certified and labeled, hinged door, sealable and lockable current transformer (CT) enclosure from the approved list at: www.ameren.com/service-manual.

B. Minimum dimensions shall be 36”Wx14”Dx48”H in accordance with the requirements of the latest edition of the Ameren Electric Service Manual available at: www.ameren.com/service-manual.

C. Contact Ameren Missouri for questions concerning metering equipment requirements. Ameren Missouri Construction Hotline: 866-992-6619.

PART 3 - EXECUTION

3.1 INSTALLATION

A. BOXES, GENERAL

1. Locate and install boxes to allow access. Coordinate with other trades to ensure boxes are not made inaccessible by equipment, duct work or piping installation.
2. Locate and install to maintain headroom and to present a neat appearance.
3. Special care shall be taken to set all boxes square and true with the building finish. As far as possible, all boxes shall be secured to the building structure or steel, using adjustable supports where necessary.
4. Outlet boxes in unfinished areas shall be surface (exposed) mounted to columns or walls, unless otherwise indicated.
5. Exposed nondimensioned junction and pull boxes mounted on concrete walls shall be attached either with expansion bolts or to permanent U-channel inserts. Install "Kwik-Con" fasteners in accordance with Section 260529 – Hangers and Supports for Electrical Equipment.
6. All boxes shall be rigidly mounted.
7. Securely fasten boxes to building structure, independent of the conduit, except for splice boxes that are connected to two metal conduits, both supported within 12 inches of the box.
8. All conduits entering sheet metal junction or pull boxes shall be through holes properly cut with a punch and die. Cast boxes shall be provided with threaded conduit bosses or hubs of proper size and externally located cast feet for mounting.
9. All open conduit knockouts, holes or hubs not used shall be properly plugged with suitable blanking devices of the same material as the box that maintain the NEMA rating of the box. Utilize stainless steel blanking devices for stainless steel boxes. Utilize NEMA 12 rated hole seal devices to seal all open holes in the top of all panelboards and dimensioned junction and pull boxes located indoors.
10. Junction and pull boxes shall be furnished and installed where indicated on the Drawings, required by code, and wherever else such a box may be deemed necessary to facilitate the pulling or splicing of wires or cables. In general, junction or pull boxes shall be installed to limit conduit runs to 125 feet and conduit bends to a maximum total of 360 degrees. The Contractor shall furnish and install properly sized pull boxes wherever necessary in order that a run of conduit between outlet and outlet, between fitting and fitting, or between outlet and fitting shall not contain more than the equivalent of four quarter (90 degree) bends (360 degrees total). Additional pull boxes may be needed to facilitate wire pulling. All

boxes shall be installed in locations that will be accessible after completion of the construction.

11. Dimensioned pull and junction boxes shall be sized in accordance with NEC Article 314-28 unless a larger size box is indicated on the Drawings.
12. If strain relief members need to be installed inside junction and pull boxes or electrical equipment enclosures, for example to prevent large conductors entering the back of a box from pressing against the inside of the removable cover, utilize fiberglass U-channel support members. Do not install any wood, or other combustible type materials, inside any electrical enclosure.
13. Location of junction and pull boxes shall be approved before installation. Where necessary, conduits may be rerouted with the approval of the Construction Representative.
14. Rigid metal conduits terminating in all NEMA Type 3, 3R, 4, 4X, 12 or 13 boxes and enclosures, without integral cast threaded hubs shall be terminated in insulated throat, grounding type, liquid tight, rigid conduit hubs. Conduit hubs shall be provided in accordance with Section 260533.13 – Conduit for Electrical Systems.
15. Provide a grounding type conduit bushing with solderless lug and copper bonding jumper sized in accordance with NEC Article 250 for all conduits terminating in NEMA Type 1 boxes and enclosures in accordance with Section 260526 – Grounding and Bonding for Electrical Systems.

3.2 AMEREN MISSOURI CURRENT TRANSFORMER ENCLOSURE

A. Install Ameren Missouri approved CT enclosure as indicated on the Drawings and in accordance with the requirements in the latest edition of the Ameren Electric Service Manual available at: www.ameren.com/service-manual.

B. Coordinate electric service connections with Ameren Missouri. Ameren Missouri Construction Hotline: 866-992-6619.

3.3 CIRCUIT IDENTIFICATION

A. Junction, pull, outlet, and device boxes shall be identified in accordance with the requirements of Section 260553 – Identification for Electrical Systems.

B. Cover plates for all junction and pull boxes shall be marked on the inside surface of the cover plate in finished areas or on the outside surface of the cover in unfinished areas in accordance with Section 260553 – Identification for Electrical Systems.

C. All conductors in a junction or pull box shall be identified in accordance with Section 260553 – Identification for Electrical Systems.

END OF SECTION 260533.16

SECTION 260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish and install electrical identification for electrical equipment, conductors, cables, and boxes as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260519 – Low-Voltage Electrical Power Conductors & Cables

C. Section 260533.13 – Conduit for Electrical Systems

D. Section 260533.16 – Boxes for Electrical Systems

E. Section 260573 – Protective Device Coordination Study and Arc Flash Risk Assessment

F. Section 262416 – Panelboards

G. Section 262726 – Wiring Devices

H. Section 262816.13 – Enclosed Circuit Breakers

1.4 SUBMITTALS

A. Submit electrical identification data as follows:

1. Nameplate type product data
2. Nameplate engraving schedule
3. Wire and cable identification label product data
4. Arc flash risk assessment warning label product data

PART 2 - PRODUCTS

2.1 NAMEPLATES

A. Nameplates shall be three-layer laminated plastic with engraved black characters on a white background.

B. Nameplates that will be located outdoors must be constructed from material that is waterproof and UV resistant.

C. Nameplate engraving shall be as follows:

1. Lettering font shall be Gothic.

2. Nameplate character sizes shall be:

    a. 1/2-inch high – Panelboards, enclosed circuit breakers, dimensioned junction boxes and dimensioned pull boxes.
    b. 3/8-inch high – Individual branch circuit breakers in panelboards 400A and larger.

3. Lettering shall be centered on nameplate.
4. Nameplates shall have a maximum of twenty-four (24) characters per line with a maximum of four (4) lines.
5. Wording on each nameplate shall contain the following information as appropriate.

    a. Equipment designation as indicated on the Drawings, such as: PANEL DH
    b. Voltage and phases such as: 120/240V-1PH-3W
    c. Designation of source equipment, such as: FED FROM MP-CRS
    d. Location of source equipment, such as: SW OF BARRACKS B2.

6. Engraving designations shall be approved by the Designer.

D. Special nameplates shall be as indicated on the Drawings.

2.2 WIRE LABELS AND CABLE MARKERS

A. Wire labels for No. 4/0 AWG and smaller wires shall be vinyl film, self-laminating, adhesive wraparound type; W. H. Brady Co. B-292, Thomas & Betts WSL Series or approved equal.

B. Cable markers for cables and wire labels for all conductors 250 KCM and larger shall be polyester film, non-adhesive, plate type designed for cable tie banding parallel to the cable/conductor.

C. Wire and cable identification numbers shall be printer generated or typewritten on the labels and markers.

D. Character size for cable identification numbers shall be a minimum of 1/8-inch high.

E. Markers labels, number generation method, and attachment methods shall be subject to the approval of the Designer.

2.3 ARC FLASH RISK ASSESSMENT WARNING LABELS

A. Warning labels for electrical equipment shall be color printed, waterproof, Designer approved, and Contractor furnished and installed.

B. For incident energy values less than or equal to 40 cal/cm2, label shall indicate “WARNING” using black lettering on an orange background. The remainder of the label shall have black characters on a white background.

C. For incident energy values greater than 40 cal/cm2, label shall indicate “DANGER” using white lettering on a red background. The remainder of the label shall have black characters on a white background.

D. Labels installed outdoors shall be resistant to ultraviolet light and weather resistant.

E. At a minimum, each label shall include the following:

1. Equipment location
2. Source protective device name providing the protection (fed from)
   NOTE: The protective device name shall use the designations of equipment on the Project Drawings rather than names assigned within the study model.
3. Nominal system voltage
4. Arc flash boundary
5. Specific arc incident energy available
6. Maximum available fault current (This is the value calculated using the ANSI fault current evaluation method and listed in the ANSI short circuit evaluation table that is used for establishing the minimum SCCR of the equipment.)
7. Label date

NOTE: Print appropriate information on label based on the arc flash risk assessment report provided in accordance with Specification Section 260573 – Overcurrent Protective Device Coordination Study and Arc Flash Risk Assessment.

F. Size of warning labels shall be:

1. Equipment main bus rating less than 400A: 3.5” x 5”
2. Equipment main bus rating 400A or more: 5” x 7”

2.4 COLOR CODE TAPE

A. Each conductor, except control and signal conductors, shall be color coded with 3M No. 35 tape, 3/4” width, or colored insulation.

1. Color coding for 600-volt conductors shall be:

<u>120/240V 1 Phase</u>
Phase A Black
Phase B Red
Neutral White
Equipment Ground Green

2.5 PANELBOARD CIRCUIT DIRECTORIES

A. Each panelboard shall have a framed circuit directory card with a clear plastic covering mounted on the inside of the door.

B. The directory card shall provide a space at least 1/4-inch high by 3 inches long, or the equivalent, for each circuit.

C. For panelboards located outdoors, the directory card shall be laminated in clear plastic.

D. The directory card shall be typed to identify the load fed by each circuit for compliance with NEC 408.4.

PART 3 - EXECUTION

3.1 GENERAL

A. Degrease and clean surfaces to receive nameplates, markers, labels, and color code tape.

3.2 NAMEPLATES

A. Nameplates shall be provided for each panelboard, individual circuit breaker in panelboards 400A and larger, enclosed circuit breaker, dimensioned pull box, and dimensioned junction box.

B. Nameplates shall be secured with an approved adhesive such as Goodyear "Pliobond" glue or stainless-steel machine screws in tapped holes. Self-tapping screws or sheet metal screws shall not be used.

3.3 WIRE LABELS AND CABLE MARKERS

A. Branch circuits, control and signal wires and cables shall be identified.

1. Attach a wire identification label to each conductor of a circuit cable group at each termination point.
2. Attach a cable identification marker to each circuit cable group at all termination entry points.

B. Wire labels and cable markers shall identify each conductor and cable with the circuit number. Identify with branch circuit or feeder number for power circuits and with control wire or cable number as indicated on schematic and interconnection diagrams and equipment shop drawings for control wiring.

C. Cable markers for cables and wire labels for all conductors 250 KCM and larger shall be secured with heavy duty plastic cable ties. Cut excess tie material off flush with tie clasp. Do not leave sharp edges.

3.4 ARC FLASH RISK ASSESSMENT WARNING LABELS

A. Provide arc flash hazard warning labels in accordance with NEC Article 110-16 for all new panelboards, enclosed circuit breakers and the Ameren Missouri CT enclosure.

B. Labels shall be applied to the outside of the front cover at the center of the cover such that the label is clearly visible with the door closed. Equipment, such as NEMA 3R panelboards, that have an inner dead front panel with an outer door shall have the label applied in a clearly visible location on the inner dead front panel rather than on the outside front of the outer door.

C. Clean the surface to which each label is to be applied with denatured alcohol or a similar, fast evaporating cleaning agent that will not damage the paint finish.

3.5 COLOR CODE TAPE

A. Code all wire and cable not available color coded from manufacturer by application of electrical plastic tape in colors specified. Apply tape in uniform manner circling wire or cable. Half-lap tape for length of cable as required by Local Authorities or NEC but not less than five (5) full wraps.

3.6 JUNCTION, PULL, OUTLET AND DEVICE BOX IDENTIFICATION

A. Cover plates for all non-dimensioned junction and pull boxes shall be marked on the outside surface of the cover plate with the voltage, panel and circuit number of the branch circuit(s) contained inside the box. Marking shall be with printer generated "peel and stick" labels.

B. Nameplates shall be provided on the external surface of the cover of all dimensioned junction and pull boxes which shall identify the source voltage of the circuits inside the box as well as the location of the AC power source(s) for these circuits.

3.7 PANELBOARD CIRCUIT DIRECTORIES

A. Provide new "updated" directory cards for existing panelboards in which circuits have been rearranged, added, or deleted.

B. The directory card shall be typewritten or printer generated to identify the load served by each circuit and then laminated in clear plastic for moisture protection.

C. Trace out unidentified circuits in existing panels and indicate load served on new circuit directory for compliance with NEC 408.4.

END OF SECTION 260553

SECTION 260573 – PROTECTIVE DEVICE COORDINATION STUDY AND ARC FLASH RISK ASSESSMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

A. This Section includes computer-based fault-current, overcurrent protective device coordination and arc flash risk assessment studies, and the setting of these devices and application of proper arc flash hazard warning labeling to new equipment furnished on this project.

1. Coordination Study Report shall include: Short circuit analysis, time current characteristics for all protective devices, graphical demonstration of selectivity, overcurrent protection device instruction books, and pertinent manufacturer data, and Missouri registered Professional Engineer seal and signature.
2. Arc flash risk assessment report, with Missouri registered Professional Engineer seal and signature.
3. Series ratings of protective devices are not acceptable unless specifically authorized by the Designer for existing equipment. These situations will be addressed on a case-by-case basis.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260553 – Identification for Electrical Systems

C. Section 262416 – Panelboards

D. Section 262816.13 – Enclosed Circuit Breakers

1.4 SUBMITTALS

A. Study documentation

1. Product Certificates: For coordination study and fault-current study computer software programs, certifying compliance with IEEE 399
2. Qualification Data: For fault-current study and arc flash risk assessment specialist who shall be a professional engineer registered in the State of the Missouri
3. Demonstrate experience with Arc Flash Risk Assessment by submitting names of at least three actual Arc Flash Risk Assessments performed in the past year.
4. Demonstrate capabilities in providing equipment, services, and training to reduce Arc Flash exposure.
5. Demonstrate experience in providing equipment labels in compliance with NFPA 70 (2020 edition), Article 110 and ANSI Z535.4 to identify AFIE and appropriate Personal Protective Equipment classes.
6. Single-line diagram

a. Include “as installed” cable/conductor lengths, size and number of conductors for each circuit segment.

7. Fault-current study report
8. Coordination study report including completed computer program input data sheets
9. Equipment evaluation report
10. Overcurrent protective device settings report
11. Arc flash risk assessment report

B. Submit an electronic copy of the fault-current, overcurrent protective device coordination, and arc flash risk assessment studies for review and comment prior to or along with all submittals related to new overcurrent protective devices to be furnished on this project; panelboards, circuit breakers, etc.

C. Final report

1. Provide two (2) bound copies of the approved fault-current, overcurrent protective device coordination, and arc flash risk assessment studies bound in 8-1/2 inch by 11-inch volumes with drawings and diagrams folded to fit the 8-1/2 inch by 11-inch format, sealed and signed by licensed Missouri Professional Engineer. Report cover shall be extra heavy weight paper (80 lb or heavier). Report data shall be printed on 8-1/2 inch by 11-inch paper. Diagrams, drawings, and coordination curves shall be printed on 11 inch by 17-inch paper unless larger size drawings, 30” x 42” maximum size, are required for legibility. Securely retain larger size drawings by folding and placing in pockets bound into report.
2. Provide one complete copy of all report documentation on CD or DVD to include all data files, drawings and diagrams. File types for the report documentation should be .doc, .pdf, .dwg, or .xls. In addition, provide complete study files, in the native Study Software format, on CD or DVD to include all models, data, single lines, etc.

D. General report requirements:

1. Include complete distribution system from Ameren Missouri pole mounted transformer to panelboards and load centers in each building and at the outdoor amphitheater.
2. Provide identification and description of industry testing standards on which study is based, for each section of study.
3. Provide calculations, impedance diagrams, conclusions, and recommendations as part of study general content.
4. Provide short circuit tabulations which include system impedances, X/R ratio, asymmetry factor, kVA, and symmetrical and asymmetrical fault currents.
5. Provide each study with the following:

a. Coordination plots which graphically indicate coordination proposed for several systems. Provide plots centered on full scale log-log-forms.
b. Coordination plots with complete titles, representative one-line diagrams and legends, associated power company’s system characteristics, significant motor starting characteristics, complete parameters for power fuses, if applicable, and associated system load protective devices.
c. Coordination plots which define types of protective devices selected, with proposed coil taps, time dial settings, and pick-up settings required.
d. Long time region of coordination plots shall indicate complete tap scale for each relay and full load current transformer parameters and designate pick-ups required for low voltage circuit breakers.

e. Short time region shall indicate low voltage circuit breaker, short time and instantaneous trip devices, fuse manufacturing tolerance bands, when applicable, and significant symmetrical and asymmetrical fault currents.

6. Coordinate each item of equipment as follows:

a. Separate low voltage power circuit breakers from each other by 16 percent current margin for coordination and protection in event of secondary line-to-line faults.
b. Terminate protective device characteristics or operating band to reflect actual symmetrical and asymmetrical fault currents sensed by device.
c. Prepare study with network analyzer, computer, or by written calculations. Include complete fault calculations as specified for each proposed and ultimate source combination.

E. Drawings and specifications indicate general requirements for new panelboards and circuit breakers. Determine additional specific characteristics of equipment furnished in accordance with results of short circuit and protective device coordination study.

1. Short circuit protective device coordination and arc flash study shall be coordinated with Contractor provided equipment shop drawings and existing conditions.
2. Submit equipment design discrepancies and proposed corrective modifications, if required, with short circuit and protective device coordination study. Identify variations clearly on shop drawings.
3. Provide equipment, overcurrent devices, field settings, adjustments and minor modifications for conformance with approved short circuit and protective device coordination study.
4. Identify existing equipment that is overstressed with recommended solution, including series rating of the equipment if that is possible.

1.5 APPLICABLE STANDARDS

A. The latest edition of the following industry standards shall apply to the work specified herein.

1. ANSI/IEEE C37.46 – Power Fuses and Fuse Disconnecting

2. ANSI/IEEE C37.50 – Low-Voltage AC Power Circuit Breakers Used in Enclosures – Test Procedures

3. ANSI Z535.4 – Product Safety Signs and Labels, Includes Errata

4. ICEA P-32-382 – Short Circuit Characteristics of Insulated Cable

5. ICEA P-45-482 – Short Circuit Performance of Metallic Shields and Sheaths on Insulated Cables

6. IEEE 242 – IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)

7. IEEE 399 – IEEE Recommended Practice for Power Systems Analysis (IEEE Brown Book)

8. IEEE 1015 – IEEE Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems (IEEE Emerald Book).

9. IEEE 1584 – IEEE Guide for Performing Arc Flash Calculations, Includes Amendments and Errata

10. NFPA 70 – National Electrical Code

11. NFPA 70B – Recommended Practice for Electrical Equipment Maintenance

12. NFPA 70E – Standard for Electrical Safety in the Workplace

13. International Electrical Testing Association, Inc. (NETA) – Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems

1.6 QUALITY ASSURANCE

A. Studies shall use licensed computer programs that are distributed nationally and are in wide use. Software algorithms shall comply with requirements of standards and guides specified in this Section. Manual calculations are not acceptable.

B. Coordination-Study Specialist Qualifications: An organization experienced in the application of computer software used for electrical short circuit analysis and coordination studies having performed successful studies of similar magnitude on electrical distribution systems using similar devices. The coordination study shall be performed by a State of Missouri registered professional electrical engineer, in accordance with ANSI/IEEE Standard 242, "Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems."

C. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association to supervise testing specified herein.

D. Comply with IEEE 399 for general study procedures.

E. Comply with IEEE 242 for short-circuit currents and coordination time intervals.

1.7 ACCEPTABLE STUDY PROVIDERS

A. Protective Device Coordination Study and Arc Flash Risk Assessment Report Provider: Subject to compliance with requirements, study shall be commissioned by Division 26 and provided by State of Missouri registered professional engineer from manufacturer of the new panelboards per Section 262416 – Panelboards, or other qualified State of Missouri registered professional engineer, such as Corey Jasper, P.E., BHMG Engineers, Inc. (314-686-1216), subject to approval of the Owner and Designer.

1.8 COMPUTER SOFTWARE PROGRAM

A. Computer Software Program: Subject to compliance with requirements, the protective device coordination study and arc flash risk assessment shall be provided using SKM Power Tools Electrical Engineering Software (PTW 32) by SKM Systems Analysis, Inc., or approved equal by ESA, Inc. or CYME International, Inc.

1.9 COMPUTER SOFTWARE PROGRAM REQUIREMENTS

A. Computer software program must comply with IEEE 399.

B. Analytical features of fault-current-study computer software program shall include "mandatory", "very desirable", and "desirable" features as listed in IEEE 399, Table 7-4.

C. Computer software program shall provide plotting and diagramming time-current-characteristic curves as part of its output. Computer software program shall report device settings and ratings of all overcurrent protective devices.

1. Additional Program Features:

a. Arcing faults
b. Simultaneous faults
c. Explicit negative sequence
d. Mutual coupling in zero sequence
e. Arc flash risk assessment

1.10 EXAMINATION

A. Examine protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance. Devices to be coordinated shall be as indicated on the one-line diagrams on the Drawings.

B. Proceed with coordination study only after relevant equipment submittals have been assembled. Protective devices not submitted for approval with coordination study may not be used in study. Protective devices submitted prior to this coordination study will be reviewed, but final approval will be contingent upon the study results.

C. Field verify all information shown on the electrical one-line diagrams, including but not limited to:

1. Ratings of existing equipment
2. Transformer ratings and impedances
3. Overcurrent protective device sizes/ratings
4. Conductor types and sizes
5. Conduit types (magnetic or non-magnetic)
6. Feeder lengths

D. Update project one-line diagrams with information obtained from field verifications.

1.11 FAULT-CURRENT STUDY

A. Fault study shall include the available utility fault current at each pole mounted transformer obtained from:

Ameren Missouri Construction Services
866-992-6619
servicerequest@ameren.com

B. Calculate momentary and interrupting duties based on the maximum available fault current.

C. Calculations to verify interrupting ratings of overcurrent protective devices shall comply with the following:

1. Low-Voltage Circuit Breakers: IEEE 1015 and IEEE C37.50
2. Low-Voltage Fuses: IEEE C37.46
3. Circuit Breakers: IEEE C37.13

D. Fault study must be completed and submitted prior to proceeding with procurement/manufacturing of any of the following new equipment:

1. Circuit breaker panelboards under Section 262416 – Panelboards
2. Enclosed circuit breakers under Section 262816.13 – Enclosed Circuit Breakers

E. Study Report: Enter calculated X/R ratios and interrupting (5-cycle) fault currents on electrical distribution system diagram of the report. List other output values from computer analysis, including momentary (1/2-cycle), interrupting (5-cycle), and 30-cycle fault-current values for 3-phase, 2-phase, and phase-to-ground faults.

F. Equipment Evaluation Report: Prepare a report on the adequacy of protective devices and conductors by comparing fault-current ratings of these devices with calculated fault-current momentary and interrupting duties. Identify existing equipment that is overstressed with recommended solution, including series rating of the equipment if that is possible. If series ratings for protection of existing electrical equipment are approved by the Designer, provide caution labels for all series rated equipment for compliance with NEC 240.86 and 110.22(B) or (C).

1. Equipment evaluation report shall include all enclosed circuit breakers, panelboards and load centers shown on the Project Drawings.

1.12 COORDINATION STUDY

A. The final approved settings shall incorporate the results of the Arc Flash Risk Assessment to minimize the hazard associated with the related systems.

B. Gather and tabulate the following input data to support coordination study:

1. Product Data for overcurrent protective devices specified in other Division 26 Sections and involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
2. Electrical distribution system diagram showing the following:

    a. Load current that is the basis for sizing continuous ratings of circuits for cables and equipment
    b. Circuit-breaker and fuse-current ratings and types
    c. Transformer kilovolt amperes, primary and secondary voltages, connection types, impedance, and X/R ratios
    d. Cables: Indicate conduit material, sizes of conductors, conductor insulation, and length
    e. Motor horsepower and code letter designation according to NEMA MG 1

3. Data sheets to supplement electrical distribution system diagram, cross-referenced with tag numbers on diagram

    a. Special load considerations
    b. Magnetic inrush current overload capabilities of transformers
    c. Motor inrush current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve
    d. Time-current characteristic curves of devices indicated to be coordinated

e. Manufacturer, frame size, interrupting rating in amperes RMS symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers
f. Panelboards and enclosed circuit breakers interrupting rating in amperes rms symmetrical

C. Perform coordination study and prepare a written report using the results of fault-current study and approved computer software program. Comply with IEEE 399.

D. Comply with NFPA 70 for overcurrent protection of circuit elements and devices.

E. Comply with IEEE 242 time intervals.

F. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Verify adequacy of phase conductors at maximum phase-to-phase bolted fault currents, equipment grounding conductors, and grounding electrode conductors at maximum ground-fault currents.

G. Coordination-Study Report: Prepare a written report indicating the following results of coordination study:

1. Tabular Format of Settings Selected for Overcurrent Protective Devices:

a. Device tag
b. Circuit-breaker sensor rating; and long-time, short-time, and instantaneous settings
c. Fuse-current rating and type

2. Coordination Curves: Prepared to determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between series devices, including existing upstream devices. Show the following specific information:

a. Device tag
b. Voltage and current ratio for curves
c. No damage, melting, and clearing curves for fuses
d. Cable damage curves
e. Maximum fault-current cutoff point

3. Study shall include a narrative identifying any potential coordination short falls and recommendations for change.
4. Completed data sheets for setting of overcurrent protective devices

1.13 OVERCURRENT PROTECTIVE DEVICE SETTINGS

A. Manufacturer's Field Service: Engage a factory-authorized service representative, of electrical distribution equipment being set and adjusted, to set overcurrent protective devices within equipment, if overcurrent protective devices are adjustable.

B. Testing: Perform the following device setting and prepare reports:

1. After installing overcurrent protective devices and during energizing process of electrical distribution system, perform the following:

a. Verify that overcurrent protective devices meet parameters used in studies.
b. Adjust devices to values listed in study results, if overcurrent protective devices are adjustable.
c. “Seal” each adjustable circuit breaker setting access cover with an approved sealing device, Square D “TUSEAL” or approved equal, to prevent unauthorized changes to settings.

2. Adjust devices according to recommendations in Chapter 7, "Inspection and Test Procedures", and Tables 10.7 and 10.8 in NETA “Acceptance Testing Specifications for Electric Power Distribution Equipment and Systems”.

1.14 ARC FLASH RISK ASSESSMENT

A. Gather and tabulate the information provided by the Short Circuit Analysis and the Coordination Study, for the preparation of the Arc Flash Risk Assessment.

B. The intent of the Arc Flash Risk Assessment is to achieve the lowest possible hazard ratings for the associated equipment while still maintaining the code required level of electrical coordination for the system. The results of the risk assessment shall be incorporated into the recommended protective device settings to minimize the arc flash hazard.

C. Scope of Work:

1. Provide arc flash risk assessment warning labels in accordance with NEC Article 110-16 for the following equipment:

a. All panelboards, enclosed circuit breakers and load centers shown on the Project Drawings.

D. Arc Flash Risk Assessment:

1. The Arc Flash Risk Assessment shall be performed with the aid of computer software intended for this purpose in order to calculate Arc Flash Incident Energy (AFIE) levels and flash protection boundary distances.
2. The Arc Flash Risk Assessment shall be performed in conjunction with a short-circuit analysis and time-current coordination analysis.
3. Results of the Risk Assessment shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, personal-protective equipment classes and AFIE levels.
4. The Risk Assessment shall be performed under worst-case arc flash conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.
5. The Arc Flash Risk Assessment shall be performed by a professional engineer who is currently registered in the State of Missouri.
6. The Arc Flash Risk Assessment shall be performed in compliance with the latest edition of IEEE Standard 1584, the IEEE Guide for Performing Arc Flash Calculations including any and all addendums and errata.
7. The Arc Flash Risk Assessment shall include recommendations for reducing AFIE levels and enhancing worker safety.
8. Prior to final approval, incorporate actual installed cable/conductor lengths into the Arc Flash Risk Assessment.

E. Comply with NFPA 70, NFPA 70E, and NFPA 70B standards for the Arc Flash Risk Assessment Report.

F. Field Labeling and Signage:

1. Provide complete arc flash hazard warning signage per NFPA 70 Article 110-16 and ANSI Z535.4 at each panelboard, enclosed circuit breaker, load center and other equipment if/as required by National Electrical Code (NEC) and/or NFPA 70E requirements.
2. Arc flash hazard warning labels shall be provided in accordance with Section 260553 – Identification for Electrical Systems.
3. The source protective device name providing the protection (fed from) on each arc flash hazard warning label shall use the designations of equipment shown on the Project Drawings rather than names assigned within the power system study software model.

1.15 COORDINATION OF WORK

A. Adjustment of protective device equipment to meet the approved protective device coordination submittal shall be the responsibility of Division 26 at no additional cost to the Owner.

1.16 ARC FLASH TRAINING

A. The arc flash study provider shall train the Owner's personnel on the potential arc flash hazards associated with working on energized electrical equipment. The audience shall include employees who work on or near energized electrical equipment, who must be made aware of the associated electrical hazards. The training shall be conducted at the Owner's facility and shall be a minimum of 1 hour and a maximum of 2 hours in duration.

B. The intent of this training is not to "certify" or "qualify" the Owner's maintenance personnel to work on energized electrical equipment or provide an adequate level of training for them to meet the NFPA 70E definition of a "qualified person" but rather to give them a broad understanding of the purpose of arc flash hazard warning labeling and an awareness of the dangers of working on or near energized electrical equipment.

C. A key purpose of the training is to help the attendees become aware of potential shock and arc flash hazards associated with energized electrical equipment and ways to mitigate the risk of injury associated with these hazards.

D. It is not the intent of this training to provided electrical equipment preventative maintenance training.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 260573

SECTION 260583 – WIRING CONNECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish and install all wiring connectors and terminations for 600-volt conductors as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260519 – Low-Voltage Electrical Conductors and Cables

C. Section 260526 – Grounding and Bonding for Electrical Systems

D. Section 260533.16 – Boxes for Electrical Systems

E. Section 262416 – Panelboards

F. Section 262726 – Wiring Devices

G. Section 262816.13 – Enclosed Circuit Breakers

1.4 SUBMITTALS

A. Manufacturer's product data sheets shall be submitted for each of the following items:

1. 600-volt connectors
2. 600-volt terminations
3. 600-volt pin adapters
4. 600-volt splice insulating materials

PART 2 - PRODUCTS

2.1 600-VOLT CONNECTIONS AND TERMINATIONS

A. *Pressure Type Terminal and Splice Connectors:* Solderless, color coded, nylon insulated, pressure type, UL Listed 105°C, 600-volt, sized for the cable to be terminated or spliced, tin-plated copper, with crimping tool coded to the connectors with stops to prevent over-crimping and means to prevent under-crimping; 3M Scotchlok or approved equal.

B. *Spring Type, Twist-On Splice Connectors:* Solderless, color coded, flame retardant polypropylene and thermoplastic elastomer or flame retardant nylon, spin-on wings, spring steel inner spring with corrosion resistant coating, UL Listed 105°C, 600-volt, sized for splicing two or more conductors up to size #6 AWG; 3M Performance Plus or approved equal.

C. *Control Wiring Connections and Termination*: Control wiring connectors shall be vinyl or nylon pre-insulated spade lugs to match stud or screw size with insulation grip sleeve flared to prevent turned-back strands and crimping tool to crimp wire barrel and insulation sleeve.

1. Where attachment is to a terminal block screw or stud, install using pre-insulated spade type connectors.

D. Conductor to conductor splices shall be made using wire nuts or wing nuts only wrapped with a minimum of three (3) half-lapped layers of jacketing tape specified. No crimp type connectors shall be used for these types of splices.

E. *Power Connections, Terminations and Splice Connectors:*

1. Size 12 AWG through 2/0 AWG connectors shall be non-insulated, one-hole rectangular tongue, for copper conductors, UL Listed 90°C, 600-volt.

2. Size 3/0 AWG and larger conductors shall be non-insulated, two-hole rectangular tongue with long barrel length to permit two (2) crimps for copper conductors, UL Listed 90°C, 600-volt.

3. Utilize compression pin adaptors for terminating conductors at equipment lugs when lug is too small for conductor to be terminated.

    a. Short barrel compression connector with solid reducing pin suitable for use with stranded copper building wire
    b. EDPM rubber insulating cover
    c. Burndy AYP Series or approved equal by Ilsco or Morris

4. Feeder tap splices shall only be made where specifically indicated on the Drawings or where pre-approved by the Engineer.

    a. Spring type, twist-on splice connectors as specified herein. For size 6 AWG and smaller conductors only.
    b. Insulated, direct burial rated, multiple tap mechanical type connectors for size range 12 AWG to 500 KCM. Burndy UNITAP Catalog No. BIBSxxxxDB or approved equal by Blackburn, Ilsco or Polaris.
    c. Multiple tap compression type connectors for size range 14 AWG to 750 KCM. Burndy “H” Shape Copper Tap Catalog No. YHxxxx with flame retardant cover or approved equal by Blackburn or Ilsco

5. In-line feeder splices shall only be made where specifically indicated on the Drawings or where pre-approved by the Designer.

    a. Size 12 AWG through 2/0 AWG connectors, for splicing like sized conductors, shall be non-insulated, standard length barrel, for copper conductors, UL Listed 90°C, 600-volt, compression type.
    b. Size 3/0 AWG and larger connectors, for splicing like sized conductors, shall be non-insulated, long barrel length to permit two (2) crimps on each conductor, for copper conductors, UL Listed 90°C, 600-volt.
    c. Size 12 AWG through 3/0 AWG connectors, for splicing different sized conductors, shall be Thomas & Betts C-Tap compression connections or approved equal. Overwrap connectors with a minimum of three (3) half-lapped layers of Thomas & Betts Shrink-Kon TBFT201-36 self-fusing insulation tape.

F. *Power Termination Insulation:*

1. Insulating Putty: 3M Scotchfil electrical insulating putty or approved equal by Thomas & Betts
2. Insulating Tape: 3M Scotch 23 or Thomas & Betts Shrink-Kon TBF201-36 self-fusing insulating tape
3. Jacketing Tape: 3M Scotch 33+ jacketing tape
4. Provide pre-engineered insulating kits by 3M or Thomas & Betts where appropriate.

PART 3 - EXECUTION

3.1 GENERAL

A. Conductors shall be continuous from source to destination without splices or taps in conduit runs, except where indicated on the Drawings to compensate for voltage drop or where required to prevent excessive pulling tension or sidewall pressure on wire or cable. Submit all proposed splice locations to the Designer for approval prior to pulling wire and cable. Splices, where permitted, shall be mechanically strong and have an insulation value equal to the wire or cable being spliced. All splices and taps shall be contained within NEC sized junction boxes meeting the requirements of Section 260533.16 – Boxes for Electrical Systems.

B. Split-bolt connectors are not approved for any use other than connection of two (2) equipment grounding conductors or bonding jumpers in accordance with Specification Section 260526 – Grounding and Bonding for Electrical Systems.

C. All splices in underground junction boxes and handholes shall be waterproof in accordance with NEC 314-30(C).

3.2 CONTROL WIRING CONNECTIONS AND TERMINATIONS

A. Thoroughly clean wires before installing connectors.

B. Tape back spare conductors with the specified jacketing tape.

C. Where attachment is to a terminal block screw or stud, install using pre-insulated spade type connectors.

D. Where control cable terminations are split across terminal blocks or are otherwise separated by more than 12 inches distance, identify each conductor group with the circuit number as specified in Section 260553 – Identification for Electrical Systems.

E. Conductor to conductor splices shall be made using wire nuts or wing nuts. No crimp type connectors shall be used for these types of splices.

1. Apply a minimum of three (3) half-lapped layers of jacketing tape over each and every spring type, twist-on splice connection.

3.3 600-VOLT CONNECTIONS AND TERMINATIONS

A. Cut conductors to proper length such that the barrel or inner metal spring of the connector makes full contact with the bare conductor and not the insulation and the plastic skirt of the connector full covers the bare conductor.

1. Conductor to conductor splices for size 10 AWG or smaller conductors shall be made using spring type, twist-on splice connectors. No crimp type connectors shall be used for these types of splices.
2. Apply a minimum of three (3) half-lapped layers of jacketing tape over each and every spring type, twist-on splice connection.

B. Power Connections and Terminations:

1. Cover all exposed live parts such as connectors, bolts, nuts, and bus bar with insulating material to equal or exceed insulation of the connected cable.
2. At equipment with cable leads such as motors, install compression type terminal connectors on equipment leads and power circuit leads, bolt together, and insulate with pre-engineered motor terminal kits or as specified herein.
3. At equipment with integral set screw or clamp type connectors such as terminal blocks, molded case circuit breakers or mechanical lugs in panelboards and switchboards, strip conductor insulation as required to clear contact surfaces, and torque connector in accordance with manufacturer's recommendations.
4. At equipment with lugs sized too small for conductor termination utilize compression pin adapters of the appropriate size with EDPM insulating cover. Utilize the proper tool/die for installing the adapter on the end of the conductor.

3.4 600-VOLT POWER TERMINATION INSULATION

A. Insulate with pre-engineered kits where appropriate, or with a minimum of three (3) half-lapped layers of insulating tape covered with three (3) half-lapped layers of jacketing tape. Where major surface irregularities exist, fill voids with insulating putty prior to application of insulating tape.

B. Provide electrical insulating putty to fill major irregularities and voids in termination prior to taping.

C. Apply self-fusing insulating tape directly to the conductors or over the electrical insulation putty.

D. Apply jacketing tape over the insulating tape to provide an outer covering for the cable termination.

3.5 FIELD QUALITY CONTROL

A. General:

1. Testing shall be performed in the presence of Construction Representative. Contractor must provide 48 hours notice prior to conducting tests.
2. Prepare a test report upon completion of testing activities. Report format shall include the following information:

    c. Summary of test results
    d. Test equipment summary (model number, accuracy, calibration date)
    e. Test personnel names and signoffs
    f. Completed data sheets
    g. Test log and observations
    h. Certificate of Compliance

B. Torque test conductor connections and terminations to manufacturer’s recommended values.

C. Provide testing for 600-volt wire and cable in accordance with Section 260519 – Low-Voltage Electrical Power Conductors and Cables in conjunction with the testing specified herein.

END OF SECTION 260583

SECTION 262416 – PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish and install all circuit breaker panelboards as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260519 – Low-Voltage Electrical Power Conductors and Cables

C. Section 260526 – Grounding and Bonding for Electrical Systems

D. Section 260529 – Hangers and Supports for Electrical Equipment

E. Section 260533.13 – Conduit for Electrical Systems

F. Section 260553 – Identification for Electrical Systems

G. Section 260573 – Protective Device Coordination Study and Arc Flash Risk Assessment

H. Section 260583 – Wiring Connections

1.4 SUBMITTALS

A. Manufacturer's product data sheets and shop drawings shall be submitted for each circuit breaker panelboard, including the circuit breakers.

B. Panelboard shop drawings shall include, but not be limited to, the following:

1. Outline drawings including the overall panelboard enclosure dimensions, interior mounting dimensions and wiring gutter dimensions.
2. The location of the circuit breakers and neutral and equipment ground busses.
3. Type and ratings of all circuit breakers.

C. Alternate No. 3: The following submittals shall be provided for each panelboard surge protective device (SPD):

1. Provide verification that the SPD unit complies with the required UL 1449, Fourth Edition and UL 1283 surge voltage rating (SVR).
2. Provide actual let through voltage test data in the form of oscillograph results for both the ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (ringwave) tested in accordance with ANSI/IEEE C62.45.

3. Provide test report from a nationally recognized independent testing laboratory verifying the SPD components can survive published surge current rating on both a per mode and per phase basis using the IEEE C62.41, 8 x 20 microsecond current wave. Test data on individual module is not acceptable.
4. Provide spectrum analysis of each unit based on MIL-STD-220A test procedures between 50 kHz and 200 kHz verifying the device's noise attenuation exceeds 44 dB at 100 kHz.
5. Provide test report from a nationally recognized independent testing laboratory verifying the SPD overcurrent protection will allow the rated maximum surge current to pass through the device without fuse operation.
6. Provide life cycle testing certification.
7. Provide an equipment manual that includes but is not limited to spare parts lists and operating instructions for the specified SPD unit.
8. SPD warranty certificate

1.5 REFERENCED STANDARDS

A. IEEE C62.41.1, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits (Alternate No. 3)

B. IEEE C62.41.2, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits (Alternate No. 3)

C. IEEE C62.45, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits (Alternate No. 3)

D. National Electrical Code: Article 242 (Alternate No. 3)

E. National Electrical Code: Article 408

F. UL 50 – Enclosures for Electrical Equipment, Non-Environmental Considerations

G. UL 67 – Standard for Panelboards

H. UL 489 – Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

I. UL 1283 – Electromagnetic Interference Filters (Alternate No. 3)

J. UL 1449, 4th Edition – Surge Protective Devices (Alternate No. 3)

1.6 QUALIFICATIONS

A. The manufacturer of the panelboard assemblies shall be the manufacturer of the major components within each assembly.

1.7 LISTING REQUIREMENTS

A. Panelboards shall bear the UL Mark and shall be listed to the most recent edition of UL 67.

B. SPDs shall bear the UL Mark and shall be listed to the most recent editions of UL 1449 and UL 1283. “Manufactured in accordance with” is not equivalent to UL listing and does not meet the intent of this specification. (Alternate No. 3)

1.8 QUALITY ASSURANCE

A. All panelboards shall be tested at the factory for compliance with all applicable codes and standards and shall be ready for installation when received at the project site.

PART 2 - PRODUCTS

2.1 CIRCUIT BREAKER PANELBOARDS

A. Circuit breaker panelboards must be of panelboard type construction. Load centers are not acceptable.

B. Circuit breaker panelboards shall be dead front safety type equipped with circuit breakers. Each panelboard, including all bus bracing, shall have an integrated short circuit withstand rating equal to the short circuit interrupting capacity of the circuit breakers. All panelboards shall be fully rated. Series rated panelboards are not acceptable. Panelboard bus structure and main lugs or main circuit breaker shall have current and voltage ratings, number of phases, poles and number of wires and short circuit current rating as indicated on the Drawings.

C. Panelboard enclosures shall be fabricated from code gauge steel and constructed in accordance with UL 50 requirements.

D. All panelboard enclosures shall be surface mounted, fabricated from cold-rolled steel, thoroughly cleaned and then coated on all sides with rust-inhibiting primer and finished with the appropriate number of coats of ANSI-49 or ANSI-61 light gray baked-on enamel paint. Each panelboard shall have an outer door and an inner door both equipped with a locking handle requiring a milled key. Furnish two (2) keys for each panelboard and all panelboard locks shall be keyed alike. The inner door shall provide access to only the circuit breakers, while the outer door shall be secured to the edge of the enclosure with a continuous hinge from top to bottom to provide access to the panelboard wiring gutters. Panelboard enclosures shall be NEMA Type 3R, door-in-door where located outdoors and NEMA Type 1, door-hinged-to-box, where located indoors.

E. Both side gutters in the enclosure for outdoor main panelboard, “MP-CRS”, shall be sized to provide a minimum of 8.5 inches of wire-bending space to accommodate termination of up to size 600 KCM conductors on the 400A branch feeder circuit breaker. Side gutters in all other panelboard enclosures and top and bottom gutters in all panelboard enclosures shall comply with the requirements of NEC 408.55 for the size of conductors to be terminated as indicated on the Drawings.

F. A framed circuit directory card with a clear plastic covering shall be provided on the inside of the inner door of each panelboard. The directory card shall be in accordance with Section 260553 – Identification for Electrical Systems.

G. All bus bars shall be silver-plated copper and shall be made all from the same material. All plating shall be done electrolytically and shall cover the entire length of bus. Plating must be not less than 0.003-inch thick and shall cover both sides and all edges of each bus bar. Aluminum bus bars are not acceptable.

H. All bus bar conductors (phase, neutral, and ground) shall be fabricated from 1000 A/in^2 density rated Oxygen Free High Conductivity (OFHC) Copper 102, being 99.95 per cent pure copper and having an average annealed conductivity of 101 per cent IACS. Copper bus bar conductors shall be hard-drawn temper, shall meet the requirements of ASTM Specifications B 187, and shall be sized in

accordance with Underwriters' Laboratories Standards. Neutral bus bar conductors shall be insulated from the panelboard and shall be the same size as the phase bus bar conductors.

I. Bus bars shall extend the full height of the available space for mounting future circuit breakers.

J. The panelboard interior shall be provided with a copper ground bus bar conductor, equal to at least 25% ampacity of the phase bus bar conductors, which shall be bonded to the panelboard enclosure.

K. The neutral bus bar conductor and the ground bus bar conductor shall each be provided with an individual terminal or lug for each wire connected to it.

L. The neutral bus bar and the ground bus bar shall not be electrically bonded together.

M. The location of the main terminations, top or bottom, shall be determined by the entrance of the incoming power feeder conductors to the panelboard enclosure.

N. Provide molded case, thermal magnetic main circuit breaker or UL listed main lugs in each panelboard as indicated on the Drawings. All lugs shall be rated for a minimum temperature of 75˚C and sized to allow terminating the quantity and size of stranded copper conductors indicated on the Drawings.

O. Circuit breakers shall be quick-make, quick-break, bolt-on type having over center toggle mechanisms with thermal magnetic trips and shall be trip free. All circuit breakers shall be by the same manufacturer as the panelboards. Multi-pole circuit breakers shall have common trips and a single operating handle. Handle tie bars will not be accepted.

P. Circuit breakers shall be provided with a means for indicating a tripped position. Circuit breaker voltage, ampere rating and number of poles shall be as indicated on the Drawings. Circuit breakers shall be equipped with individually insulated, braced, and protected connectors.

Q. Circuit breakers in the service entrance panelboard shall have a minimum short-circuit interrupting capacity of 35 kA RMS symmetrical amperes. Circuit breakers in all other panelboards shall have a minimum short-circuit interrupting capacity of 10 kA RMS symmetrical amperes. Do not order panelboards until the required short-circuit current ratings have been determined in accordance with Specification Section 260573 – Protective Device Coordination Study and Arc Flash Risk Assessment.

R. Circuit breakers shall include factory installed mechanical lugs that are UL listed to accept stranded copper conductors. Lugs shall be aluminum or copper. Steel or galvanized steel lugs are not acceptable. Circuit breaker lugs shall be UL listed and rated for a minimum temperature of 75˚C.

S. Circuit breakers lugs shall be sized to accept the following size copper conductors:

Circuit Breaker Frame Size	Maximum Number and Size of Stranded Copper Conductors per Phase
15 to 20	(1) #10
25 to 35	(1) #6
40 to 60	(1) #4
70 to 100	(1) #1/0
110 to 225	(1) #250 KCM
300 to 400	(1) #600 KCM

T. Provide spare circuit breakers as indicated on the Drawings.

U. Single-pole circuit breakers in 120/240V panelboards having 15 or 20 ampere ratings shall be UL Listed as Switching Duty (SWD) rated.

V. Circuit breakers protecting circuits supplying heating, ventilation or air conditioning equipment shall be UL Listed as HACR type.

W. All wiring terminals for conductors leaving the panel shall be designed to be used with either copper or aluminum conductors.

X. Bussing sequence shall be distributed phase sequence type. Bus sequence shall start at the top left phase bus of the interior for both top and bottom fed panels. Sequencing shall be A-B, left to right, top to bottom, front to back as viewed from the front of the panelboard.

Y. Provisions or spaces for future circuit breakers shall be located at the bottom of the panel for top feed main or at the top of the panel for bottom feed main. All open, blank circuit breaker knockouts shall be properly plugged with suitable blanking devices.

Z. Locate next to each breaker, space, or provision an individual number permanently affixed to the panelboard. Numbering tape or painted numbers shall not be acceptable.

AA. The inside of the panel or door shall have a printed nameplate indicating the name of the panelboard manufacturer, the manufacturer's shop order number, panelboard type, system voltage and bus bar ampacity. Paper type labels are not acceptable. Each panelboard shall be marked with its UL short circuit rating.

BB. All panelboards shall be built in accordance with and to meet the requirements of the applicable sections of the National Electrical Code, NEMA Publication PBl, OSHA and applicable UL standards. All panelboards shall bear the Underwriters' Laboratories (UL) label of approval.

CC. The Service Entrance Main Distribution Panelboard shall be:

1. Square D I-Line Series (Basis of Design)
2. ABB-GE ReliaGear
3. Eaton Type PRL4X

DD. All other panelboards shall be:

1. Square D Type NQ with Type QOB bolt-on circuit breakers (Basis of Design)
2. ABB ReliaGear RQ with Type THQB bolt-on branch circuit breakers
3. Eaton Type PRL1X with Type BAB bolt-on branch circuit breakers

EE. All panelboards and enclosed circuit breakers, under Specification Section 262816.13 – Enclosed Circuit Breakers, shall be provided from the same manufacturer.

2.2 SURGE PROTECTIVE DEVICES (ALTERNATE BID NO. 3)

A. Provide integral surge protective device (SPD) factory installed on the following panelboards:

1. Panelboard MP-CRS
2. Panelboard DH
3. Panelboard B8 (Replacement of this panel is part of Alternate No. 1)

B. SPDs shall be UL 1449 labeled with a 200kA Short Circuit Current Rating (SCCR). Fuse ratings shall not be considered in lieu of demonstrated withstand testing of SPD.

C. SPDs shall be UL 1449 labeled as Type 2, installed on the load side of the main service disconnect device. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. An SPD relying upon external or supplementary installed safety disconnects does not meet the intent of this specification.

D. SPDs shall be UL 1449 labeled with 20kA I-nominal (In).

E. Suppression components shall be heavy duty, thermally protected, 50kA MOVs.

F. SPDs shall provide surge current paths for all modes of protection: L-N, L-G, N-G, and L-L for 120/240V, 1-phase, 3-wire systems.

G. SPDs shall be integral to the panelboard and shall be directly mounted to the panelboard bus bars.

H. SPDs shall meet or exceed the following criteria:

1. Surge Current Capacity Ratings shall be:

   a. Panelboard MP-CRS: 120kA per mode and 240kA per phase
   b. Panelboard DH: 80kA per mode and 160kA per phase
   c. Panelboard B8: 80kA per mode and 160kA per phase

2. UL 1449 Listed Voltage Protection Ratings (VPRs) shall not exceed the following:

Nominal Voltage	L-N	L-G	N-G	L-L
120/240V, 60 Hz	500V	600V	500V	800V

3. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV):

Nominal Voltage	L-N	L-G	N-G	L-L
120/240V, 60 Hz	150V	150V	150V	300V

4. SPD shall have UL 1283 EMI/RFI filtering with active tracking up to 50dB from 10kHz to 100MHz.

5. SPD shall be equipped with the following diagnostics:

   a. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED
   b. Audible alarm with on/off silence function and diagnostic test function
   c. Surge Counter
   d. Form C dry status contact rated 150VDC or 125VAC, 1A maximum
   e. No other test equipment shall be required for SPD monitoring or testing before or after installation.

6. *Environmental Conditions*:

   a. Operating temperature: -4°F to 122°F
   b. Relative humidity: 5 – 95%, non-condensing

I. *SPD Warranty*: SPD shall have a full ten (10) year manufacturer's warranty from date of initial service, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the warranty period.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install at locations indicated on the Drawings. All mounting and supporting materials shall be provided as indicated on the Drawings and in accordance with Section 260529 - Hangers and Supports for Electrical Equipment.

B. Install panelboards in accordance with the manufacturers written instructions.

C. Locate and arrange with proper clearances from other equipment and material to obtain good accessibility for operation and maintenance. Working space and clearances shall be in accordance with NEC Article 110.

D. Clean all welds, scars, and abrasions; remove metal splatter, rust, and all foreign materials; and apply an organic zinc-rich coating of the following manufacture:

1. Carboline SP676
2. Cook 920-A-171
3. Koopers' Organic Zinc

E. Outdoor mounted panelboards shall be mounted as indicated on the Drawings on U-channel steel supports in accordance with Specification Section 260529 – Hangers and Supports for Electrical Systems.

F. Indoor panelboards shall be installed with the top of the enclosure at 6'-0" above finished floor.

G. All outdoor panelboards shall be mounted in such a way as for the center of the grip of the operating handle of the topmost circuit breaker(s) in the panelboard, when in the highest position, is/are not more than 6 feet, 7 inches above grade for compliance with NEC 404.8(A).

H. All rigid metal conduits which terminate at panelboards located outdoors shall terminate in insulated throat, grounding type, liquid tight rigid conduit hubs. Conduit hubs shall be provided in accordance with Section 260533.13 - Conduit for Electrical Systems and bonded to the panelboard equipment ground bus in accordance with Section 260526 - Grounding and Bonding for Electrical Systems.

I. Adjust the interior such that the dead front fits securely over all of the circuit breakers and there are no gaps or spaces.

J. Provide blank filler plates for all unused spaces in all panelboards.

K. *Visual and Mechanical Inspection:* Inspect all panelboards for physical damage, proper alignment, anchorage, and grounding. Check installation and tightness of connections at main lugs and at all circuit breakers in accordance with manufacturer's published torque values.

L. Perform insulation tests on each phase and verify low-resistance ground connections on equipment ground bus.

M. Alternate Bid No. 3: Reset SPD surge counter in each panelboard that is provided with an SPD to zero (0).

3.2 IDENTIFICATION

A. Each panelboard shall have a laminated plastic nameplate, with engraved black characters on a white background, on the outside surface of the door engraved with the designation as indicated on the Drawings in accordance with Section 260553 - Identification for Electrical Systems.

3.3 PANELBOARD CIRCUIT DIRECTORIES

A. Each panelboard shall have a framed circuit directory card with a clear plastic covering mounted on the inside of the door.

B. The directory card shall provide a space at least 1/4-inch high by 3 inches long, or the equivalent, for each circuit.

C. The directory card shall be typewritten or printer generated to identify the load fed by each circuit for compliance with NEC 408-4 and then laminated with clear plastic to protect it from moisture.

3.4 ARC FLASH HAZARD WARNING LABEL

A. Provide arc flash hazard warning label on exterior door of all panelboards in accordance with Sections 260553 - Identification for Electrical Systems and 260573 – Protective Device Coordination Study and Arc Flash Risk Assessment.

END OF SECTION 262416

SECTION 262726 – WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish and install all receptacles and cover plates as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260519 – Low-Voltage Electrical Power Conductors and Cables

C. Section 260533.16 – Boxes for Electrical Systems

D. Section 260553 – Identification for Electrical Systems

E. Section 260583 – Wiring Connections

1.4 SUBMITTALS

A. Manufacturer's product data sheets shall be submitted for each of the following:

1. Ground fault circuit interrupter receptacles
2. While-in-use weatherproof covers for duplex GFCI receptacle

PART 2 - PRODUCTS

2.1 TOGGLE SWITCHES

A. General purpose toggle switches shall be Specification Grade, toggle type, rated for 20 amperes, 120/277 volts AC, 60 hertz, having binding terminal screws for back and side wiring to accept up to Size 10 AWG copper wire, totally enclosed molded base and cover, quiet operation, and brown switch handles. Toggle switches shall have approved self-grounding straps and/or a grounding terminal having a green hex head screw.

B. General purpose toggle switches shall be rated for a minimum of 1 HP at 120 VAC.

C. Switches identified on the Drawings with the symbol "S" shall be single-pole, single-throw, two-position maintained contact switches and shall be Hubbell HBL1221, Arrow-Hart 1991 or Leviton 1221-2.

D. General purpose toggle switches shall meet Federal Specification W-S-896 and shall be UL listed and labeled.

2.2 RECEPTACLES

A. Receptacles identified on the Drawings with the symbol "GFCI" shall be extra heavy duty industrial grade, tamper resistant, weather resistant, corrosion resistant, self-testing ground fault circuit interrupter, having nickel plated brass power and ground contacts with binding terminal screws for back and side wiring with solid or stranded copper conductors up to size 10 AWG, yellow nylon face with high impact polyester housing, device mounted "TEST" and "RESET" push buttons, solid green power indicator, solid red GF/Trip indicator, flashing red end-of-life indication, and with differential current sensing device capable of detecting ground fault currents of 5 milliamps, plus or minus 1 milliamp with conformal coated printed circuit board, and interrupt supply circuit within the UL trip time curve. Mounting strap assembly shall be nickel plated brass, approved for grounding, with stainless steel mounting screws and stainless steel auto self-grounding clip. Maximum continuous operating temperature shall be ≥ 66°C. Dielectric withstand voltage shall be ≥ 1.5kV. Short circuit current rating shall be ≥ 10kA.

B. GFCI receptacles shall be duplex, 20 amperes, 125 volts AC, 2-pole, 3-wire grounding, straight blade, NEMA 5-20R configuration meeting UL 498, UL 943, NEMA WD-6 and complying with all National Electrical Code (NEC) requirements for GFCI receptacles, TR and WR resistance, UL E41978 Federal Spec listed and labeled; Hubbell GF5362SGYEL or approved equal by Arrow-Hart or Leviton.

C. All receptacles shall meet Federal Specification W-C-596 and shall be UL listed and labeled.

2.3 WIRING DEVICE COVER PLATES

A. Weatherproof switch operating covers shall be cast, “copper-free” aluminum, having a toggle switch handle for square toggles, with gasket and four stainless steel screws for attachment to a Type FD cast device box. The switch handle positions shall be marked ON and OFF and shall be padlockable.

1. Single gang switch operating covers shall be Appleton Electric FSK-1VS-A, O-Z/Gedney FS-1-WSCA, Hubbell – Killark FZ series, or approved equal.
2. Two-gang switch operating covers shall be O-Z/Gedney FS-2-WSCA, or approved equal

B. All wiring device cover plates shall meet NEMA and ANSI Standards and UL File E91963 – Guide QCDX and Federal Specification WP-455A.

2.4 WHILE-IN-USE WEATHERPROOF COVERS FOR DUPLEX GFCI RECEPTACLE

A. Weatherproof covers for duplex GFCI type receptacle located outdoors shall be UL Listed for wet location (raintight) use with utilization equipment attachment plug inserted into the receptacle.

B. Cover door shall be spring loaded, self-closing type and the cover shall be designed for installation on a vertically mounted Type FD box housing a duplex GFCI receptacle.

C. Cover shall be provided with weatherproof gasket and shall have one stainless steel attachment screw in each corner.

D. Cover shall be cast aluminum with powder coated gray finish.

E. Cover shall be NEMA 3R rated and shall meet or exceed the extra duty rating of UL 514D and shall comply with NEC 406.9(B).

F. While-in-use weatherproof covers for duplex GFCI receptacle shall be Hubbell WP26E or approved equal by Appleton Electric, Eaton Crouse-Hinds, Killark, or O-Z/Gedney.

G. All wiring device cover plates shall meet NEMA and ANSI Standards and UL File E91963 – Guide QCDX and Federal Specification WP-455A.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Single-pole toggle switches shall be installed so that the switch is "ON" when the toggle handle is in the UP position.

B. Receptacles shall be mounted vertically so that the U-shaped grounding slot is at the TOP.

C. The white neutral conductor shall always be connected to the "white" wire or "silver" colored terminal (large slot) of the receptacle.

D. The grounding yoke of all receptacles shall be firmly connected to the device box.

E. Do not feed through outlets. Provide wiring pigtails on all receptacles.

F. Mounting heights for all general-purpose switches and receptacles shall be as indicated in Section 260500 – Common Work Results for Electrical.

3.2 CIRCUIT IDENTIFICATION

A. Cover plates for all general-purpose switches and receptacles shall be marked on the outside surface of the cover plate with a printer generated peel and stick label in accordance with Section 260553 – Identification for Electrical Systems with the source panelboard designation and circuit number.

3.3 TESTING

A. All GFCI receptacles shall be tested for correct wiring, polarity and ground fault protection operation.

B. *Malfunctioning Devices*: Repair or replace and retest. Repeat procedure until all units operate properly.

END OF SECTION 262726

SECTION 262816.13 – ENCLOSED CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor shall furnish and install all enclosed circuit breakers as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 260500 – Common Work Results for Electrical

B. Section 260526 – Grounding and Bonding for Electrical Systems

C. Section 260529 – Hangers and Supports for Electrical Equipment

D. Section 260553 – Identification for Electrical Systems

E. Section 260573 – Protective Device Coordination Study and Arc Flash Risk Assessment

F. Section 260583 – Wiring Connections

1.4 SUBMITTALS

A. Manufacturer's product data sheets shall be submitted for each type and size of enclosed circuit breaker used on this project, including information on the electronic trip unit.

B. Provide dimensioned outline drawing for circuit breaker enclosures.

1.5 REFERENCED STANDARDS

A. National Electrical Code: Articles 230, 240, 312, and 404

B. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations

C. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures

1.6 LISTING REQUIREMENTS

A. Enclosed circuit breakers shall be UL Listed and Labeled as service entrance equipment.

PART 2 - PRODUCTS

2.1 ENCLOSED CIRCUIT BREAKERS

A. The main circuit breaker for new electrical services shall have the following ratings:

1. Type: Molded case thermal magnetic

2. Frame size: 800A
3. Rating plug: 800A
4. Continuous current rating: 80%
5. Electronic trip unit: Long time, short time and instantaneous trip settings
6. Short circuit rating: 35kA
   Do not order enclosed circuit breakers until the required short-circuit current ratings have been determined in accordance with Specification Section 260573 – Protective Device Coordination Study and Arc Flash Risk Assessment.

B. Terminal lugs shall be sized for up to two (2) 600 kcmil conductors on the line and load side of the circuit breaker, shall be Underwriters' Laboratories (UL) listed as being suitable for copper or aluminum conductors and shall be equipped with solderless connectors, front removable. All current carrying parts shall be plated by electrolytic processes to resist corrosion and to promote cool operation.

C. Provide full rated isolated copper neutral bus within the circuit breaker enclosure with lugs for connection of two (2) 600 kcmil copper incoming and two (2) 600 kcmil copper outgoing neutral conductors.

D. Provide 200A rated copper equipment ground bus within the circuit breaker enclosure, bonded to the enclosure, with lugs for connection of two (2) 2/0 copper equipment grounding conductors, a 3/0 copper main bonding jumper and a 3/0 copper grounding electrode conductor.

E. Circuit breaker enclosures shall be NEMA Type 3R without knockouts for outdoor locations and shall have a hinged cover.

F. All enclosures shall be prime coated with a rust-inhibiting phosphate and finished in ANSI-61 light gray or ANSI-49 gray baked-on enamel paint.

G. All enclosures shall meet UL Standard 498 and shall be UL listed and labeled.

H. Circuit breaker enclosures shall be sized as required to provide enough air space around the circuit breaker for proper cooling in an outdoor ambient temperature of up to 104°F.

I. The minimum wire-bending space at terminals and the minimum gutter space within circuit breaker enclosures shall be as required per NEC 312.6 for (2) 500 KCM conductors per terminal on both the line and load side of the circuit breaker.

J. Circuit breaker enclosures shall be UL labeled as “suitable for service entrance”.

K. Provide weather and UV resistant label “MAIN SERVICE DISCONNECT” on outside front door of the circuit breaker enclosure.

L. The circuit breaker operating handle shall physically indicate the ON and OFF positions of the breaker. The operating handle shall be able to accept a minimum of two padlocks for padlocking the handle in the OFF position and shall have the capability of accepting at least one padlock for padlocking the handle in the ON position. Padlocking provisions for the handle shall be based on using padlocks having heavy duty industrial type shackles 3/8-inch thick.

M. The enclosure door shall be mechanically interlocked with the circuit breaker operating handle to prevent opening the door when the circuit breaker is in the ON position.

N. Enclosed circuit breaker approved manufacturers are:

1. Square D PowerPact P with Micrologic 5.0 electronic trip unit (Basis of Design)
2. Approved equal by ABB
3. Approved equal by Eaton

O. All enclosed circuit breakers and panelboards, under Specification Section 262416 – Panelboards, shall be provided from the same manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide separately enclosed main circuit breaker at each service entrance location.

B. Mount outdoor enclosed main circuit breaker on U-channel supports in accordance with Section 260529 – Hangers and Supports for Electrical Equipment.

3.2 IDENTIFICATION

A. Mounted on the outside surface of each enclosure circuit breaker door shall be a three-layer engraved laminated plastic nameplate meeting the requirements of Section 260553 – Identification for Electrical Systems.

3.3 ARC FLASH HAZARD WARNING LABEL

A. Provide arc flash hazard warning label on exterior door of all enclosed circuit breakers in accordance with Sections 260553 - Identification for Electrical Systems and 260573 – Protective Device Coordination Study and Arc Flash Risk Assessment.

END OF SECTION 262816.13

SECTION 265613 – EXTERIOR LIGHTING FIXTURES AND LAMPS

ALTERNATE BID NO. 1

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SCOPE

A. The Contractor remove and replace existing exterior lighting fixtures and shall furnish and install new exterior lighting fixtures, poles, bases and accessories as specified herein and as shown on the Drawings.

1.3 RELATED SECTIONS

A. Section 033000 – Cast In Place Concrete

B. Section 260500 – Common Work Results for Electrical

C. Section 260505 – Selective Demolition for Electrical

D. Section 260519 – Low-Voltage Electrical Power Conductors and Cables

E. Section 260529 – Hangers and Supports for Electrical Equipment

F. Section 260533.13 – Conduit for Electrical Systems

G. Section 260533.16 – Boxes for Electrical Systems

H. Section 260583 – Wiring Connections

1.4 SUBMITTALS

A. Manufacturer's product data sheets shall be submitted for each type of the following:

1. Lighting fixtures, including drivers and LED lamp modules
2. Lighting fixture poles

B. Provide dimensions, ratings, performance data, including luminaire photometric data, accessories, installation instructions and any production application conditions and limitations of use stipulated by the product testing agency.

C. *Photometric Plot*: Provide photometric plot and summary table for the site lighting fixtures using the AutoCAD file for the site lighting plan that will be provided by the Engineer.

D. *Record Drawings*: Accurately record the actual installed location of each lighting fixture.

1.5 SUBSTITUTIONS

A. The Contractor shall base his Base Bid on the first named lighting fixture manufacturer for each lighting fixture type specified in the "Lighting Fixture Schedule" on the Drawings. For each fixture type, only products of manufacturers listed in the "manufacturers catalog number" column of the fixture schedule or the specifications, which meet or exceed the performance, fabrication and aesthetics of the fist named fixture shall be considered an equal. Lighting fixture "equals" may be submitted for review as part of the shop drawing submittal process.

B. Lighting fixtures from alternate manufacturers not listed in the lighting fixture schedule or the specifications shall be submitted to the Designer for review as a substitution prior to bid submittal in accordance with the requirements below and Section 007213 – General Conditions and Section 007300 – Supplementary Conditions. The Designer reserves the right to reject any substitution submittal.

C. All requests for lighting fixture substitutions submitted to the Engineer for approval must be accompanied by a lighting fixture comparison sheet(s) that documents equivalency of the substituted fixture and the specified fixture and includes a detailed list of all differences. Requests for substitution that are not accompanied by the required comparison sheet(s) will be rejected.

D. Each comparison sheet(s) must include the following data for both the specified lighting fixture and the substituted lighting fixture.

1. Photometric Data – Include candle power table, coefficient of utilization table, lighting distribution table and maintained illumination table. Photometric data must be based on the same LED CCT, CRI, lumens and distribution type as the specified fixture.
2. Product Data – Provide data on lighting fixture dimensions, construction, finish, color, mounting, louver, lens, diffuser, reflector, lamps, ballasts, accessories and options as applicable.

1.6 EXTRA MATERIALS

A. With the exception of lighting fixtures that are factory sealed with no field replaceable parts, provide the following extra materials:

1. Two (2) spare LED drivers for each size and type used on this project
2. 10% LED lamp modules (minimum of 3) for each size and type used on this project
3. 10% spare fuses (minimum of 3) for each size and type used on this project

1.7 WARRANTY

A. All LED lighting fixtures shall have a minimum 5-year manufacturer's no cost replacement warranty.

PART 2 - PRODUCTS

2.1 EXTERIOR LIGHTING FIXTURES

A. Lighting fixtures shall be specified in the Lighting Fixture Schedule on the Drawings. The lighting fixture schedule specifies the quality and standards required. Lighting fixture manufacturers frequently change their catalog numbers and therefore the catalog numbers listed in the lighting fixture schedule may not be complete or may be incorrect. The Contractor shall be responsible for submitting lighting fixtures that comply with the catalog numbers listed as well as all

requirements stipulated in the lighting fixture schedule, Drawing notes and the specifications. The Contractor/manufacturer shall contact the Designer prior to submitting his bid, regarding any conflicts between the catalog number, lighting fixture schedule or specifications.

B. Only one manufacturer shall be used for each fixture type listed in the lighting fixture schedule for the entire project.

C. Lighting fixtures shall be equipped with proper accessories, lenses, louvers, reflectors, shields, mounting brackets, clips, frames, surge suppressors, lamp modules, drivers and other essentials for proper installation in or upon walls, ceilings, poles, or concrete bases and shall be properly painted for protection and preservation appropriate to the location where installed.

D. All fixtures shall be Underwriters' Laboratory (UL) listed and labeled.

E. All fixtures with integral LED drivers shall have GLR or lighting fixture manufactures standard fast-blow field replaceable fusing.

F. Fixture assemblies, including LED drivers, poles, plugs, photoelectric controls, surge suppressors etc., shall be UL labeled and shall be mounted as shown on the Drawings.

G. Fixtures installed in damp locations shall be UL listed "Suitable for Damp Locations".

H. Fixtures installed in wet locations shall be UL listed "Suitable for Wet Locations" and all metal parts and mounting screws shall be stainless steel.

I. Access covers or lens frames shall be hinged on all fixtures mounted above 15 feet. Elements attached to covers or lens frames shall not slip or become loose upon opening of the frame.

J. *Gasketing*: All lighting fixtures located outdoors shall be gasketed. Gasketing shall be appropriately placed and be bonded to seal out water and insects. Gasket material shall withstand full range of operating temperatures without leaking, cracking or becoming loose. Gasket material shall be impervious to water and be made of neoprene, silicone or similar material. Gaskets shall be one continuous length unless otherwise indicated.

K. *Photoelectric Control*: Where lighting fixtures are indicated to have an integral LED rated photocontrol, the photocontrol shall have a minimum adjustable range of 0.5 to 5.0 footcandles and shall be mounted in replaceable weatherproof, plug-in or twist-lock assembly.

2.2 POLE-MOUNTED LIGHTING FIXTURES

A. LED driver shall be mounted on tray and shall be easily removeable for replacement by loosening captive screws and a plug-in wiring harness.

B. Provide surge protector per ANSI/IEEE C62.41.2 with ratings as indicated in the Lighting Fixture Schedule on the Drawings.

C. Provide integral twist-lock LED rated photoelectric control.

D. Metal Light Poles:

1. Provide steel poles as indicated in the lighting fixture schedule for mounting the Types A B and D lighting fixtures.
2. *Shipping*: Each pole shall be covered with suitable protective wrapping or other packaging to protect the pole finish during shipping via a commercial carrier. Remove protective

wrapping and inspect for shipping damage upon receipt. File claim with carrier for any damage.

3. The light pole manufacturer shall provide the following information:

    a. Installation and handling instructions
    b. Template for placing anchor bolts and conduits
    c. Anchor L-bolts including nuts, washers and bolt covers
    d. Touch-up paint finishing kit

4. Poles shall be designed for winds up to 100 mph plus a 1.3 gust factor while supporting lighting fixtures of their projected surface areas.
5. Provide a first and/or second mode vibration damper it determined to be required by the pole manufacturer based on the conditions specific to this project.
6. Length of poles shall be as indicated on the Drawings.
7. Poles shall be non-tapered round or square as indicated in the lighting fixture schedule with minimum size 3" x 5" wiring access handhole near base with gasketed cover suitable for wet location service with stainless steel screw(s) and backbar. Provide grounding lug accessible inside the handhole for grounding the pole and luminaire assembly to a ground rod provided at the base of each pole as indicated in the mounting detail on the Drawings.
8. Provide provision for field mounting a weatherproof box and toggle switch(es) on pole at approximately 48" above finish grade to center for local switching of pole mounted lighting fixture(s) where indicated on the Drawings.
9. Pole construction shall be minimum 11 gauge, weldable-grade, cold-rolled carbon steel tubing conforming to ASTM A500 Grade B with 4-bolt steel base baseplate fabricated of hot-rolled carbon steel conforming to ASTM A36 or equivalent (36 ksi minimum yield) with 2-piece painted steel base cover and stainless steel attaching hardware. All welds shall conform to AWS D1.1 using ER70S-6 electrodes.
10. Pole top tenon shall match the lighting fixture or mounting bracket slip-fitter.
11. Provide 3 tenon steel or aluminum bullhorn, painted black to match lighting fixtures, for mounting Type C sports lights to existing 30' round steel pole as indicated on the Drawings.
12. *Anchor Bots and Hardware*: Hot-dipped galvanized steel anchor bolts shall be sized by the pole manufacturer. Four (4) bolts shall be provided for each pole. Bolts shall have an "L" bend on one end for placement in a concrete base and threads of adequate length on the other end for bolting the pole base to the concrete base. Each anchor bolt shall be provided with one leveling nut, one hold-down nut and two (2) washers by pole manufacturer. Nuts and washers shall be hot-dipped galvanized like the bolts. Leveling shims in lieu of leveling nuts are not acceptable.
13. Full base cover shall be provided to cover anchor bolts and pole baseplate. Base cover shall have provision for preventing vertical uplift of cover after installation. Base cover shall be painted steel. Plastic base covers are not acceptable.
14. The following accessories shall be furnished as applicable for the type of lighting fixture to be mounted to the pole:

    a. Mounting brackets
    b. Arm connection(s) and arm(s)
    c. Pole top cap
    d. Pole base cover

15. *Finish*: Poles and base covers shall be provided with factory finish coat to match the luminaire mounted on the pole. Poles specified to have a finish coat shall also have a prime coat. Poles with finish coat that are scraped or scratched shall have the finish repaired immediately to prevent oxidation of the aluminum. Scraped or scratched areas shall be re-

finished in strict accordance with the pole manufacturer's instructions, sanded, wiped clean and a new prime coat and finish coat applied. New finish coat shall match surrounding areas.

16. *Manufacturer*: Metal poles shall be manufactured by the same company as the lighting fixtures to be mounted on the poles or by Lumecon.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. All lighting fixtures shall be installed in accordance with the NEC and in strict accordance with the lighting fixture manufacturer's written instructions.

B. Contractor shall provide all mounting brackets, hardware, conduit, wire, boxes and terminations required for a complete and operational installation.

C. All conduit connections shall be watertight. Conduit, boxes, brackets and hardware shall be corrosion-resistant type.

D. Set fixtures level, plumb, and square with walls or mounting surface and as applicable to the type of fixture and secure according to the manufacturer's written instructions, approved submittal materials and/or as shown in the details on the Drawings.

E. Connections within each lighting fixture shall be made using electrical twist-on spring connectors in accordance with Section 260583 – Wiring Connections.

3.2 POLE-MOUNTED LIGHTING FIXTURE INSTALLATION

A. *Concrete Bases for Pole Mounted Lighting Fixtures*: Provide poured concrete base for all new pole-mounted lighting fixtures in accordance with the mounting details on the Drawings and as follows:

1. Work shall consist of furnishing all labor, equipment and materials necessary for the installation of the cylindrical concrete bases.
2. Obtain underground utility locates prior to performing any excavation for pole bases or underground conduits.
3. Concrete shall be provided in accordance with Section 033000 – Cast In Place Concrete with minimum 28-day compressive strength of 4,000 psi.
4. Size of concrete base and top elevation of concrete shall be as indicated in the detail on the Drawings.
5. Machine auger hole for base during dry conditions of the correct size as indicated in the detail on the Drawings.
6. Remove any loose earth that falls into the excavation before placing any concrete.
7. Position reinforcing steel in accordance with the detail on the Drawings.
8. Maintain reinforcement securely in position in a manner that will hold reinforcing in place during concrete placement. Tie bars at intersections using soft steel tie-wire.
9. Metal reinforcement shall be inspected and cleaned, just prior to placement of concrete, of flaky rust, mud, oil, ice, concrete splashing, or any other foreign material that could adversely affect the proper bonding of the concrete to the reinforcement.
10. Anchor L-bolts, furnished by the manufacturer with the poles, shall be installed using plywood or steel template to ensure correct spacing and positioning to match final desired pole orientation. Great care shall be taken to ensure that bolts remain plumb during concrete placement.

11. Power conduits shall extend 2-inches above finished concrete in center of pole base and shall be secured in place during concrete placement with the anchor bolt template and by tie wiring to the concrete reinforcement. Extend spare conduit beyond pole base a minimum of 2-feet and shall be capped.
12. Pour concrete base monolithically.
13. Provide 1" chamfered edge all around top of concrete base.
14. Fresh concrete, after placing, shall be kept at a minimum temperature of 50˚F for the first 72 hours and kept at a temperature above freezing for the next 72 hours. Use of salt or chemicals to prevent freezing will not be permitted.
15. Conform to recommendations in ACI 306.
16. Concrete damaged by freezing shall be removed and replaced at no additional cost to the Owner.

B. Underground wiring to poles shall be pulled into Schedule 40 PVC conduit directly buried to a minimum depth of 2'-0" below finish grade.

C. *Grounding*: Metal poles shall be grounded with a separate bare stranded #6 AWG minimum copper ground conductor exothermically welded to a 5/8" diameter x 8' long copper-clad steel grounding rod driven to a depth of 3'-0" below grade to top of ground rod within 2'-0" of the concrete base.

D. Install leveling nut on each anchor bolt, screwed down until it meets the concrete, and then adjusted until all four (4) are level. Poles shall be set on concrete base after concrete has cured. Pole shall then be securely fastened to anchor bolts with top nuts in accordance with the torque values provided by the pole manufacturer.

E. Contractor shall wire lighting fixtures to underground wiring and connect grounding conductor to grounding lug in each pole. Pole fixture branch circuit wiring shall be tapped or spliced to main wiring run and run up in pole to lighting fixture.

F. *Pole Straightness*: Poles shall be straight and plumb. Pole alignment shall be accomplished on a calm and cloudy day or early in the morning before solar radiation has expanded one side of the pole causing thermal deflection. Alignment shall be in accordance with the pole manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

A. Visually inspect each lighting fixture housing for manufacturing flaws or misalignment of components such as gaskets, hinges and lenses prior to installation. Fixtures shall also be inspected for cracks, holes or poor finish that will cause entry of moisture or insects, or cause rust or corrosion to form thereby reducing the life of the housing.

B. The manufacturer shall replace leaking fixture housing or components without cost to the Owner if, in the opinion of the Designer or Construction Representative, such replacement is necessary to provide the required water and insect-tight integrity of the lighting fixture.

C. Inspect each installed fixture for damage. Replace damaged or inoperable lamps.

D. Test all lighting fixtures in the presence of the Construction Representative for proper operation.

E. *Malfunctioning Fixtures and Components*: Repair or replace and retest. Repeat procedure until all units operate properly.

3.4 CLEANING AND ADJUSTING

A. Fixtures shall be properly protected from damage or marring during construction until final acceptance by the Construction Representative.

B. Fixtures, lamps, lenses and enclosures shall be cleaned using methods and materials recommended by the fixture manufacturers and all lamps shall be in working order prior to final acceptance by the Construction Representative.

END OF SECTION 265613

SECTION 310000 – EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Reference Standard Specifications – Missouri Department of Transportation (MoDOT) Standard Specifications for Highway Construction, latest edition.

1.2 SUMMARY

A. This Section includes the following:

1. Excavating and backfilling for utility trenches.
2. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

B. Related Sections:

1. Section 311000 – Site Clearing
2. Section 329200 – Turfs and Grasses

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength 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:

1. Course placed between the subgrade and cement concrete equipment pad.

C. Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Suitable soil imported from approved off-site sources for use as fill or backfill.

E. Class A Excavation: Removal, handling, and disposal of all materials of whatever nature encountered regardless of type, character, composition, or condition thereof, except for Rock Excavation. Class A Excavation shall include the removal of clayey, silty, or sandy soil, trash and rubble, cinders, shale, chert, crushed rock, brick, or cobblestone paving or surfacing, asphaltic concrete paving, and other plain, bituminous bound bases or surface courses or macadam, gravel, or broken stone.

F. Cohesive Soil: Soil that, when unconfined, has strength when air dried and cohesion when submerged in water.

G. Cohesionless Soil: Soil that, when unconfined, has no strength when air dried and has no cohesion when submerged in water. (Includes granular material.)

H. 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 Construction Representative. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the work.
2. Open Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Construction Representative. Unauthorized excavation, as well as remedial work directed by Construction Representative, shall be without additional compensation.

I. Existing Grade: Surface elevation prior to commencement of the work.

J. Fill: Soil materials used to raise existing grades.

K. Finished Grade: Final surface elevation as shown on the Drawings.

L. Rock Excavation: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 3/4 cu. yd. (0.57 cu. m) for pit and/or trench excavation, that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

1. Excavation of Pit and/or Trenches: Late-model, track-mounted hydraulic excavator equipped with a ¾ cubic yard capacity rock bucket; rated at not less than 90-hp (67-kW) net flywheel horsepower, and 30,000-pound drawbar pull.
2. If the Contractor chooses to use equipment of lesser size, capacity, or power than specified above for excavating purposes, the Contractor will assume all responsibility for the cost and method of removal of materials resembling rock, which cannot be removed with their equipment. Contract change order proposals submitted by the Contractor for Rock Excavation will only be applicable if the Contractor's equipment equals or exceeds equipment requirements specified above, unless approved otherwise by Construction Representative.

M. 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.

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

O. Topsoil: Fertile, friable soil which contains not more than 40% clay and not more than 55% sand as determined in accordance with ASTM D422. At least 90% of the material shall pass a No. 10 sieve and shall be free of large sticks, weeds, brush, stones larger than 1-inch in maximum dimension, and all other litter. It shall contain an amount of organic matter normal to the region with a minimum of 1% and a maximum of 6% as determined by the Loss on Ignition Test previously specified. Topsoil shall not contain oil, toxic substances, or other chemicals such as sulfides which would cause a very low pH when exposed to the air. Soils and soil material with soluble salts as carbonates, bicarbonates, and sulfates shall have a conductivity of less than 4 mmhos per cm.

P. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Geotextiles
2. Controlled low-strength material, including design mixture

B. Field Quality Control test reports and logs.

C. Pre-excavation Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.5 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Construction Representative and then only after arranging to provide temporary utility services according to requirements indicated.

1. Notify Construction Representative not less than two weeks in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Construction Representative's written permission.
3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.

1.6 TEST STANDARDS

A. The following test standards apply to the work under this section.

1. ASTM D2216, "Laboratory Determination of Moisture Content of Soil."
2. ASTM D422, "Particle-Size Analysis of Soils."
3. ASTM D698, "Test method for Laboratory Compaction Characteristics of Soil Using Standard Effort." (Standard Proctor)
4. ASTM D2922, "Density of Soil and Soil-Aggregate in Place by Nuclear Methods".
5. ASTM D2937, "Density of Soil in Place by the Drive-Cylinder Method."
6. ASTM D3017, "Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods."

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide approved borrow soil materials when sufficient suitable soil materials are not available from excavations. All borrow soil and granular materials shall be provided from MoDOT approved sources.

1. Comply with the requirements of MoDOT's Missouri Standard Specifications for Highway Construction, Section 203, Roadway and Drainage Excavation, Embankment, and Compaction for environmental clearances for borrow material sources.

B. Suitable Soils: ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM, or a combination of these groups; free of rock or gravel larger than 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Suitable Soils located within 36" of finished grade in lawn and planter areas shall be limited to cohesive soils in Soil Classification Groups ML, CL, and CH, or a combination of these groups, free of rock or gravel larger than 1 inch in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter, subject to approval of Construction Representative.

C. Unsuitable Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

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

D. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand complying with the requirements of Section 1007 of the MoDOT Standard Specifications for Highway Construction.

1. Type 1 Aggregate

E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

F. Drainage Fill: Narrowly graded mixture of washed crushed stone or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

G. Granular Backfill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 100 percent passing a 3/4-inch (18.75-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

H. Waste Rock: Graded mixture of natural or crushed limestone screenings having the following gradation:

Sieve Size	Percent Passing
3/8-inch	100 %
#4 sieve	90 – 100 %
#8 sieve	85 – 100 %
#40 sieve	40 – 60 %
#80 sieve	15 – 40 %
#200 sieve	15 – 30 %

I. Sand: ASTM C 33; fine aggregate, natural, or manufactured sand.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polypropylene fibers; with elongation greater than 50 percent; complying with AASHTO M 288 and the following minimum average roll values, measured per test methods referenced, Mirafi 160N or approved equal.

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 157 lbf; ASTM D 4632.
3. Grab Tensile Elongation: 50%; ASTM D 4632.
4. Trapezoidal Tear Strength: 60 lbf; ASTM D 4533.
5. Sewn Seam Strength: 142 lbf; ASTM D 4632.
6. Tear Strength: 60 lbf; ASTM D 4533.
7. Puncture Strength: 95 lbf; ASTM D 4833.
8. Apparent Opening Size: No. 70 U.S. sieve; ASTM D 4751.
9. Permittivity: 1.4 per second, minimum; ASTM D 4491.
10. Permeability: 0.22 cm/sec; ASTM D 4491.
11. UV Stability: 70 percent strength retained after 500 hours' exposure; ASTM D 4355.
12. Flow Rate: 110 gpm/ft^2; ASTM D 4491

B. Soil Reinforcement Geotextile: Woven geotextile fabric, manufactured for soil reinforcement applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
3. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
4. Tear Strength: 90 lbf (400 N); ASTM D 4533.
5. Puncture Strength: 90 lbf (400 N); ASTM D 4833.
6. Apparent Opening Size: No. 30 (0.60-mm) sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

C. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Grab Tensile Strength: 247 lbf (1100 N); ASTM D 4632.
3. Sewn Seam Strength: 222 lbf (990 N); ASTM D 4632.
4. Tear Strength: 90 lbf (400 N); ASTM D 4533.
5. Puncture Strength: 90 lbf (400 N); ASTM D 4833.
6. Apparent Opening Size: No. 30 (0.60-mm) sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.

2.3 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Low-density, self-compacting, flowable concrete material of low to moderate strength, low permeability, and minimal shrinkage, as follows:

1. Portland Cement: ASTM C 150, Type I.
2. Fly Ash: ASTM C 618, Class C or F.

3. Normal-Weight Aggregate: ASTM C 33, 3/4-inch (19-mm) nominal maximum aggregate size.
4. Water: ASTM C 94/C 94M.
5. Air-Entraining Admixture: ASTM C 260.

B. Produce conventional-weight, controlled low-strength material with 80-psi (28-day) compressive strength when tested according to ASTM C 495; permeability, maximum 1 x 10^{-6} cm/sec.; shrinkage less than 0.5%

C. Flowable backfill complying with Section 621 of the MoDOT Standard Specifications for Highway Construction.

PART 3 - EXECUTION

3.1 COORDINATION

A. All underground utilities at the project site are privately owned. Before any excavations are begun, the Contractor shall have all underground utilities in the area to be excavated located and marked with colored paint and flags by a private utility locate company acceptable to the Construction Representative.

B. Time spent by Owner to identify utilities and status of utilities discovered during excavation and not shown on the Drawings shall not be the basis of a change order request from the Contractor.

3.2 PREPARATION

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

B. Preparation of subgrade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface is specified in Section 311000 – Site Clearing.

C. Protect and maintain erosion and sedimentation controls, which are specified in Section 311000 – Site Clearing, during earthwork operations.

D. Provide protective insulating materials to protect subgrades and foundation soils against freezing temperatures or frost.

3.3 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

C. Labor and equipment required to maintain all excavations free from water at all times during the work shall be provided until backfill is completed.

D. Water shall be disposed of in a manner that will not cause ponding in the work area or hamper or damage in any way the work of other trades.

E. Care shall be taken to avoid contaminating existing sewer systems with sediment or debris from Contractor's pumping operations.

F. Contractor shall clean any such deposits from sewer systems upon completion of his work at no additional cost to Owner.

G. Work on this project will potentially expose the Owner's existing utilities and structures to water if excavations become flooded.

H. Contractor shall keep all excavations dewatered at all times to include non-working hours.

3.4 EXPLOSIVES

A. Explosives: Do not use explosives.

3.5 EXCAVATION, GENERAL

A. Earthwork shall be carried out so as to minimize the impact on existing trees and landscaping.

B. The Contractor shall design, provide, and maintain at all times the necessary shoring, bracing and sheet piling for proper protection of excavated areas from cave-ins or for protection of existing structures or utilities from damage.

C. Contractor shall provide temporary supports for all underground utilities crossing an excavation. Prior to excavating provide information to Construction Representative indicating the method of supporting telephone and electric duct banks.

D. All excavated areas shall be properly barricaded using 4’ high orange plastic mesh construction fencing for personnel protection. Support fencing using metal tee posts driven into the ground at a maximum spacing of 15’ on center.

E. Excavation shall consist of the removal of all earth, rocks, boulders, concrete, roots, or any other materials that are found within the limits of the excavation or that interfere with the work as indicated on the Drawings or as specified herein.

F. The bottoms of all excavations shall be properly leveled, loose materials removed, and all excavations maintained in good condition by keeping dry and free from debris, ice, and frost until the concrete has been placed. Any overexcavation shall be brought back to proper grade with suitable soil compacted as specified herein at no additional cost to Owner.

G. In excavations where the surface has been disturbed by construction activities, the soil shall be compacted in place commensurate with the allowable soil bearing pressure or the disturbed soil shall be removed and replaced with suitable soil compacted to meet the minimum density requirements of this Specification at no additional cost to Owner.

H. When unsuitable materials or soil with insufficient strength are encountered below the bottom of an excavation, such unsuitable material or soil shall be removed and replaced with suitable soil

compacted to meet the specified density requirements. Payment for this work shall be made in accordance with the General Conditions.

I. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as Class A Excavation and Rock Excavation. Do not excavate rock until it has been classified by Construction Representative. The Contract Sum will be adjusted for rock excavation in accordance with the Contract Documents. Changes in the Contract time may be authorized for rock excavation.

1. Intermittent drilling, ram hammering, or ripping of material not classified as rock excavation is Class A Excavation.
2. Rock Excavation includes removal and disposal of rock.

3.6 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 (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

C. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

1. Grade trench bottom to provide a smooth, firm, stable, and rock free foundation throughout the length of the piping. All rock greater than one inch in diameter found in the trench shall be removed for a depth of six inches below the bottom of the pipe and replaced by suitable bedding material.
2. Remove unstable, soft, and unsuitable materials at the surface upon which pipes are to be laid and backfill with crushed stone as indicated on the drawings.
3. Provide layers of crushed stone in the bottom of trench. Shape stone layer to fit bottom of piping. Dig bell holes at each pipe joint to relieve the bells of all loads and to ensure continuous bearing of the pipe barrel on the foundation.
4. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.7 SUBGRADE INSPECTION

A. Notify Contractor's geotechnical engineer and Construction Representative when excavations have reached required subgrade.

B. If geotechnical engineer determines that unsuitable soil is present, advise Construction Representative. After receiving approval of Construction Representative, continue excavation and replace with compacted backfill or fill material as directed by geotechnical engineer.

C. Proof-roll subgrade below slabs and pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).

3. Excavate soft spots, unsuitable soils, and areas of excessive pumping or rutting, as determined by geotechnical engineer, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by geotechnical engineer or Construction Representative, without additional compensation.

F. The subgrade for all structures and the subgrade under utility trenches, shall be prepared by compacting the top 12" of soil to the minimum densities hereinafter specified under Backfilling.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by geotechnical engineer and Construction Representative.

1. Fill unauthorized excavations under other construction or utility pipe as directed by geotechnical engineer, subject to approval of Construction Representative.

3.9 STORAGE OF SOIL MATERIALS

A. Unless otherwise noted, suitable excavated material may be used as backfill provided the compaction requirements are met. No large rocks or stones, frozen material, trash, or rubble of any kind shall be used in the backfill.

B. Contractor for his convenience may use imported material for backfill.

C. Stockpile borrow soil materials and excavated suitable 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.
2. Stockpile soil materials only in designated areas approved by the Construction Representative.

3.10 BACKFILL

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

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Inspection and written approval of work to be covered by Construction Representative.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

C. When granular material is used in areas to be planted provide 30" suitable cohesive soil layer plus 6" of topsoil. Soil backfill shall be subject to approval of Construction Representative.

3.11 SUBBASE AND BASE COURSES

A. Place subbase and base course on subgrades free of mud, frost, snow, or ice.

B. Under equipment pads, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of subbase or base course material at 95 percent.

C. On prepared subgrade, place subbase and base course as follows:

1. Shape subbase and base course to required crown elevations and cross-slope grades.
2. Place subbase and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
3. Place subbase and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact subbase and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.12 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. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 - Cast-in-Place Concrete.

D. Place and compact initial backfill of suitable soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Backfill voids with suitable soil while installing and removing shoring and bracing.

F. Place and compact final backfill of suitable soil to final subgrade elevation.

3.13 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 suitable soil materials placed to an elevation of 6-inches below finished grade.
2. Scarify the top 6” of soil in grass and planted areas in two directions prior to placing topsoil.
3. Place all topsoil and complete all finish grading in grass and planted areas.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. 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 suitable soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 9 inches (225 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches (150 mm) 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 to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under equipment pads, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 95 percent.
2. For utility trenches, compact each layer of bedding and initial backfill material at 95 percent.
3. Under lawn or unpaved areas, compact each layer of backfill or fill soil material at 85 percent.
4. For cohesive soils, the moisture shall be controlled between -1% to +3% of optimum.

D. Jetting, as a method of backfill compaction, will not be allowed.

3.16 TOPSOIL PLACEMENT

A. For grass and planted areas bring subgrade to elevation suitable for placement of topsoil.

B. Furnish and install topsoil for areas to be seeded, sodded, or planted.

C. Areas to receive topsoil shall be cleaned by Contractor of all sticks and stones larger than 1” in maximum dimension and all other debris and rough graded to the required subgrade elevations.

3.17 SEEDING/SODDING

A. Seeding and sodding will be provided by the Contractor in accordance with Section 329200 – Turfs and Grasses.

3.18 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.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).

3.19 FIELD QUALITY CONTROL

A. Contact Construction Representative a minimum of 24 hours prior to rock placement at concrete equipment pad location for inspection to confirm soil is undisturbed or properly compacted.

3.20 PROTECTION

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

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

1. Scarify or remove and replace soil material to depth as directed by Construction Representative; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil and waste material, including unsuitable soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION 310000

SECTION 311000 – SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Removing existing trees, shrubs, groundcovers, plants, and grass.
2. Clearing and grubbing.
3. Stripping and stockpiling topsoil.
4. Removing above- and below-grade site improvements.
5. Disconnecting, capping, or sealing, abandoning site utilities in place, and removing site utilities.
6. Temporary erosion and sedimentation control measures.

B. Related Sections:

1. Section 310000 – Earthwork for soil materials, excavating, backfilling, and site grading.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain on Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Pre-Site Clearing Photographs, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, which identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations. Comply with all requirements of Division 01 for use of site.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

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

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

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Section 310000 – Earthwork.

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

B. Granular Backfill: Requirements for granular backfill materials are specified in Section 310000 – Earthwork.

C. Controlled Low Strength Materials: Requirements for Controlled Low Strength Materials (CLSM) are specified in Section 310000 – Earthwork.

PART 3 - EXECUTION

3.1 PREPARATION

A. Stake site clearing limits and obtain approval of Construction Representative prior to commencing with site clearing operations.

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

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

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

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

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. 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.

B. Provide erosion, sedimentation, and water pollution control measures at all locations where drainage is leaving the site.

C. Comply with EPA and Missouri DNR rules and regulations and Best Management Procedures for Storm Water Pollution Prevention. The total area disturbed by this project is less than one acre so a Storm Water Pollution Prevention Plan is not required.

D. Inspect, repair, and maintain 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 UTILITIES

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

1. Notify Construction Representative not less than two weeks in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Construction Representative's written permission.

B. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
3. Remove obstructions and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.

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 (200 mm) and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Topsoil will not be stripped and stockpiled separate from subsoil.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs and aggregate base as required.

3.7 DISPOSAL

A. Disposal: Remove surplus soil material, 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 321216 – ASPHALT PAVING

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. Reference Standards: Missouri Department of Transportation Standard Specifications for Highway Construction (MoDOT Standard Specifications), latest edition.

1.2 SUMMARY

A. Section Includes:

1. Hot-mix asphalt patching.

1.3 RELATED SECTIONS

A. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.4 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: For each job mix proposed for the Work.

B. Qualification Data: For qualified manufacturer and installer.

C. Material Certificates: For each paving material, from manufacturer.

D. Material Test Reports: For each paving material.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the Missouri Department of Transportation.

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Missouri Department of Transportation and for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone or crushed gravel.

C. Fine Aggregate: ASTM D 1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242 or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt pavement will be designed according to:

1. Roadway: AASHTO Guidelines for Design of Pavement Structures, 1986
2. Parking Lot: The Asphalt Institute

B. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22.

C. Asphalt Cement: ASTM D 946 for penetration-graded material.

D. Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30 or MC-70.

E. Tack Coat: ASTM D 977 or AASHTO M 140 emulsified asphalt, or ASTM D 2397 or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.3 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Surface Course: MoDOT Standard Type BP-2 Bituminous Pavement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

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

3.2 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.3 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

3.4 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt surface course in single lift.
2. Spread mix at minimum temperature of 250 deg F.
3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.

2. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
3. Compact asphalt at joints to a density within 2 percent of specified course density.

3.6 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density: 96 percent of reference laboratory density according to ASTM D 6927 or AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
2. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:

1. Surface Course: 1/8 inch.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D 979 or AASHTO T 168.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

    a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than 3 cores taken.
    b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.9 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 321216

SECTION 329200 – TURFS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 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 planted areas damaged by the performance of the work.

1.3 SPECIFICATIONS AND STANDARDS

A. U.S. Department of Agriculture: SRA 156 U.S. Department of Agriculture, Rules and Regulations under the Federal Seed Act.

B. American Joint Committee on Horticultural Nomenclature Standard: 1942 Edition Standardized Plant Names.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Seed mix
2. Fertilizer
3. Erosion control fabric

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 mix shall be:

1. 50% Kentucky Bluegrass
2. 30% Creeping Red Fescue
3. 20% Perennial Rye

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 Owner 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 Owner 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 Americal 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 damaged by the Contractor are to be seeded and fertilized. 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, disking, harrowing or other approved methods until the condition of the soil is acceptable to the Owner's Representative. 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 requirements of 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